Concept Note

DRAFT as of 01 August 2024

Project/Programme Title:	Climate Information and Early Warning Systems, One Pacific Programme
Country(ies):	Pacific island countries and territories: Cook Islands, Federated States of Micronesia, Fiji, Kiribati, Marshall Islands, Nauru, Niue, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu
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Accredited Entity(ies) (AE):	SPREP (Secretariat of the Pacific Regional Environment Programme)
Date of first submission/ version number:	*[2021-12-18] [V.0]*
Date of current submission/ version number	*[2024-08-30] [V.1]*

Notes

- The maximum number of pages should **not exceed 12 pages**, excluding annexes. Proposals exceeding the prescribed length will not be assessed within the indicative service standard time of 30 days.
- As per the Information Disclosure Policy, the concept note, and additional documents provided to the Secretariat can be disclosed unless marked by the Accredited Entity(ies) (or NDAs) as confidential.
- The relevant National Designated Authority(ies) will be informed by the Secretariat of the concept note upon receipt.
- NDA can also submit the concept note directly with or without an identified accredited entity at this stage. In this case, they can leave blank the section related to the accredited entity. The Secretariat will inform the accredited entity(ies) nominated by the NDA, if any.
- Accredited Entities and/or NDAs are encouraged to submit a Concept Note before making a request for project preparation support from the Project Preparation Facility (PPF).
- Further information on GCF concept note preparation can be found on GCF website Funding Projects Fine Print.

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[1]**	☐ 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)	n/a	**A.7. Estimated adaptation impact (number of direct beneficiaries and % of population)**	57% of total Pacific SIDS population live at the coastal zones = 4,731,000[2]
A.8. Indicative total project cost (GCF + co-finance)	USD 222.43 m (includes co-financing – tbc)	**A.9. Indicative GCF funding requested**	USD 162.43 m (includes IE fees)
A.10. Mark the type of financial instrument requested for the GCF funding	☒ Grant ☐ Reimbursable grant ☐ Guarantees ☐ Equity ☐ Subordinated loan ☐ Senior Loan ☐ Other: specify_____		
A.11. Estimated duration of project/ programme:	a) disbursement period: 10 years b) repayment period, if applicable:	**A.12. Estimated project/ Programme lifespan**	15-20 years
A.13. Is funding from the Project Preparation Facility requested?[3]	Yes ☒ No ☐ Other support received ☐ If so, by who:	**A.14. ESS category[4]**	☐ 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 NDAs?**	Yes ☒ No ☐
A.17. AMA signed (if submitted by AE)	Yes ☒ No ☐ If no, specify the status of AMA negotiations and expected date of signing:	**A.18. Is the CN included in the Entity Work Programme?**	Yes ☒ No ☐

[1] Concept notes (or sections of) not marked as confidential may be published in accordance with the Information Disclosure Policy (Decision B.12/35) and the Review of the Initial Proposal Approval Process (Decision B.17/18).
[2] PLOS ONE, 2019. Coastal Proximity of populations in 22 Pacific Island Countries and Territories; an estimate of 57-90% of this live within 1-5km from the coast, estimating 50-50% ratio for men and women.
[3] See here for access to project preparation support request template and guidelines
[4] Refer to the Fund's environmental and social safeguards (Decision B.07/02)

A.19. Project/Programme rationale, objectives and approach of programme/project (max 100 words)	There is global recognition that the small island developing states (SIDS) are most vulnerable to climate change while contributing least to greenhouse gas emissions. Climate change and disaster risks undermine the ability of the Pacific region to reach Sustainable Development Goals, with climate related disaster estimated to cause over $900 Billion Average Annual Losses representing more than 80% of losses caused by all natural disasters. The urgent need to adapt to climate change and improve the ability to manage increased weather and climate related risks, needs to be backed by scientific evidence, reliable data and effective Early Warning Systems, which are often limited in the Pacific SIDS. The One Pacific Programme is designed to enable the implementation at scale of the Weather Ready Pacific, developed and endorsed in 2021 by Pacific Leaders and the Pacific Meteorological Council as the umbrella initiative to strengthen Climate Information Services and Early Warning Systems in the Pacific and deliver in the region the UN Early Warning for All initiative. The programme will also be instrumental to deliver the Pacific Islands Meteorological Strategy (2017-2026), the Pacific Roadmap for Climate Services, the WMO Global Framework for Climate Services and the WMO Global Climate Observing System Implementation Plan in the Pacific. The programme will bring paradigm shift transformation at scale by consolidating, expanding and upscaling the existing investments in the region, and in particular the GCF-funded Enhancing Climate Information and Knowledge Services for resilience in five island countries of the Pacific Ocean programme, the Climate Information Services for Resilient Development in Vanuatu and the Intra-ACP Climate Services and Related Applications (ClimSA) Pacific component. The One Pacific Programme (OPP) goal is to consolidate and scale up the availability and use of Climate and Ocean Information Services and Impact Based Early Warning Systems in the Pacific SIDS to enhance adaptive capacity, strengthen resilience, reduce vulnerability, and minimize losses and damages associated with the adverse effects of climate change and extreme weather. The OPP will use a systemic and people centered approach to managing weather and climate related risks in Pacific SIDs by strengthening Climate and Oceans Information Services and Multi Hazard Early Warning Systems. This will require strengthening the whole value chain, from upstream weather data collection and processing, to modelling and production of forecasts, warnings and climate projections to downstream communication to most vulnerable communities of culturally aware and actionable messages. Information will be tailored to address the specific needs of relevant user groups, ranging from early warnings for vulnerable communities at risk of being impacted from imminent extreme weather events to climate risks assessments for government agencies in charge of sectoral policies (e.g. agriculture, water, food and energy security). The OPP will focus on different vulnerable groups, especially women and marginalised groups including people living with disabilities. It will apply a gender and equality lens to ensure that both men, women and people with disabilities benefit from activities aimed at increasing their resilience and capacity to adapt to climate threats in the future. Preserving and using traditional knowledge will also be key for effectiveness of EWS. Lack of maintenance of hydromet equipment and inadequate financing at scale for sustainable operation of CIEWS as a key challenge in the region. Some promising experiences of providing innovative financial and insurance products to offset the risks to infrastructure and investment exist in the region but require dedicated support for further testing and upscaling. The programme will comprise of regional and country level actions to address these challenged by supporting regional harmonisation of hydromet instruments to ensure interoperability and simplify maintenance, developing a pooled financing mechanism for maintenance and upgrading, supporting revenue generation from CIEWS data provision (e.g. to the maritime and aviation sectors), integrating the use of CIEWS for infrastructure planning and operations, testing and upscaling of insurance and financing approaches to reduce risks and barriers to investment. The OPP approach and design is closely aligned with the Climate Information and Early Warning Systems (CIEWS) GCF sector guide.

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

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

1. Pacific Small Islands Developing States (Pacific SIDS) are vulnerable to a wide range of weather, climate and oceanic extreme and high impact events, including tropical cyclones and typhoons, high waves and seas, earthquakes, volcanic eruptions, drought, coastal inundation (including storm surges, and tsunami), heavy rain and flash floods. In the 2020-21 cyclone season alone, Fiji has been devastated by two severe tropical cyclones, causing loss of life and widespread damage, whilst Samoa was badly affected by flooding and landslides in December 2020. Economic losses from cyclones and flooding in the South Pacific region in 2020 were around USD 1 billion with at least 71 lives lost. Individual extreme events can cause very significant losses – Tropical Cyclone Winston in 2016 affected over half of Fiji's population resulting in USD 900 million in losses whilst Tropical Cyclone Pam in 2015 reduced Vanuatu's GDP by 60%.

2. The average annual loss in GDP in the South Pacific following a natural disaster is estimated to be around 14.4% with a 34% likelihood of a natural disaster occurring in any year. That analysis also includes the impacts of drought, which plays out over a longer timescale but usually impacts far more people than short-term weather or oceanic events. The damage estimates from these combined events equate to an average annual loss in GDP of 4.9% and with a total GDP in the Pacific Islands of USD10.35 billion that equates to an average annual loss of USD 507 million. These estimates, however, do not include quantification of losses of life or disruptions to livelihoods and social cohesion.

3. Further, the risks posed by extreme events are increasing as the Pacific region is particularly vulnerable to sea level rise and other climate change impacts and it is likely that extreme weather events will become more intense, more fre-quent and more widespread in coming decades. Climate change and disaster risks increase the vulnerability of Pacific Island people, and significantly undermine the ability of the Pacific region to reach Sustainable Development Goals. Coastal sea level rise is among the most severe consequences of climate change and the Pacific region is at high risk. Global mean sea level rise will continue over many centuries because of climate change that is already locked in, and it will exacerbate coastal inundation events associated with storm surges and tsunamis. Floods and tropical cyclones are responsible for particularly high economic losses across the Pacific SIDS. Figure 1 shows the volumetric representation of total Average Annual Losses (AAL), which include both losses due to intensive risk and those due to extensive risk, indirect losses and slow-onset disasters. Climate related risks represent well over 80% of AALs, with tropical cyclones accounting for $533 million, drought $217 million and floods $157 million.

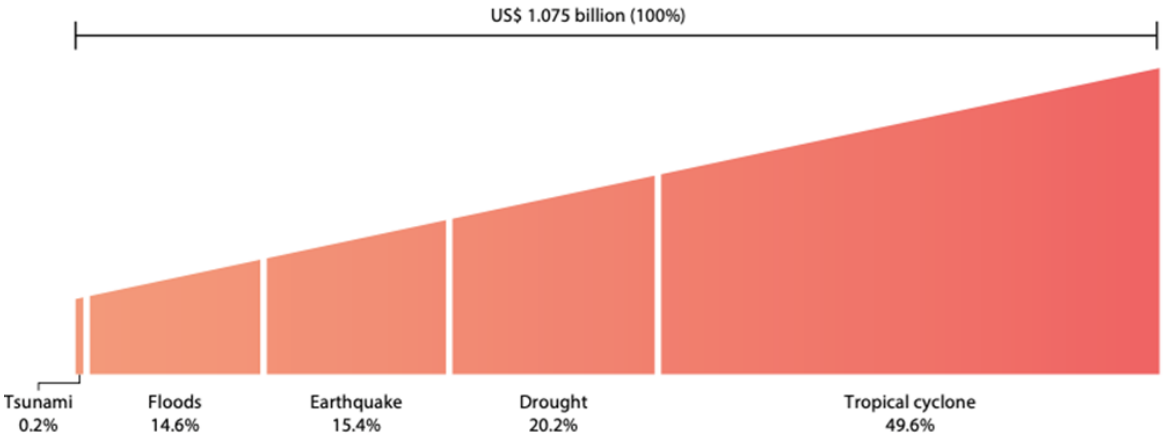


Figure 1: *Volumetric representation of the average annual losses by hazard type in Pacific SIDS (Source: The Disaster Riskscape across the Pacific Small Island Developing States, Asia-Pacific Disaster Report, UNESCAP, 2019)*

4. The regional climate is influenced by three large-scale atmospheric features: the South Pacific Convergence Zone (SPCZ), the Inter Tropical Convergence Zone (ITCZ), and the Western Pacific Monsoon (WPM) Figure 1). These features represent expansive bands of large-scale wind convergence and high rainfall, which strongly influence intra-annual and inter-annual variability in rainfall, winds, tropical cyclone tracks, ocean currents, ocean nutrients and other environmental aspects.[5] The interplay between these climate drivers causes dramatic changes in weather in South Pacific islands, most obviously during El Niño and La Niña events.

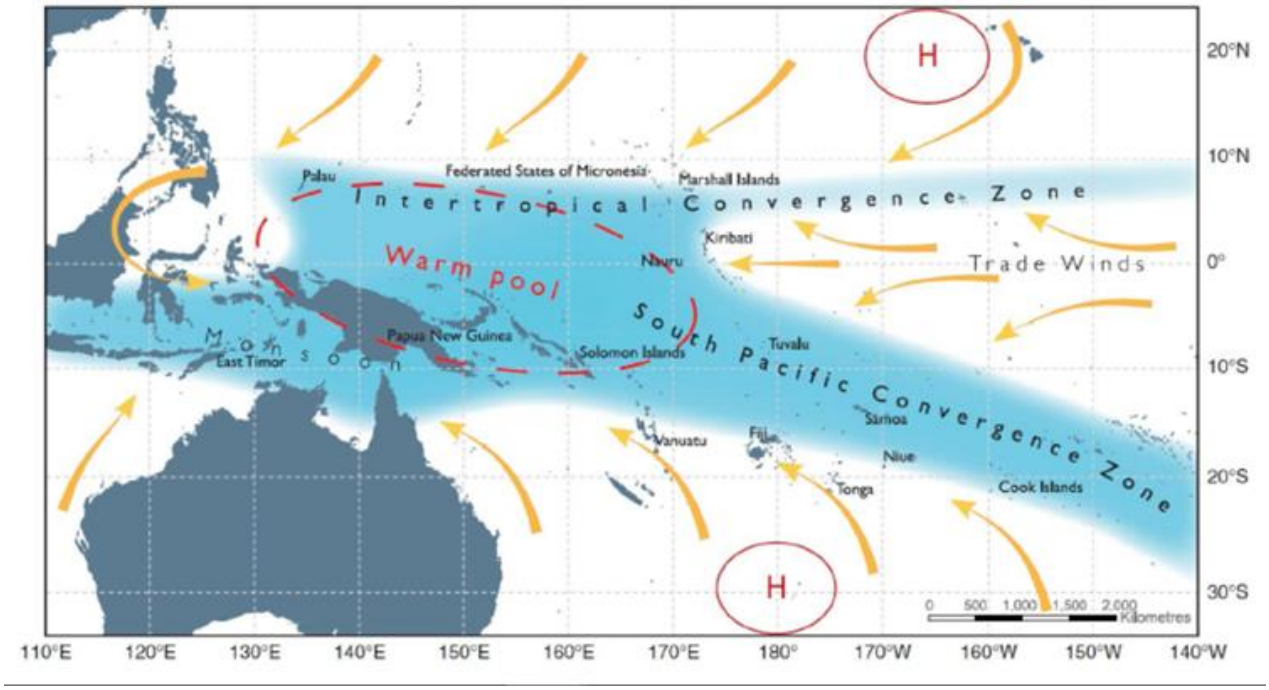


Figure 2: *Natural climate drivers of the tropical Pacific. Arrows show near-surface winds and H represents the typical positions of moving high-pressure systems (source: Australian Bureau of Meteorology and CSIRO, 2011. Climate Change in the Pacific: Scientific Assessment and New Research, Volume 1: Regional)*

Extreme climate events

5. Extreme climate, weather and oceanic events such as tropical cyclones, heavy rainfall and flooding, drought and heat stress, sea level rise, storm surges and ocean acidification are already important for the region and will become more severe in the near future. At the global stage, these are presented in Figure 3.

[5] CSIRO, Australian Bureau of Meteorology and SPREP (2015). Climate in the Pacific: A regional summary of new science and management tools

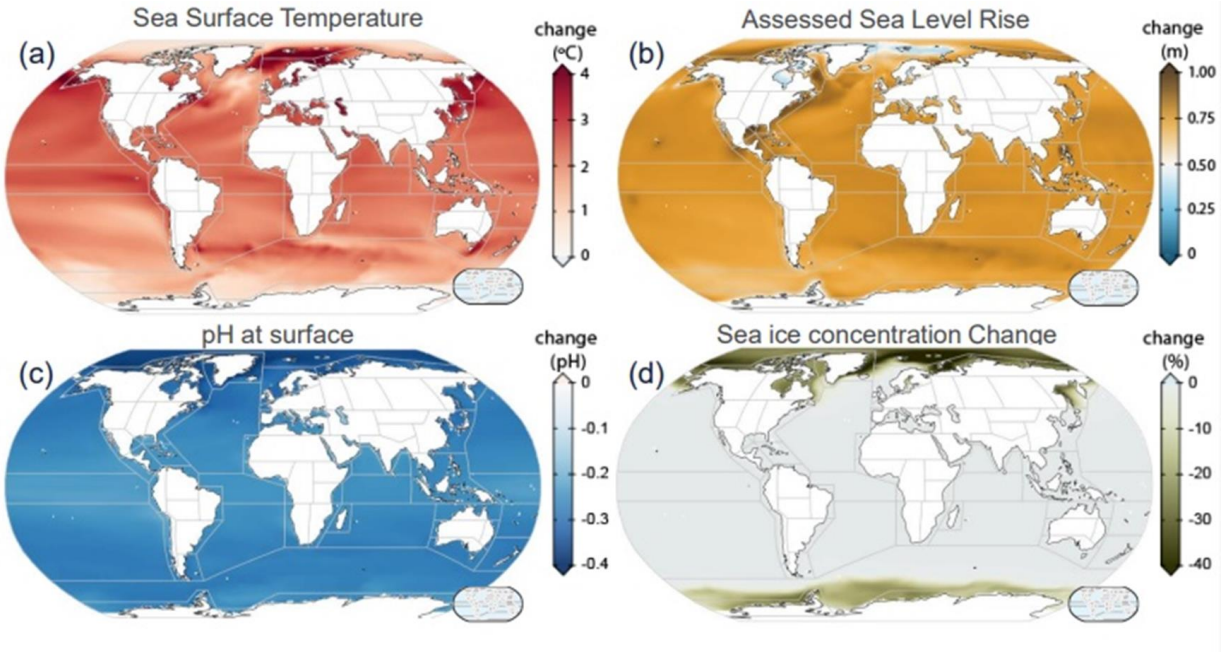


Figure 3: *Project changes in annual (a) sea surface temperature, (b) assessed sea level rise, (c) pH at surface, and (d) sea ice concentration by 2081–2100 global warming under SSP2-4.5 scenario, relative to 1850–1900 (1995–2014 for sea level rise). (Source: IPCC AR6)*

6. Tropical cyclones: Since tropical cyclones only develop where sea-surface temperatures exceed 27°C, it is likely that more tropical cyclones will develop in any season when the area with sea-surface temperatures exceeding 27°C expands. It is also expected that tropical cyclones will endure longer and be able to attain high intensity more frequently, as well as reaching places that have historically been unaffected (or only rarely affected) by them. The IPCCC AR6 has stated that trends vary spatially and seasonally over small island regions in the Pacific. Small islands will face more intense but generally fewer tropical cyclones, except in the central north Pacific where frequency will increase.

7. Temperature increase, drought, and heat stress: At the regional level, annual mean temperature increased at a rate of 0.14°C per decade in the period 1951–2015, with rates of warming the same for the December-February, March-May and September-November periods. A slower rate of warming (0.11°C per decade) was observed for the June-August period. Furthermore, the rate of warming has increased in recent years: 0.12°C per decade over 1983–2015, compared with 0.09°C per decade over 1951–1982.[6] Sea-surface temperatures in the tropical Pacific have generally warmed since 1950, which has been partly attributed to anthropogenic global warming. However, temperature variations associated with Interdecadal Pacific Oscillation (IPO) / Pacific Decadal Oscillation (PDO) also influence the background trend.[7] The West Pacific Warm Pool has considerably expanded over recent decades, with the area of water with temperatures exceeding 29.5°C having increased by 400-600%.[8] The extent to which shifts in IPO/PDO indices are predictable on decadal timescales is the subject of ongoing research. As temperatures increase, limits to human tolerance will be breached at the hottest times of the year, droughts will become more frequent and last longer, and warmer ocean temperatures will cause massive changes to coastal ecosystems and coral bleaching or death.

8. Severe weather and floods: Climate model projections on precipitation suggest a slight overall increase. There are however high degrees of uncertainty around these projections (-4% to +19%) and they also suggest that there may be significant changes in precipitation seasonality (for example,

[6] McGree, S. et al. 2019. Journal of Climate. Recent Changes in Mean and Extreme Temperature and Precipitation in the Western Pacific Islands
[7] Australian Bureau of Meteorology and CSIRO, 2011. Climate Change in the Pacific: Scientific Assessment and New Research, Volume 1: Regional
[8] Cravatte, S. et al. 2009. Climate Dynamics. Observed freshening and warming of the Western Pacific Warm Pool

-17% to +17% in the North Pacific in March-May). While it is not necessary to discard these projections, they are clearly of limited use for the purpose of predicting impacts of precipitation change on the region. What is slightly more apparent is that extreme wet seasons will increase quite significantly (35-40%) over the next 90 years while extreme dry seasons will probably become less frequent. Rainfall intensity, however, is likely to increase, bringing damaging flash floods, especially in watersheds with reduced forest cover.

9. Sea level rise: For the most recent period analysed, 2006-2018, sea level rise is at a rate of 3.7 mm/year – nearly three times as fast as during 1901–1971 (1.3 mm/year). The IPCC AR6 refers to this as "robust acceleration (high confidence) of global mean sea level rise over the 20th century", as did the Special Report on the Ocean and Cryosphere in a Changing Climate (SROCC) in 2019. Over the 21st century, the majority of coastal locations have a median projected regional sea level rise within ± 20% of the projected global mean sea level change. This will pose challenges to Pacific Island nations far greater than those that they have become accustomed to contemplating. Most coastal plains will be permanently flooded, and entire populations will be forced to retreat inland or migrate to safer areas.

10. Ocean acidification: Ocean acidification has increased globally as have the frequency and intensity of marine heatwaves in some areas of the Indian, Atlantic and Pacific Oceans except for a decrease over the eastern Pacific Ocean. Marine heatwaves and ocean acidification will increase further with 1.5°C of global warming and with larger increases at 2°C and higher (IPCC AR6). In the past decade, it has been increasingly realised that ocean acidification is perhaps more of a threat to coral reefs (and other calcifying organisms) than coral bleaching[9], although this has not become any less of a threat to food supplies.

Sector-specific impacts of climate change

11. Decision makers across all sectors in the Pacific region are faced with addressing the impacts of climate variability and climate change – rising temperatures, changing rainfall frequency and intensity, ocean warming and acidification, and sea-level rise – as outlined in the above sections. Pollution and overuse of natural resources, such as overfishing and intensive land and water use, and unsustainable development and mining are degrading Pacific ecosystems and compound the impacts of climate change. This section analyses the sector-specific impacts of climate change on key sectors in the Pacific – agriculture, fisheries and food security, disaster risk management, energy, health, water and tourism – which have also been identified as priority sectors in the Pacific Roadmap for Strengthened Climate Services 2017 – 2026.

12. Agriculture, fisheries and Food Security: Staple food crops grown in the Pacific islands include bananas, breadfruit, cassava, coconuts, sweet potato, taro and yams. Wheat flour and rice are important staples that are almost entirely imported. Cacao, coconut, coffee, palm oil and sugar are the main export crops.[10] Traditionally, Pacific island communities grew multiple crops, which conferred some resilience to climate change as not all crops were affected by specific hazards. However, increasing production of monocultural export crops has reduced the diversity of local production and decrease resilience of food supply in the face of climate hazards.[11]

13. Climate change is adversely impacting agriculture and food security in Pacific island countries in several ways: affecting both the ability to produce food and the ability to import food. Interannual climate variability has a large influence on agricultural production; and longer-term systematic changes in the climate introduce an additional complicated factor. For coastal communities, food production is compromised by the "effects of erosion, increased contamination of groundwater and estuaries by saltwater incursion, cyclones and storm surges, heat stress and drought".[12] Sea-level rise is a direct threat to taro cultivation which are critical for socio-economic development, as well as important to cultural and religious obligations. At present, once saltwater seeps into or displaces fresh water in their taro patches, farmers abandon the taro plots and move inland or shift to other crops. Deforestation is increasing as people clear steeper slopes to plant. This creates further issues such

[9] Doney et al., 2009)
[10] Bell, J. et al. 2016. Climate change and Pacific Island food systems.
[11] Barnett, J. 2011. Regional Environmental Change. Dangerous climate change in the Pacific Islands: food production and food security
[12] Barnett, J. 2011. Regional Environmental Change. Dangerous climate change in the Pacific Islands: food production and food security

as erosion, silting of waterways, and destruction of biodiversity in the downstream marine population.[13] For example Tuvalu, saline intrusion is enhanced by soil porosity and destroys pulaka crops (swamp taro – the country's main carbohydrate staple) and decreases fruit tree yields of coconut, banana and breadfruit. Tropical cyclones can cause significant losses in agricultural production, with the potential to destroy tree and horticultural crops for several years after each occurrence. High wind speeds are a significant threat to tree crops such as bananas, breadfruit, coconuts and mangoes.

14. Increases in extreme weather events such as drought and floods are likely to have greater impact than temperatures changes in the short-to-medium term (2030 – 2050), with devastating effects on agricultural productivity – including grain, horticultural, forestry and livestock production. Key export crops such as pawpaw and taro are highly sensitive to variations in rainfall patterns.[14] Crops such as sweet potato are sensitive to waterlogging and sugar cane is affected by floods. High temperatures affect the formation of sweet potato and yam; and increase the risk of pests and diseases.[15] Furthermore, the impact of extreme climate events on critical infrastructure undermines both subsistence and commercial agriculture. Damage to equipment for processing and storing food can threaten the effective supply of food; and damages to roads, rails and vehicles can disrupt the supply of goods to markets, which in turn undermines the livelihoods of rural farmers.[16]

15. The impact of future climate change on agriculture is expected to have potentially serious implications for food security in the Programme countries. In some countries increasing food imports will be required to meet basic caloric needs and the price of imports can be expected to rise in real terms, which will cause significant strain on household incomes. Food insecurity will increase unless supplementary sources of income can be found.[17]

16. The Pacific region is heavily dependent on oceanic and coastal fisheries for food security, livelihoods, revenue, employment and development. Fish intake is high and is estimated to account for 50 – 90% of animal protein intake in rural areas, and 40 – 80 % in urban areas. Most of the fish eaten by rural communities comes from subsistence fisheries, with little or no cost to the consumer.[18] Climate change is expected to have significant impacts on coastal and oceanic habitats, the fish and invertebrates that they support, and consequently, the productivity of fisheries and aquaculture. Increasing temporal and spatial variability in fish abundance may result from degradation of reefs and mangroves, and changing water turbidity, salinity and temperature. In particular, decreased productivity of demersal fish and invertebrates and a more eastward distribution of some tuna species, are expected to present the greatest threat to the use of fisheries resources by Pacific communities and economies. Invertebrates such as pearl oysters and shrimp, which are important aquaculture commodities, will be affected by increasing ocean temperatures and acidification.

17. The Western and Central Pacific Ocean has the largest tuna fishery in the world[19] and tuna fishing can be fundamental for the economies in certain countries. For example, in 2017, fishing license fees in Tuvalu accounted for 50 % of total government revenue.[20] The predicted increase in frequency or severity of ENSO events due to climate change may affect the amount of fish caught in the EEZs of the Pacific island countries, with resultant impacts on revenue earned from access fees paid by distant water fishing nations. Furthermore, climate change-related increases in storm damages may adversely affect fisheries development due to damage to and loss of fishing vessels, boat launching facilities, fuel facilities, and fish storage and processing facilities.

18. Energy: Pacific SIDS are heavily dependent on fossil fuels to meet local energy demands; and the cost of energy is among the highest in the world – as much as 200-300% compared to other regions – predominantly due to high fuel transportation costs. Consequently, Pacific SIDS are highly vulnerable to oil price shocks and thus energy insecurity.[21] The generation and use of energy

[13] SPREP, 2009. Palau PACC Country Brief
[14] UNFCCC, 2011. Cook Islands Second National Communication
[15] Bell, J. *et al.* 2016. Climate change and Pacific Island food systems
[16] Barnett, J. 2011. Regional Environmental Change. Dangerous climate change in the Pacific Islands: food production and food security
[17] SPC, 2016. Vulnerability of Pacific Island agriculture and forestry to climate change
[18] Hanich, Q. *et al.* 2018. Marine Policy. Small-scale fisheries under climate change in the Pacific Islands region
[19] Allain, V. *et al.* 2016. Overview of tuna fisheries, stock status and management framework in the Western and Central Pacific Ocean Island Fisheries in the Pacific: The challenges of governance and sustainability.
[20] IMF, 2018. Tuvalu International Monetary Fund Country Report No. 18/209
[21] Wolf, F. *et al.* 2016. Energy Policy. Energy access and security strategies in Small Island Developing States

resources are highly important to development in the Pacific. Fossil fuel dependence impedes adaptation capacity: increasing demand for foreign exchange for imports – forex spending on imports may constitute over 50% of total export earnings. Developing self-sufficiency in energy production using renewable energy sources can enable import savings to be redirected to adaptation investments and sustainable development.[22] While SIDS greenhouse gas (GHG) emissions represent a very small percentage at global level, emission reduction is still important as all reductions count and increases the credibility and moral leverage of SIDS in global climate change negotiations. Several Pacific SIDS have indeed ambitious targets for increasing production of energy through renewable sources (e.g. RMI 100% by 2050, Niue 80% by 2025, Palau 45% by 2025).

19. Energy production – including the efficiency of production – is highly sensitive to meteorological and climate events. The efficiency and effectiveness of renewable energy systems in particular must take into account local climatic conditions during both their design and operation. For example, information on solar radiation and wind fields is required for the development of solar and wind power; and hydrometeorological information at the catchment domain is needed for hydropower systems. Therefore, partnerships and stakeholder engagement between NMHSs and the energy sector to apply weather and climate information are critical to developing efficient and effective energy systems.[23]

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

21. Pacific SIDS are some of the most vulnerable in the world to the health impacts of climate change. This vulnerability is on account of their exposure to changing weather patterns, the associated health risks, and their limited capacities to manage and adapt in the face of climate risks. Dengue fever, malaria, diarrheal disease, leptospirosis, typhoid fever, respiratory infections, obstructive airways disease and malnutrition are considered to be highly climate-sensitive diseases.[24] However, the Pacific region has additional climate-related health risks of concern, which have not been documented to the same extent elsewhere in the world, including noncommunicable diseases (NCDs), mental and/or psychosocial health disorders and ciguatera.[25]

22. The rates of NCDs in Pacific SIDS are among the highest in the world;[26] thus, the potential for climate change to act as an additional risk factor for NCDs – due to exacerbating food insecurity and poor nutrition – is of significant concern. In addition, communities in the Pacific region are already being subject to climate-induced forced migration and displacement – both internal and external – which may result in considerable physical and psychosocial health consequences.[27]

23. Water: At the regional level, the Pacific island countries have the lowest access to improved drinking water in the world and the second lowest sanitation coverage.[28] However, there is significant variation in coverage both between countries and within countries. Geographic and economic isolation, and limited human and physical resources, present significant challenges to improving water, sanitation and hygiene in Pacific island countries.

24. In the Pacific region, water is the primary means through which climate variability, climate change and natural hazards influence livelihoods and wellbeing.[29] Direct impacts on water resources can occur via increased intensity of rainfall and flash floods leading to contamination of water supplies

[22] World Bank, 2014. WB-UN High Level Dialogue on Advancing Sustainable Development in Small Island Developing States. SIDS – Towards a Sustainable Energy Future.
[23] SPREP, 2017. Pacific Roadmap for Strengthened Climate Services 2017 – 2026
[24] Woodward, A. *et al.* 2014. Lancet. Climate change and health: on the latest IPCC report
[25] McIver, L. *et al.* 2016. Environmental Health Perspectives. Health Impacts of Climate Change in Pacific Island Countries: A Regional Assessment of Vulnerabilities and Adaptation Priorities
[26] Mannava, P., 2015. Asia Pacific Journal of Public Health. Health systems and noncommunicable diseases in the Asia-Pacific region: a review of the published literature
[27] McIver, L. *et al.* 2016. Environmental Health Perspectives. Health Impacts of Climate Change in Pacific Island Countries: A Regional Assessment of Vulnerabilities and Adaptation Priorities
[28] Global Change Institute and the School of Public Health, The University of Queensland, 2019. Water, Sanitation and Hygiene in the Pacific: The need to meet SDG 6
[29] WHO, 2016. Sanitation, Drinking-Water and Health in Pacific Island Countries. 2015 Update and Future Outlook

impacting on water quality; reduced safety of groundwater due to slower recharge and saltwater intrusion from reduced freshwater flow; and changes in seasonality and timing of precipitation. Indirect impacts on water resources may result from pressures on ecosystems and biodiversity and subsequent changes (e.g. changes in species abundance and desertification); demographic changes due to forced displacement; changes to agricultural ecosystems and potential food insecurity; contamination of water resources due to changes to run-off and sedimentation; and sea-level rise.

25. More intense ENSO events will impact on water supply and island economies.[30] Droughts are especially damaging in the atolls lacking sufficient rainwater harvesting and storage capacity. Climate change is likely to make access to freshwater, already in limited supply, a very serious issue. The strong La Niña event that followed in 1998 – 2000 led to acute water shortages in many Pacific island countries – with partial shutdown of the tourism industry required in some extreme cases.[31]

Climate information services and Early Warning Systems baseline in the Pacific region

26. In this section the context and situation of the Climate Information Services delivery and Early Warning Systems in the pacific region is discussed based on the results of the consultations conducted for the preparation of the WRP programme including recent discussions with Met-Directors and NDAs in May 2024. Annex XX provides an overview matrix of the capacities Assessment of NMHSs across a number of criteria in the four areas of governance and institutions, infrastructure, forecasts and warnings and capacity and training. In the framework of the WMO Systematic Observations Financing Facility (SOFF) detailed Hydromet diagnostic reports and GBON national gap analysis are under preparation. The reports will be used during proposal development as reference sources and baseline to inform programme design.

27. Most Pacific SIDS have a well-defined mandate for their NMSs either proscribed in specific legislations (Acts, regulation, etc) and strategic plans or embedded in other national legislations and higher-level strategic policies and planning frameworks.

28. Some countries (Kiribati, Papua New Guinea, Tuvalu and Vanuatu) have developed and approved specific strategic plan for their NMSs. A few other countries (Federated States of Micronesia, Fiji, Palau, Republic of Marshall Islands) have processes in place to develop strategic plans for their NMSs. The Cook Islands, Samoa, and the Solomon Islands are developing strategic plans under the WMO Climate Risk and Early Warning Systems (CREWS) 2.0 initiative. Other countries indicated they needed assistance to develop their NMSs' strategic plans and other related documents.

29. There is across nearly all countries a formally legislated or regulated arrangement between NMSs and National Hydrological Service (NHSs) and NDMO or Emergency Management Office (EMO) equivalents. In practice, the working arrangements vary widely across the different countries but overall, the NMHSs appear to be well connected to the NDMOs and seem to be an integral part of their country's emergency management plans.

30. There is a drive by most NMHSs towards risk, impact and response-based messaging and improving the communication systems and messaging to their communities to make it more effective and the need to do this in partnership with NDMOs was clearly expressed by both NMHSs and NDMOs.

31. Whilst the Pacific Meteorological Services have their own national mandates and governance arrangements, an important umbrella governance arrangement is the Pacific Meteorological Council (PMC). The PMC is a specialised subsidiary body of SPREP, established to facilitate and coordinate the scientific and technical programme and activities of the National Meteorological Services. The PMC provides policy relevant advice to the SPREP Meeting on the needs and priorities of its member countries and territories in relation to meteorology (weather and climate) and related fields. The Pacific Meteorological Desk Partnership (PMDP) is a regional coordinated response to meeting weather and climate services development in the Pacific Islands region. It works closely with the PMC and member countries to develop capacity and advance the sustainability of weather and climate services in Pacific Islands. It therefore serves as the regional weather and climate services coordination mechanism, managed by the SPREP and WMO RA-V.

[30] UNFCCC, 2011. Cook Islands Second National Communication
[31] IPCC, 2007. Fourth Assessment Report

32. Some countries have a specific Meteorology Division or Department that sits within a larger Ministry, most commonly environment, climate change, or transport. Small countries have the Meteorology Service or its home Division or Department sitting within Ministries such as Finance or in the Office of the President/Prime Minister. Water resources and hydrological services are not as clearly defined or mandated. Even in countries where riverine flooding is a significant issue, the mandate and role of water resources is not always well defined. An overview of the status of Human Resources NMHSs compiled by WMO indicates that Pacific NMHSs face serious needs for capacity strengthening in all professional areas, but in particular of Meteorologists, Climatologists and Meteorological Technicians.[32]

33. The general view emerged during the consultations during the formulation of the WRP indicated that hydrological and oceans services need to be better integrated to effectively deliver impact-based forecasts for flash floods and coastal inundation events. Discussions with IATA (international air transport association) revealed their view is that their members would be better served if there was only one or two Meteorological Authorities in the Region to better focus on the services provided. This would also allow for a central source to provide information during extreme weather events, for example, the communication of activation of contingency measures by airports, and this would also simplify the process of cost recovery.

34. The assessment and consultations for the development of WRP also highlighted that there are diverse capacities and approaches to the development and delivery of forecasts, warnings and related information across the NMHSs, NMSs or NHSs. Countries with NMHSs/NMSs that have sufficiently developed forecast and warning capacity (Fiji, Papua New Guinea (PNG), Samoa, Solomon Islands, Tonga, Vanuatu) develop their own forecasts by obtaining data, forecast products and warning information from a diverse range of sources and providers. Regional Specialised Meteorological Centres (RSMC) are responsible for the distribution of official information, advisories and warnings for one or more specific weather types such as severe weather, tropical cyclones or hurricanes in a defined geographical area of responsibility, as part of the World Meteorological Organization's (WMO) World Weather Watch.[33] The Fiji Meteorological Service (FMS) operates as a RSMC responsible for issuing advisories on tropical cyclones in the area from the equator to 25˚ south and 160˚east to 120˚west. The Central Pacific Hurricane Center (CPHC) is co-located with the Honolulu Weather Forecast Office, and issues all tropical cyclone warnings, watches, advisories, discussions, and statements for tropical cyclones in the Central Pacific from 140 Degrees West Longitude to the International Dateline. Forecasters in these higher capacity non-US NMHSs interpret the data together with forecasts and warnings provided by FMS/RSMC-Nadi and modify and tailor them for their local conditions and user requirements. These products are then issued as the local forecasts and warnings. NMHSs work closely with their NDMOs and associated emergency services during high impact events. Countries with more limited meteorological and hydrological capacity most frequently use forecasts and warnings issued by the regionally mandated centres of FMS/RSMC-Nadi (Cook Islands, Kiribati, Nauru, Niue, Tokelau, Tuvalu) and Guam National Weather Office (FSM, Palau, RMI) and do varying amounts of local interpretation.

35. To enable these NMHS to effectively support preparedness and response to extreme weather events, water and ocean risks they require the ability to autonomously access increasingly accurate and localised forecasts, and empowerment to engage more authoritatively with government and community decision makers. As such, whilst improving the number and capacity of meteorologists and hydrologists is a recognised requirement of most NMHSs there is an opportunity through improving forecasting technologies to deliver more locally relevant forecasts and warnings from regional centres within and outside the Pacific, rather than trying to build a comprehensive technical forecast centre for each individual country.

36. Ocean observations and forecasting services are quite limited overall and it has been stated by a number of NMHSs that this is an area for which improvements are required to improve community safety. Much of the existing service is derived directly from NWP output with little verification. It is felt that significant improvements in ocean services could be achieved with additional observations of swell and tides and improved training of the forecasters.

[32] https://library.wmo.int/doc_num.php?explnum_id=4184
[33] http://severeweather.wmo.int/rsmcs.html

37. Many countries provide some seasonal information particularly in the context of drought in coral atoll islands where fresh water supplies are at a premium. This is disseminated via alerts, billboards, etc. There is a need to strengthen seasonal forecasting approaches, for example, using the BoM (Bureau of Meteorology, Australia) seasonal forecast model, ACCESS-S, the Korean multi-model ensemble developed for the Pacific (CliPS - PICASO), NOAA, or other seasonal prediction products, and delivering messages more effectively to key sectors such as agriculture and water supply authorities.

38. The amount and operability of observing equipment across the Pacific SIDS varies considerably, as does technical capability to maintain instrumentation, process data and transmit the final products. Some countries rely on just one or two manual surface observation stations to maintain their climate record and for weather forecasting, whilst in some countries there is a wide network of manned stations and/or Automatic Weather Stations (AWS). Ongoing maintenance of NMHS equipment and having the required number of appropriately trained electronics technicians is a challenge for most NMHSs. Frequently, at the conclusion of projects that provide infrastructure, no ongoing budget is provided for further maintenance. At present, few Pacific SIDS are uploading on a regular basis all their local observations into Global Observing Network (GBON) to improve global and regional scale numerical weather prediction models being run by WMO Global Information System Centres (GISC). A contributing factor to the lack of data being ingested into GBON revolves around the sustainability of observational equipment in the long term.

39. Expanding the observation network with modern instrumentation that transmits more frequent observations increases the load on existing IT infrastructure and data management processes. Similarly, outputs generated from external products such as data rich high resolution NWP model output requires enhanced IT infrastructure and support. Consequently, Information Technology (IT) support and data management is a related area of infrastructure (and capacity) that was identified by WRP as a high priority need in nearly all NMHSs. Internet and mobile networks are also expanding across the Pacific and uptake is rapidly increasing, though costs are high and reliability limited in many areas. However, further improvements are needed in satellite coverage for digital phone networks and in affordability of phones and plans in remote communities. This is critical because distribution of forecasts and warnings is increasingly utilising digital technologies and to facilitate this, it is strongly recommended that warnings messages are delivered by NMHSs in Common Alerting Protocol (CAP) to enable the messages to be distributed on and by any digital platform.

40. There are a wide variety of forecast and warning production platforms in use across the NMHSs. Some countries such as Samoa and Tonga are actively seeking to update their forecast and warnings platforms while a some other acknowledge that their platforms are ageing and in need of refurbishment but are currently unable address the issue.

41. Generally, there is a strong awareness among NMHSs of the need to deliver risk, impact and response-based messages i.e., what the weather will do rather than what the weather will be, but the extent to which this is implemented varies widely. Most NMHSs require further training in the use of risk, impact and response-based approaches to forecasts and warnings. Nearly all countries have processes, or are developing processes, to gain community and industry feedback on how to better deliver messages and develop content that is response oriented in a local context with appropriate impact statements.

42. One of the challenges consistently raised in the consultations was the need to better translate technical terms in forecasts and warnings into locally relevant impact messages because many technical terms do not exist in local languages. A recent study in Niue, Solomon Islands, Tonga and Vanuatu found that a high proportion of community members used both traditional knowledge based and contemporary forecasts (70% overall, 53% Vanuatu, 78% Solomon Islands, 82% Niue, 83% Tonga) to assist them in planning for weather and climate events.[34] Traditional knowledge approaches to communicating weather and other extreme events need to be better incorporated into warnings and preparedness messages delivered by NDMOs and NMHSs. This needs to be a two-way process and there are promising examples, such as in the VanKirap Project, of how traditional knowledge can be used with science to develop more effective early warning systems.

[34] Chambers, L., Lui, S., Plotz, R. *et al.* Traditional or contemporary weather and climate forecasts: reaching Pacific communities. *Reg Environ Change* **19**, 1521–1528 (2019). https://doi.org/10.1007/s10113-019-01487-7

Problem Statement

43. The livelihoods and economies of Pacific SIDS depend heavily on the ocean and climate-sensitive sectors such as fisheries, tourism and agriculture. Changes in precipitation and cyclone patterns are already having devastating effects on water security, agricultural yields and availability of arable land. Fisheries are under threat owing to loss of coral reef, mangrove and sea grass habitats as a result of destructive climate-related events and warming of the sea significantly affecting the blue economy which is key in the Pacific. Lives, livelihoods, assets and infrastructure are threatened by several climate-related hazards, which are projected to increse in intensity and frequency due to climate change. Current forecasts are not sufficiently reliable and downscaled for use in disaster risk management. As recognised in the Pacific Island Meteorological Strategy 2017–2026, essential services provided by National Meteorological and Hydrological Services (NMHSs) underpin economic growth and sustainable development in the region and yet they cannot be consistently provided. Their weather, climate, water and ocean information services are critical to the safety, livelihoods and capacity to adapt to climate change of Pacific island populations. However their quality, effectiveness and regional integration requires improvements to ensure that information is reliably reaching vulnerable communities and feeds into investment planning. Also, women and people with disabilities are disproportionally affected by disasters, with significantly higher deaths. Important gaps remain in the observation networks, IT infrastucture, hazard modelling, forecasting, communication and effectiveness of warnings, and effectively addressing the gender and equity dimensions. Multiple projects have contributed to improving Climate Informaiton Services and disaster preparedness and recovery. The results are however often fragmented and better cordination is required, in particular in the procurement, operation and mainatinance of equipment and infrastructure. Uptake of NMHS forecasts in remote Pacific communities can be limited, particularly those relating to expected impacts. To address this, a clearer understanding is needed of the types of information local communities currently use and how this information is received, to enable NHMSs and NDRMs to modify their products and their delivery to better meet community needs. As demonstrated by some promising expereiences, integration of traditional knowledge of the climate and oceans in the Early Warning Systems can play a critical role in increasing the effectiveness. This requires expansion and replication across the region of the approaches and tools piloted in some countries.

Main barriers to effective climate services and risk management

44. There has been significant investment in the development and improvement in the capacity and capabilities of NMHSs as outlined in the Pacific Islands Meteorological Strategy 2017–2026 (PIMS). There are many different development and collaborating/agency initiatives, programmes and projects involving a large number of international institutions e.g. World Bank, Asian Development Bank, WMO, UNDP, UNEP, Food and Agriculture Organisation, Adaptation Fund, Global Environment Facility (GEF), ADPC, UNESCO, World Food Programme (WFP), Economic and Social Commission for Asia and the Pacific (ESCAP), International Organisation for Migration (IOM), United Nations Office for Disaster Risk Reduction (UNDRR), IMO, ICAO, SPREP, SPC, PASO, PIFS, APCC, JICA, JMA, KMA, CMA, ECMWF, UK Met Office, United Kingdom, New Zealand, Japan, Australia, US, France, Finland, Italy, Denmark, China, Republic of Korea, Russia. All these initiatives have their own context and objectives and a challenge expressed by NMHSs is to bring some cohesion to these various activities so that the whole is greater than the sum of the parts. This requires stronger involvement of regional partners such as SPREP and the WMO Regional Association that includes the Pacific (RA-V) in aligning initiatives to overarching strategies such as the PIMS 2017-2026. The need for better alignment is especially evident in infrastructure where different projects can result in a wide diversity of equipment types, which creates additional overheads and stretches already limited capacity in equipment maintenance and sustainability.

45. As a result of past support, most NMHSs have improved their technical skills required to process, prepare and deliver weather, water, climate, and other related environmental services to their governments, communities and other customers. However, major gaps and barriers remain, including:

    (i) Governance arrangements, mandates, coordination, strategic plans and institutional support are lacking in some countries (e.g., legislation establishing the role and responsibilities of the weather service and ensuring its funding, clarification of the NMHS mandate and the relationship with NDMOs and other partners)

(ii) The observation network is patchy and the ability to invest in and maintain modern observational infrastructure is limited, with computational infrastructure and capacity not meeting global standards

(iii) Forecasting systems in use are highly variable in approach and quality, with insufficient qualified meteorological and technical staff to develop and deliver accurate, localised and impact-based forecasts and warnings. This creates challenges for NMHSs in providing the information needed by governments, communities and industries to better prepare for extreme events and manage the subsequent impacts on livelihoods and economies.

(iv) Weak interfaces to effectively and efficiently communicate weather and climate information to the end-users and limitations of user engagement in their design. Limited documentation and integration of traditional knowledge in EWS.

(v) Limited ability of end-users (vulnerable communities, sectors and private sector) to use weather and climate information to better prepare and respond to the impacts of climate change

46. Additionally, as reaffirmed by the UN General Assembly in the 2019 Political declaration of the High-Level Meeting to Review Progress Made in Addressing the Priorities of Small Island Developing States through the Implementation of the SIDS Accelerated Modalities of Action (SAMOA) Pathway, SIDS remain a special case for sustainable development as they continue to face the combined challenges arising, in particular, from their geographical remoteness, the small scale of their economies, high costs and the adverse effects of climate change and natural disasters.

Alignment with Regional policies, strategies and programmes

47. In the context described above, reliable climate information services (CIS) and impact-based multi-hazard early warning systems (MHEWS) are more crucial than ever. The Paris Agreement stipulates early warning systems as one of the major focus areas to enhance adaptive capacity, strengthen resilience, reduce vulnerability, and minimise losses and damages associated with the adverse effects of climate change. The UNFCCC Warsaw International Mechanism for Loss and Damage highlights CIEWS as a key measure for averting losses and damages associated with adverse effects of climate change (UNFCCC, 2022).

48. The services provided by National Meteorological and Hydrological Services (NMHSs) and National Disaster Management Offices (NDMOs) are essential to the safety and well-being of Pacific people and communities, protection of property and sustainable development. The Framework for Resilience Development in the Pacific (FRDP) Goal 3 calls for improving Pacific Island countries and territories (PICTs) to prepare for emergencies and disasters ensuring timely and effective response and recovery to rapid disasters such as extreme weather, water and ocean events.

49. The One Pacific Programme (OPP) will contribute to the Pacific Islands Meteorological Strategy (2017-2026), the Pacific Roadmap for Climate Services, the WMO Global Framework for Climate Services, WMO Global Climate Observing System Implementation Plan in the Pacific, and the Pacific Meteorology Council Expert Panels, among others (Table 1). It will also align and contribute to the UN Secretary General Early Warnings for All initiative (EW4ALL) and the executive action plan launched at COP27[35]. The initiative is co-led by the World Meteorological Organization (WMO) and the United Nations Office for Disaster Risk Reduction (UNDRR), with support from the International Telecommunication Union (ITU), the International Federation of Red Cross and Red Crescent Societies (IFRC) and other partners.

50. At its fifth biennial meeting in Apia, Samoa in August 2019, the Pacific Meteorological Council (PMC) recommended the Secretariat of the Pacific Regional Environment Programme (SPREP) commission a study to scope the feasibility for a Decadal Program of Investment to enable the Pacific Small Island Developing States to better anticipate, prepare for and respond to those risks. As a result, the Weather Ready Pacific (WRP) programme was developed and endorsed in 2021 by Pacific Leaders with a decadal programme of investment of over USD 190 millions[36]. WRP was endorsed by the

[35] https://www.un.org/en/climatechange/early-warnings-for-all

[36] The budget estimate of USD 165.2 million included in the Programme document (2021) was revised to USD 191 millions by the WRP Implementation Plan (2023). The plan is divided into three main sections: an Overall Implementation Plan covering the period 2024–2033 with an indicative budget of USD 191 million, a Phase 1 Implementation Plan covering the period 2024–2028 with an indicative budget of USD 40 million, and an Inception Phase Implementation Plan covering the

Pacific Meteorological Council (PMC-6) as the vehicle for the implementation of the EW4ALL in the Pacific. At the Regional Coordination Workshop Collaborating for Inclusive Early Warnings Systems and Climate Services in the Pacific held in Fiji in April 2024 organized by PMC, EW4ALL and WMO it was agreed that the scope of WRP will be expanded to align with the EW4ALL framework to cover all the 4 pillars. Governance arrangements will also be reviewed (in particular the Steering Committee) to ensure that they are more inclusive of other key stakeholders, especially from the disaster risk reduction community.

51. The One Pacific Programme will closely align to the WRP, directly contribute to its implementation by financing specific activities and complement its thematic scope through synergic support of actions such as strengthening preparedness and response, including anticipatory actions, and resilience financing (see also Table 2). The proposed programme design, which covers all the 4 pillars of the EW4ALL, anticipates the upcoming expansion of the scope of the WRP.

52. From the 16 Pacific SIDS that participated in the November-December 2020 consultations for the Weather Ready Pacific (WRP), 11 have adequate legislative authority, three have no current Act but this is under review, and two (PNG and Tokelau) have no current legislation. Eight PICTs have national plans or strategies, seven are currently preparing such plans, while only one (Nauru) does not have a strategic plan in place. The One Pacific Programme proposed interventions are drawn from these submissions including the May 2024 consultations with national meteorological services Directors and GCF NDAs and is fully aligned with national priorities.

53. The One Pacific Programme design is also closely aligned with the GCF Climate Information and Early Warning Systems (CIEWS) sector guide that focuses on: (i) climate information services; (ii) impact-based multi-hazard early warning systems; and (iii) disaster risk reduction and management.

Table 1. Relevant policies, strategies, and frameworks for the One Pacific Programme

Policy /Strategy /Framework	Description
Pacific Islands Meteorological Strategy (PIMS) 2017–2026	PIMS has five priority areas: (i) improved weather services; (ii) disaster risk reduction; (iii) improved climate and hydrological services; (iv) integrated observing and communication systems; and (v) coordinated support for NMHS and PMC.
Pacific Roadmap for Climate Services (2017–2026)	Prioritises key actions identified for implementing the Global Framework for Climate Services (GFCS) that are relevant to the Pacific. It expands from the GFCS's focus areas of agriculture and food security, disaster risk management, sustainable energy, health, and water by adding fisheries and tourism. The roadmap also welcomes funding for projects targeted at delivering equipment, computing hardware and software and software turnkey tools and systems for generating climate services.
Pacific Climate Change Research Roadmap[37]	This roadmap provides a consensus and strategic approach to facilitating prioritisation, management, coordination and delivery of climate change science and services research and associated traditional knowledge in the Pacific. The ultimate aim is to facilitate the development and application of science-based and traditional knowledge to deliver on-ground impacts and enhance resilience to climate change in the Pacific. The roadmap has six key pillars that describe in summary the scope in terms of the types of data, information and associated capabilities that might need to be developed and implemented in order to address the

period November 2023–December 2024 with an indicative budget of USD 7.7 million. In February 2023, the Government of Australia pledged their support for WRP with a contribution of AUD 30 million.

[37] The Pacific CC Research Roadmap and associated Implementation Plan is being coordinated by the PCCC presently with support from a Working Group including CSIRO, UKMO, NOAA/USGS, NIES (Japan), NIWA (and BOM TBC). For the most part this membership also includes membership of the Climate Change Node of the WMO-mandated PI-RCC-Network. It is funded by DFAT through SPREP and CSIRO in 2018 and endorsed by PMC in 2020. An update of the roadmap was endorsed by PMC at PMC-6 in 2023 and is scheduled to be finalised and endorsed by PMC in Sep 2024. The Research Roadmap will also provide the PCCC with the strategic framework for coordinating CC research implementation in the Pacific for the next 5-10 yrs.

	priority gaps and needs of designated end-users and other climate change stakeholders in the Pacific. The six pillars are climate change science, traditional knowledge, capacity development, climate services, governance oversight & administration, and data & information management.
WMO Global Climate Observing System Implementation Plan in the Pacific	WMO supports the work of NMHSs through the WMO Integrated Global Observing System (WIGOS), atmospheric constituent observing systems managed by the Global Atmosphere Watch (GAW), the WMO Information System (WIS), the World Hydrological Cycle Observing System (WHYCOS) and the Climate Services Information System of the Global Framework for Climate Services (GFCS).
Pacific Meteorology Council (PMC) Expert Panels	PMC Expert Panels were established to provide technical advice to the Council on matters concerning the development of meteorological services in the region under each of the six thematic areas of the Pacific Islands Meteorological Strategy 2017-2026 (i.e., climate services, marine and ocean, aviation weather, communications and infrastructure, education, training and research, and hydrological services).
The Framework for Resilient Development in the Pacific (FRDP)	FRDP provides the overarching regional approach to integrated climate change and disaster risk management for the period 2017–2030. The FRDP also outlines high-level strategic guidance to a non-exhaustive set of 'priority actions', for consideration by different stakeholders. These actions provide guidance only and are to be implemented as relevant to the individual priorities and needs of stakeholders but provide the overarching framework for stakeholder engagement.
The 2050 Strategy for the Blue Pacific	This frames regional cooperation and broader action around seven key thematic areas which has Climate Change and Disasters as one. Within that thematic area, there is a strategic pathway of regional cooperation and collaboration to "...build the capacity and resilience of communities to effectively address the impacts of climate change….".

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

54. The proposed One Pacific Programme (OPP) will contribute to the implementation of WRP and of the Pacific Islands Meteorological Strategy (2017-2026), the Pacific Roadmap for Climate Services, the WMO Global Framework for Climate Services, WMO Global Climate Observing System Implementation Plan in the Pacific, and the Pacific Meteorology Council Expert Panels. It will also contribute to achieving the objective of the UN Early Warning for All (EW4ALL) initiative by directly supporting the implementation of WRP, endorsed by the Pacific Meteorological Council as the vehicle for the implementation of the EW4ALL in the Pacific.

55. The **programme goal is** to consolidate and scale up the availability and use of Climate and Ocean Information Services and Impact Based Early Warning Systems in the Pacific to enhance adaptive capacity, strengthen resilience, reduce vulnerability, and minimize losses and damages associated with the adverse effects of climate change and extreme weather.

56. The OPP will have a duration of 10 years and will provide support to the 14 Pacific SIDS, members of the GCF and SPREP, through regional and national level activities based on their specific needs and in synergy with other relevant initiatives.

The OPP will use a systemic and people centered approach to managing weather and climate related risks in PICs through CIS and MHEWS[38]. This will require strengthening the whole value chain, from upstream weather data collection and processing, to modeling and production of forecasts, warnings and climate projections to downstream communication to most vulnerable communities of culturally aware and actionable messages. Information will be tailored to address the specific needs of relevant user groups,

[38] For simplicity in the reminder of the document we will refer to Climate Information and Early Warning Systems (CIEWS), comprising CIS and MHEWS.

ranging from early warnings for vulnerable communities at risk of being impacted from imminent extreme weather events to climate risks assessments for government agencies in charge of sectoral policies (e.g. agriculture, water, food and energy security). To maximise the chances that effective actions will be taken it will be essential to engage end-users in co-designing CIEWS by jointly defining what information is needed and how it should be delivered, taking into account real world operational contexts, the cultural dimension, gender and disability. Preserving and using traditional knowledge will also be key for effectiveness of EWS. Building on the results and lessons from the VanKIRAP Project and Climate and Oceans Support Programme in the Pacific (COSPPac 3)[39], the programme will therefore support the documentation and integration of the unique pacific traditional knowledge of climate and the ocean into the design and operations of EWS.

57. WRP and other initiatives have identified lack of maintenance of hydromet equipment and inadequate financing at scale for sustainable operation of CIEWS as a key challenge in the Pacific. Some promising experiences of providing innovative financial and insurance products to offset the risks to infrastructure and investment exist but require dedicated support for further testing and upscaling. The programme will comprise regional and country level actions to address these barriers by activities such as supporting regional harmonization of hydromet instruments to ensure interoperability and simplify maintenance, developing a pooled financing mechanism for maintenance and upgrading, supporting revenue generation from CIEWS data provision (e.g. to the maritime and aviation sectors)[40], integrating the use of CIEWS for infrastructure planning and operations, testing and upscaling of insurance and financing approaches to reduce risks and barriers to investment.

58. The One Pacific Programme will build on several ongoing or completed projects/programmes addressing aspects of climate information services, monitoring systems and management including early warning systems and disaster risk reduction and management, such as:

(i) *Weather Ready Pacific* provides the overarching programmatic framework and priorities that the One Pacific Programme will contribute to. The WRP identified five focus areas: (i) enhanced NMHSs; (ii) governance and institutional arrangements; (iii) capacity building and training; (iv) NMHSs/NDMOs communicating impact-based forecasts and warnings; and (v) targeted infrastructure investment. The One Pacific Programme will align with the WRP approach and directly contribute to the implementation of Key Results Areas 2,3,4,5. In addition it will provide complementary and synergic support for strengthening Climate information Services, improving preparedness, including early action, and integrating climate information into resilience financing.

(ii) Intra-ACP Climate Services and Related Applications (ClimSA). The ClimSA programme has a total of EUR 85m under the intra ACP Cooperation – 11th European Development Fund – Strategy Paper and Indicative Programme 2014-2020 programming actions for the ACP regional organisations /institutions and countries. The EUR 9m Pacific component of ClimSA is implemented by SPREP. Key result areas are: (i) interaction between the users, researchers and climate services providers in ACP countries is structured; (ii) provision of climate services at regional and national levels is effectively guaranteed and secured; (iii) access to climate information is improved; (iv) capacity of ACP regions is enhanced to generate and apply climate information and products relevant to their particular concerns; and, (v) climate-informed decision-making is enhanced and climate services are mainstreamed into policy processes at regional and national levels. Focus countries are Kiribati and Samoa with Agriculture and Disaster Risk Reduction as the priority sectors. The One Pacific Programme will upscale these interventions to other countries and other priority sectors such as infrastructure, tourism, and fisheries.

(iii) The USD 49.9m GCF-funded Enhancing Climate Information and Knowledge Services for resilience in five island countries of the Pacific Ocean programme, CIS-Pac 5 is implemented by UNEP with SPREP as one of the Technical Partners. Participating countries are the Cook Islands, Niue, Palau, Marshall Islands and Tuvalu with the programme results as (i) strengthened delivery model for climate information services and multi-hazard early warning systems covering oceans and islands; (ii) strengthened

[39] https://www.sprep.org/news/cosppac-traditional-knowledge-database-strengthening-weather-forecasting-and-observations-in-the-pacific

[40] Supporting the Pacific to achieve WMO standards will have a transformative impact on managing climate and weather risks along with a better understanding of long-term climate change impacts. This will be facilitated through the existing regional cooperation mechanisms such as the Pacific Meteorological Council (PMC).

observations, monitoring, modelling and prediction of climate and its impacts on ocean areas and islands; (iii) improved community preparedness, response capabilities and resilience to climate risks; and, (iv) enhanced regional knowledge management and cooperation for climate services and multi-hazard early warning systems. The One Pacific Programme will upscale these areas to other Pacific SIDS and where practical will explore possible collaboration and extending the scope of the interventions.

(iv) The USD 19.854m GCF-funded project Climate Information Services for Resilient Development in Vanuatu (Van CIS RDP), also known as Van-KiRAP, is implemented by SPREP and focuses on (i) capacity development; (ii) user interface platform; (iii) climate information services system; (iv) observations and monitoring; and (v) research, modelling and prediction. The One Pacific Programme design and implementation modalities will consider the opportunities arising from the lessons learnt in the implementation of Van-KiRAP. As appropriate, best practices in the Van-KiRAP approach will be replicated in other Pacific SIDS.

(v) The USD 32.7m GCF-funded project Vanuatu community-based climate resilience project (VCCRP) implemented by Save the children Australia. This project supports highly vulnerable rural and coastal communities to increase their resilience to climate change, through targeted community and local adaptation activities in the agriculture and fisheries sectors. The project will also provide access to climate information and early warning systems at the local level. Key activities include establishing local disaster risk reduction committees; protecting and restoring 11,600 hectares of agricultural and fisheries sites; and training smallholder farmers in climate-resilient agriculture techniques and fishers in effective coastal resource management.

(vi) APEC Climate Center (APCC) and SPREP jointly implemented climate modelling, prediction and forecasting interventions and specialised technical training. APCC and SPREP implemented the Republic of Korea-Pacific Islands Climate Prediction (ROK-PI CLiPS) project in 2014-2017. ROK-PI CLiPS has built a regional mechanism to provide locally tailored seasonal climate prediction information and training on downscaled climate predictions in the 14 Pacific SIDS. The project developed and launched the CLIK-P and PICASO forecast tools tailored for the Pacific. The ROK-PI CliPS project was approved for a second phase and is scheduled to be completed in 2021. Through the second phase, the project is updating the forecasting tool to address NMHS concerns regarding conflicting seasonal climate models by developing a Consensus Climate Outlook (CoCO) function. The One Pacific Programme will leverage technical support and incorporate best practices from both APCC and the Pacific Met-Desk partnership arrangements.

(vii) The project 'Next Generation Climate Projections for the Western Tropical Pacific'[41] fundned by the Australia-Pacific Climate Partnership (APCP) has produced reports for the 14 PICs on the Current and future climate, available through the portal of the Regional Climate Consortium for Asia and the Pacific[42]. The projections are bases on the Couple Model Inter-comparison Project (CMIP) 5 ensemble of global climate model outputs which informed the IPCC Fifth Assessment Report (AR5) published in 2013/14. The reports use much of the same underlying datasets and information from Pacific-Australia Climate Change Science and Adaptation Planning (PACCSAP) reports (CSIRO, Bureau of Meteorology and SPREP, 2014) but presents the information in new and more salient ways, with more context and detail; thereby making the underpinning science more relevant to decision-makers for application at a sectoral level. 5 case studies with sectoral applications have also been produced to demonstrate the practical application of the projections.

(viii) The Climate Risk and Early Warning Systems (CREWS) Pacific SIDS Project "Pacific: Strengthening Hydro-Meteorological and Early Warning Services" Phase I, implemented by WMO now has Phase II approval to be implemented in 14 Pacific SIDS. The One Pacific Programme will ensure complementary joint activities including use of gender-sensitive indicators in assessments of NMHS capacities and regional assessments; people-centred early warning systems focused on reaching communities that are not currently well connected with the NMHS; promote coherence through cooperation with ongoing projects and initiatives; and promote an active dialogue with beneficiaries to find solutions to their identified EWS-related problems.

[41] https://www.pacificmet.net/project/next-generation-climate-projections-western-tropical-pacific
[42] https://www.rccap.org/climate-change-update-for-the-pacific/

59. The OPP will also contribute to strengthening coordination among the many bilateral and multilateral initiatives in this sector, with a particular focus on observational infrastructure and harmonisation of equipment procurement and maintenance. Given that a new initiative covering the pacific region focused on Hydrology is being developed by WMO with potential funding from the GCF, the One Pacific Programme will not include actions related to this aspect.

60. The One Pacific programmatic framework will consist of a regional umbrella programme comprising crosscutting activities that will serve all beneficiary countries (Component 4: Crosscutting regional support and programme management). Within the programme framework, three projects will be developed to deploy country level support:
    (i) Pilot project in Solomon Islands.
    (ii) Sub-regional Cluster 1: comprehensive support to achieve results related to all three Programme components for the countries that haven't yet received funding from GCF for CIEWS development (Fiji[i], FSM, Kiribati, Nauru, PNG, Samoa, Tonga).
    (iii) Sub-Regional Cluster 2: complementarity, integration, upscaling and sustainability of results achieved though the CIS-Pac5 (Cook Islands, Marshall Islands, Niue, Palau and Tuvalu), and the VanKIRAP in Vanuatu.

61. Components and output of the One Pacific Programme are summarised in Figure 4 below. The contribution to achieving Key Results of the WRP as well as the alignment with the EW4ALL are also illustrated in the diagram. The One Pacific Programme will contribute to all the 4 pillars of the EW4ALL.

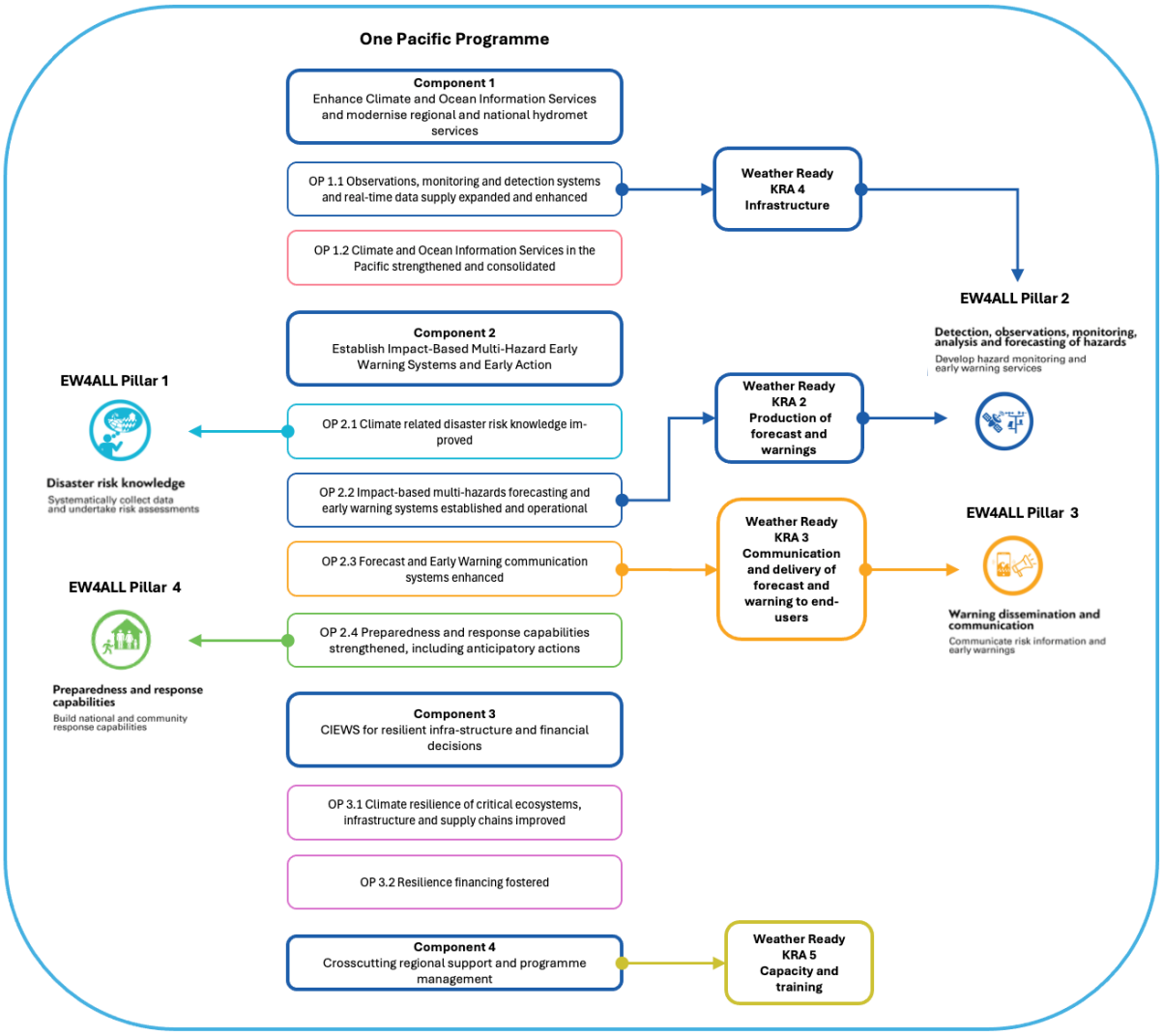


Figure 4: *Outline of programme components and outputs, their contribution to the Weather Ready Pacific Key Results Areas and alignment with the EW4ALL*

62. The OPP will consist of four main synergic components:
Component 1: Enhance Climate and Oceans Information Services and modernise regional and national hydromet services
Component 2: Establish Impact-Based Multi-Hazard Early Warning Systems and Early Action
Component 3: CIEWS for infrastructure design and resilience financing
Component 4: Crosscutting regional support and programme management

Table 2: contribution and complementarity of the One Pacific Programme with WRP

Contribution	Complementarity
One Pacific is under the umbrella framework of WRP. It contributes to the implementation of specific actions under WRP Key Result Areas 2,3,4,5 for a total of 83 M USD.	OPP will complement WRP by strengthening Climate Information Services (Output 1.1), Hazard and vulnerability mapping (Output 2.1) and Preparedness and response including anticipatory actions (Output 2.4). It will also support resilience financing (Outputs 3.3, 3.4)
WRP addresses Pillars 2 and 3 of EW4ALL	OPP addresses all Pillars of EW4ALL
WRP is focused on short term and mid term hazards (weather and climate).	OPP will address short-term (weather and climate) and supports inclusion of update climate change projections in risk assessments.
WRP focuses mainly on NHMSs and NDMOs.	In addition to supporting NHMSs and NDMOs, OPP will provide a platform to engage with line ministries across the government, communities, NGOs and the private sector.
The geographical scope of WRP covers all 21 PICs. OPP will focus on the 14 Pacific Island countries, members of GCF.	

63. In line with what foreseen by WRP, National Meteorological and Hydrological Services (NMHSs) and National Disaster Management Offices (NDMOs) will be the core beneficiaries of programme support to make sure that institutional and technical capabilities are strengthened. Experience has shown that this is however not enough as too often information does not reach timely target users or is not acted upon because it is not communicated or formulated effectively. The One Pacific Programme will provide a platform to bring together all relevant stakeholders (key agencies across the government, communities, private operators, NGOs, faith-based organizations, etc.) to jointly co-design and implement CIS and MHEWS that can make a tangible difference in reducing loss and damage and enabling long term resilience of communities and pacific societies.

64. As further discussed in section B.3, the Programme properly aligns with the GCF's investment criteria. It proposes to provide timely and relevant climate information to reduce the loss of lives and livelihoods, which affects vulnerable population like women the value of physical assets, and environmental and social losses due to the impact of extreme climate-related disasters and climate change. This outcome will have direct and indirect positive impacts on communities that are exposed to the adverse effects of climate change and variability. As a paradigm shift, the project will upscale the existing hydromet infrastructure provided in previous projects and strengthen institutional coordination for improved s gender-responsive service delivery in different priority sectors of the economy to facilitate seamless integration of climate information in national planning. The socioeconomic and environmental benefits of the project are also significant to the creation of jobs, increase income, and improve health and living standards, especially among women. Development of the Multi Hazard Impact Based Forecasting EWS and introduction of forecast based financing (FbF) mechanism will promote paradigm shift towards more resilient and sustainable development. Potential program impacts include (i) Increased Resilience and Enhance the Livelihoods of the Most Vulnerable People (ii) Increased Resilience of Health and, Well-being, and Food and Water Security and (iii) Increased Resilience of infrastructure and the built environment to climate change threats.

65. The programme will focus on different vulnerable groups, especially women and marginalised groups including people with disabilities. It will apply a gender and equality lens to ensure that both men, women and people with disabilities benefit from activities aimed at increasing their resilience and capacity to adapt to climate threats in the future.

66. Whenever possible and compatibly with national policies on data access, it will also assist countries in revenue generation for self-sustaining operations by providing climate information services for potential clients such as aviation and fishing sector businesses. The programme is expected to deliver benefits at the regional, national and local levels.

67. The goal stated above will be achieved through the implementation of activities that will deliver integrated and comprehensive outcomes under four key components as discussed below.

Table 3: Overview of OPP components, outputs, indicative activities and potential partners/executing entities

Component	Outputs	Indicative activities	Potential partners/executing entities
Component 1: Enhance Climate and Ocean Information Services and modernise regional and national hydromet services	OP 1.1 Observations, monitoring and detection systems and real-time data supply expanded and enhanced	*Activity 1.1.1: Improve climate and ocean observations, monitoring and detection capacities of NHMS*	NMHSs, WMO, BOM, NOAA, MetNZ, Meteo France, UK Met Office, KMA-KMI
	OP 1.2 Climate and Ocean Information Services in the Pacific strengthened and consolidated	*Activity 1.2.1: Strengthen institutional and policy frameworks, and delivery models for island and ocean climate services*	
Component 2: Establish Impact-Based Multi-Hazard Early Warning Systems and Early Action	OP 2.1 Climate related disaster risk knowledge improved	*Activity 2.1.1: Satellite imagery and mapping of ocean, critical ecosystems and infrastructure* *Activity 2.1.2: LiDAR mapping and coastal ecosystems* *Activity 2.1.3: Country specific analysis of climate hazards* *Activity 2.1.4: Review and update disaster risk assessments* *Activity 2.1.5: Harmonise climate data and information management* *Activity 2.1.6: Mainstream climate risk information and strengthen capacity of planners and other relevant Pacific SIDS staff*	NMHSs, NDMOs, UNDRR, NIWA, CSIRO, SPC, GNS-NZ, PECRIC USP, UNU
	OP 2.2 Impact-based multi-hazards forecasting and early warning systems established and operational	*Activity 2.2.1: Strengthen coordination and governance at regional and national levels* *Activity 2.2.2: Improve climate and ocean modelling and impact-based forecasting* *Activity 2.2.3: Advancing and fostering the use of climate and climate change science in the Pacific for decision making* *Activity 2.2.4: Engage end-users (sectors, communities and private entities) in the design of bespoke information products, tools, forecasts and warning services* *Activity 2.2.5: Document and integrate traditional knowledge of climate and ocean in impact-based forecasting and early warning services*	NMHSs, NDMOs, National Sectoral Departments/Agencies, BOM, NOAA, MetNZ, Meteo France, UK Met Office, University of the South Pacific

	OP 2.3 Forecast and Early Warning communication systems enhanced	*Activity 2.3.1: Improve communication and delivery of forecasts and Early Warnings to end users to reach the last-mile*	NMHSs, NDMOs, Regional and National telecom authorities, Telecom Companies, CSOs, Academia, WFP, ITU, PIPSO
	OP 2.4 Preparedness and response capabilities strengthened, including anticipatory actions	*Activity 2.4.1: Enhance preparedness and response capabilities* *Activity 2.4.2: Conduct public awareness and education campaigns on climate hazards and risks* *Activity 2.4.3: Support the establishment of forecast based financing and anticipatory actions*	IFRC, NRC, IOM, World Vision, Caritas, UNICEF, SPC, WFP, FAO, UNOCHR, PIANGO, AHP
Component 3: CIEWS for resilient infrastructure and financial decisions	OP 3.1 Climate resilience of critical ecosystems, infrastructure and supply chains improved	*Activity 3.1.1: Integrate climate risk information and early warnings in the planning and management of critical ecosystems, infrastructure and supply chains*	NDMOs, National Sectoral Departments /Agencies, Private sector, Financing and insurance, PIPSO, World Bank, ADB
	OP 3.2 Resilience financing fostered	*Activity 3.2.1: Develop financing strategies and solutions for enhanced resilience financing*	
Component 4: Crosscutting regional support and programme management	OP 4.1 Programme effectively and efficiently managed	*Activity 4.1.1: Manage the programme effectively and efficiently*	SPREP
	OP 4.2 Technical Assistance and crosscutting activities delivered	*Activity 4.2.1: Deliver regional technical assistance across the programme*	

68. The components, outputs and indicative activities are further described below. Indicative activities are aligned whenever possible to the activities identified in the WRP Implementation Plan (Annex 1). Additionally, it should be noted that:

    (i) At this stage, the indicative activities below are not country specific and will be further scoped during proposal development based on the specific context and needs of each country.
    (ii) WRP is currently recruiting key staff to operationalise its start-up phase, which will involve the preparation of a detailed implementation plan. It is foreseen that this planning process will be coordinated with the proposal development for the One Pacific Programme.
    (iii) The CIS-Pac5 Programme has concluded a MTR in 2024. This has resulted in a review of the planned activities and re-prioritization based on progress so far. The review is expected to be completed by Q4 2024 for submission to the next Steering Committee in early 2025. The revised planning will be crucial to inform the scoping of activities of the One Pacific Programme for the CIS Pac-5 countries during proposal development.
    (iv) Similarly, with the VanKIRAP project that will provide further insights as the project heads into the completion phase in 2025. A VanKIRAP II concept is in draft form and will fit-in to the OPP with details to be articulated in the PPF phase.

Component 1: Enhance Climate and Ocean Information Services and modernise regional and national hydromet services

Output 1.1 Observations, monitoring and detection systems and real-time data supply expanded and enhanced

69. The Pacific Islands Meteorological Strategy (2017–2026) is explicit on the needed improvements in observations and maintenance of existing equipment. There is no clear national or regional strategy to coordinate new infrastructure investment because of the diversity of donor projects, each with their own context and focus. Most funding opportunities focus on sector vulnerability to climate change and/or water security and disaster risk reduction, leaving gaps in an integrated, holistic approach to infrastructure.

70. Under the programmatic framework of the WRP, the One Pacific Programme will consider a region-wide approach where instruments/equipment procured will be harmonised to allow for negotiating regional contract for maintenance and post-installation support, better warranty packages and training on trouble shooting and maintenance.

71. The assessment conducted during the development of the WRP provides a summary of the observations and infrastructure status in the countries as presented in Table 4.

Table 4. Observation and infrastructure status across the Pacific region

Observations and infrastructure	Existing organisation, capacity, processes or equipment are well developed/strong	Existing organisation, capacity, processes or equipment are moderately developed	Existing organisation, capacity, processes or equipment are limited in their development	(INV) Current /planned project, effort and/or investment	(N/A) Not applicable to the country's requirements
Extensive network of surface observations	Cook Islands, Fiji, Tonga Vanuatu	FSM, Kiribati, Palau, PNG, Samoa, SI, Tuvalu	Nauru, Niue	Palau & Tuvalu	-
National marine observations data	-	Palau, Samoa, Tonga, Tuvalu, Vanuatu	Cook Islands, Fiji, Kiribati, Nauru, Niue, PNG, SI	Palau	-
Upper air observations	FSM, Fiji	Kiribati, Tuvalu	Cook Islands	Cook Islands	
River gauging (rain and/or river heights)	-	Fiji, Samoa	PNG, SI, Vanuatu	-	Cook Islands, FSM, Kiribati, Nauru, Niue, Tonga, Tuvalu
Weather radar	Note: Fiji has 2 weather radar. Other PICTs do not have any.			Cook Islands, Niue, Palau, Tuvalu and Vanuatu.	-
Observations transferred to global network (G), climate database (CliDE) (C) or no transfer (No)	Notes: • Climate database (CliDE), C: Cook Islands, Fiji, Palau, Samoa, SI, Tonga, Vanuatu • No: FSM, Kiribati, Nauru, Niue, PNG, Tuvalu				

(Source: Weather Ready Pacific programme document)

72. Equipment/instruments requirements for the Pacific region are summarised in Table 5. It is also to be noted that satellite technology will be explored and applied as appropriate. The options will be further assessed during the proposal development phase feasibility studies.

Table 5. Equipment /instrument requirements

Equipment	**Quantity**
Radar Systems	17 (plus five to be procured through CIS-Pac 5 Programme and 1 for VanKIRAP)
Upper Air (AM-BLS)	7 (plus five to be procured through CIS-Pac 5 Programme)
River gauges	30
AWS (Automatic Weather Station)	100 AWS placed at airports should have C&V sensors (assume 10)
Wave Rider buoys	84 (Six each for the 14 Pacific SIDS)
Tide Gauges	56 (Four each for 14 Pacific SIDS with the Cook Islands having two fixed tide gauges and two relocatable tide gauges)

NWP (Numerical Weather Prediction) Server	1 (Fiji)
TC Module Server	5
Forecaster Workstations	14 (One for each country)

(Source: Weather Ready Pacific programme document)

73. The consultations for the preparation of the WRP highlighted that ocean and marine observations are quite limited, and this is an area where improvements are required for the safety and livelihoods of those in coastal communities – noting that the Pacific coastal community population range is 57-90% of the total region population of an estimated 8.3m, the fishing industry and coastal shipping. Since the Pacific Community (SPC) has a programme on installation of tide gauges and wave buoys, the One Pacific Programme will foster coordination with such initiatives to ensure the most effective distribution of equipment and avoid duplication.

Activity 1.1.1: Improve climate and ocean observations, monitoring and detection capacities of NHMS

74. The One Pacific Programme will enhance hydro-meteorological infrastructure networks and associated IT equipment that meet emerging and future needs in a targeted, coordinated way to complement existing and planned initiatives. Further, it will strategically engage partners to promote investment in IT infrastructure to improve communications (see Output 2.3). Country participation and investment requirements for equipment, as proposed in Table 4, will be firmed up in the proposal development phase including the necessary support elements such as national government co-financing and maintenance and operational national budget support. In line with its programmatic approach, the One Pacific Programme will provide regional level support to procure, operationalise and maintain new equipment to the countries that have not yet benefited from GCF support. The selection of countries will be coordinated with the Weather Ready Pacific to ensure complementarity. For countries of the Sub-regional cluster 2 the support will be focused on maintenance, upgrading and upscaling.

75. Indicative sub-activities include:

(i) Preparation or revision of national observations network plans for automatic weather stations
(ii) Refurbish, upgrade and and expand existing network of automatic weather stations in collaboration with the Systematic Observations Financing Facility. Ensure they have connectivity with and deliver data to the NMHS including the WMO's Global Telecommunications System (GTS).
(iii) Establishing a network of automated upper air observations stations that will complement and "ground truth" remotely sensed data to improve input into Numerical Weather Prediction (NWP) systems
(iv) Development of data capture from aircraft observation using the aircraft meteorological data relay system.
(v) Preparation of a radar network plan and establishment of weather watch radar in selected countries.
(vi) Expanding ocean observations and monitoring networks to provide better coverage of waves, tides: installation and maintenance of surface wave, wave rider buoys and environmental buoys for in-situ measurements of a multi-parameter water quality and/or pressure sensors for systematic ocean monitoring (e.g. real-time temperature, salinity, dissolved oxygen, waves, pH, etc.); establishment of fixed and relocatable tide gauges.
(vii) Refurbish existing IT infrastructure and expand it where necessary to support the strengthened forecast and warning services, including provisions for cybersecurity
(viii) Establish a regional facility to coordinate procurement and maintenance of equipment and infrastructure, negotiate special warranty conditions and bulk contracts for maintenance
(ix) Support NMHS in making the economic case for structural allocation of national budget for equipment maintenance and upgrade, demonstrating to the national governments the likely future economic costs due to loss and damage if an effective data collection and early warning system is not maintained

Output 1.2 Climate and Ocean Information Services in the Pacific strengthened and consolidated

76. The effective delivery of user-tailored climate services is essential for the provision of climate information to assist with decision making and climate-resilient sustainable development. Pacific

NMHS advice can significantly reduce climate risks if the advice has a recognised formal role in disaster preparation, warnings and management and in long-term planning for climate change impacts by infrastructure, health, tourism, agriculture, fisheries and other climate-sensitive sectors. Several countries lack clarification and/or formalisation of their NMHS's mandate and its relationship with National Disaster Management Authorities, other national institutions and sectors.

77. Through this output, in line with the Global Framework for Climate Services (GFCS) and as part of the operationalisation of the Pacific Roadmap for Climate Services (2017–2026), the programme will assist countries to establish and/or implement coherent National Framework for Climate Services (NFCS) to coordinate, facilitate and strengthen collaboration among national institutions for enhanced climate information services and products, supported by effective coordination mechanisms to integrate climate information and disaster risk knowledge into the decision-making of climate-sensitive sectors. Continuing, regular stakeholder engagement will inform the development of tailored, accessible products and services that serve the practical needs of end users.

Activity 1.2.1: Strengthen institutional and policy frameworks, and delivery models for island and ocean climate services

78. The European Union funded ClimSA project has provided the basis for the overall coordination for the conception and development of User Interface Platforms (UIPs). This includes (i) development of the Pacific regional UIP based on WMO guidelines; (ii) establishment and promotion of use of the regional UIP in disaster risk reduction and the agriculture sector; and (iii) strengthening of national UIPs in the mentioned sectors linking them to the regional UIP.

79. The One Pacific Programme will expand this scope by bringing in other priority sectors (e.g., infrastructure, tourism and fisheries) and participation of additional countries (as the ClimSA project activities focus on Kiribati and Samoa). It will also strengthen the institutional and policy frameworks and delivery models for climate services in the countries that have not benefited from the CIS-Pac5 Project, building on the lessons learned so far. If required, support will be provided to the CIS-Pac5 countries in consolidating the results achieved.

80. Indicative sub-activities include:

(i) Assessing the National Climate Outlook Forums (NCOF) institutional arrangements for additional countries and developing/strengthening the National Framework for Weather, Water and Climate Services
(ii) Strengthening/developing national UIPs to effectively and efficiently link to the regional UIP
(iii) Expanding and promoting the use of the Pacific regional UIP in the additional priority sectors
(iv) Surveying and compiling climate information needs and gaps in the additional priority sectors to inform the development of climate products and advice for the additional participating countries
(v) Developing climate information products in the priority sectors for the participating countries
(vi) Mainstream climate risk knowledge into sectors

Component 2: Establish Impact-Based Multi-Hazard Early Warning Systems and Anticipatory Action

Output 2.1 Climate related disaster risk knowledge improved

81. Risk knowledge represents the first foundational pillar of effective early warning systems[43]. The UNDRR has recently prepared disaster risk reduction status reports for all programme countries except Niue, providing a snapshot of the state of disaster risk reduction under the four priorities of the Sendai Framework for Disaster Risk Reduction 2015-2030[44]. The reports provide a brief baseline assessment with identification of priority areas or work for improvements, including disaster risk knowledge.

[43] https://www.undrr.org/implementing-sendai-framework/sendai-framework-action/early-warnings-for-all
[44] https://www.preventionweb.net/collections/asia-pacific-drr-country-status-reports

82. Most countries have developed or planned disaster risk assessments in the framework of DRR initiatives and/or the NAP process [45]. In some cases, the assessments are outdated and/or do not include a systematic assessment of disaster risks to critical ecosystems, assets and sectors. More accurate data on mapping of assets, vulnerability and hazards that will be developed by the programme will also allow to enhance existing assessments. This knowledge is critical to the development of effective climate information services and early warning systems to inform sectoral applications. The work under this output will therefore aim to improve climate related disaster risk knowledge by:
    - Systematically identify climate related hazards
    - Develop, improve and update the mapping of critical infrastructure and ecosystems by using recent remote sensing data
    - Review and, where needed, upgrade existing risk assessments to systematically include risks to critical infrastructure (e.g. hospitals, airports, energy distribution systems) and ecosystems (e.g. mangroves, coral reefs) assessed based on the updated climate projections and hazard modelling developed by the Programme

83. The One Pacific Programme will focus on supporting five to six Pacific SIDS[46] under this output and will be complementary to EW4ALL activities and projects financed by other entities such as the ADB funded Pacific Disaster Resilience Program (Phase 4) in Kiribati, Samoa, Solomon Islands, Tonga and Vanuatu. It will also build on existing experiences and tools (e.g. produced by the Pacific Catastrophe Risk Assessment and Financing Initiative PCRAFI).

Activity 2.1.1: Satellite imagery and mapping of ocean, critical ecosystems and infrastructure

84. Use of recent remote sensing products and services, coupled with strengthened ground observations of land and oceans, will allow for cost effective mapping of critical infrastructure and ecosystems that can provide nature-based solutions to reduce risk (e.g. forest cover, mangroves, coral reefs, seagrass beds etc..).

85. Indicative sub-activities include:

    (i) integration of satellite-derived data (e.g. from the EU COPERNICUS Programme and NOAA) to complement and enhance information from in-situ observations for land cover-land cover change mapping
    (ii) remote sensing derived coastal observations such as water quality mapping (e.g. turbidity, chlorophyll, coloured dissolved oxygen matter, etc.), marine habitat mapping and shoreline change analysis
    (iii) engagement with the Copernicus Marine Service to support lagoon health monitoring through a combination of remote sensing, in-situ environmental sampling and dynamic modelling
    (iv) develop, improve and update the mapping of critical infrastructure by using recent remote sensing information
    (v) analyse trends in changes in critical ecosystems and identify locations which are under threat because these natural forms of protection have been degraded or removed.

Activity 2.1.2: LiDAR mapping and coastal ecosystems

86. The Samoa National Adaptation Programme of Action (NAPA) identified urban settlements, coastal environments and infrastructure as highly vulnerable to the impacts of climate change. The Government of Australia and Government of Samoa partnership led to (i) collection of high resolution topographic and bathymetric data through Light Detection and Ranging (LiDAR) technology in the Apia foreshore area and Faleolo International Airport; (ii) a training for Government agencies on how to use the data captured, particularly for modelling of sea-level rise impacts on assets at risk; and (iii) use of the data by the Australian Commonwealth Science and Industrial Research Organisation (CSIRO) to conduct a detailed analysis of storm surge risk for the Apia fore-shore and Mulinu'u peninsula which are one metre above sea level and has several major buildings that are critical to the functioning of the capital, including the Samoan Parliament House, and is the base for many essential services .

[45] Add list of countries with NAPs, including the ones supported by SPR
[46] A mapping of countries and current planned bilateral funding in this area will be conducted during the proposal development phase including development of selection criteria. These will firm up which countries including any co-financing.

87. A partnership between the Australia Government and Vanuatu Government also led to similar activities that were conducted in two phases: (i) collection of high resolution topographic and bathymetric data through LiDAR technology for priority areas of Efate, Malekula and Espiritu Santo; and (ii) a training programme for Vanuatu Government agencies on how to use the data captured, particularly for modelling of sea-level rise impacts on assets at risk.

88. A GCF-funded Tuvalu Coastal Adaptation Project has also proven the value of LiDAR surveys. A single survey has provided 100% coverage of Tuvalu's nine atoll systems, all islands and surrounding reefs and lagoons – 500 km2 in total. These data are used to analyse sea level rise impacts, storm surge inundation, sediment movement, and assets including ecosystems at risk of coastal flooding and/or erosion. These data are now also used to develop early warning system costal inundation in Tuvalu and Kiribati with support from WMO CREWP Pacific SIDS project; and swell driven coastal inundation and fore-casting in Fiji through the WMO Coastal Inundation Forecasting Programme (CIFP)[47].

89. This activity will extend these approaches to other countries including expansion of the scope in the above-mentioned and fill in any remaining gaps in the LiDAR mapping across the participating countries.

Activity 2.1.3: Country specific analysis of climate hazards

90. The approach used by the VanKIRAP[48] project in developing country specific analysis for climate hazards and prepare user friendly briefings for sectoral and policy applications will be replicated in programme countries.

Activity 2.1.4: Review and update disaster risk assessments

91. Based on the results of the activities above and on the results of hazard modelling and updated climate projections (Output 2.2), under this activity existing disaster risk assessments will be reviewed and updated depending on needs and priorities identified by the country during the proposal development. Risks assessment will be based on a holistic approach, systematically including analysis of risks to critical infrastructure (e.g. hospitals, airports, energy distribution systems) and ecosystems, and will be developed using updated climate change scenarios. A common approach based on the UNDRR National Disaster Risk Assessment guidelines[49] will be used and promoted across the region – Figure 5.

[47] https://gem.spc.int/projects/coastal-inundation-forecast-demonstration-project-cifdp
[48] https://vanclimatefutures.gov.vu/dashboard/explainers ; hazards covered include Ocean Acidification, Costal Inundation, Drought, Extreme Rainfall, Marine heat waves and tropical cyclones
[49] https://www.undrr.org/media/20847/download?startDownload=20240626

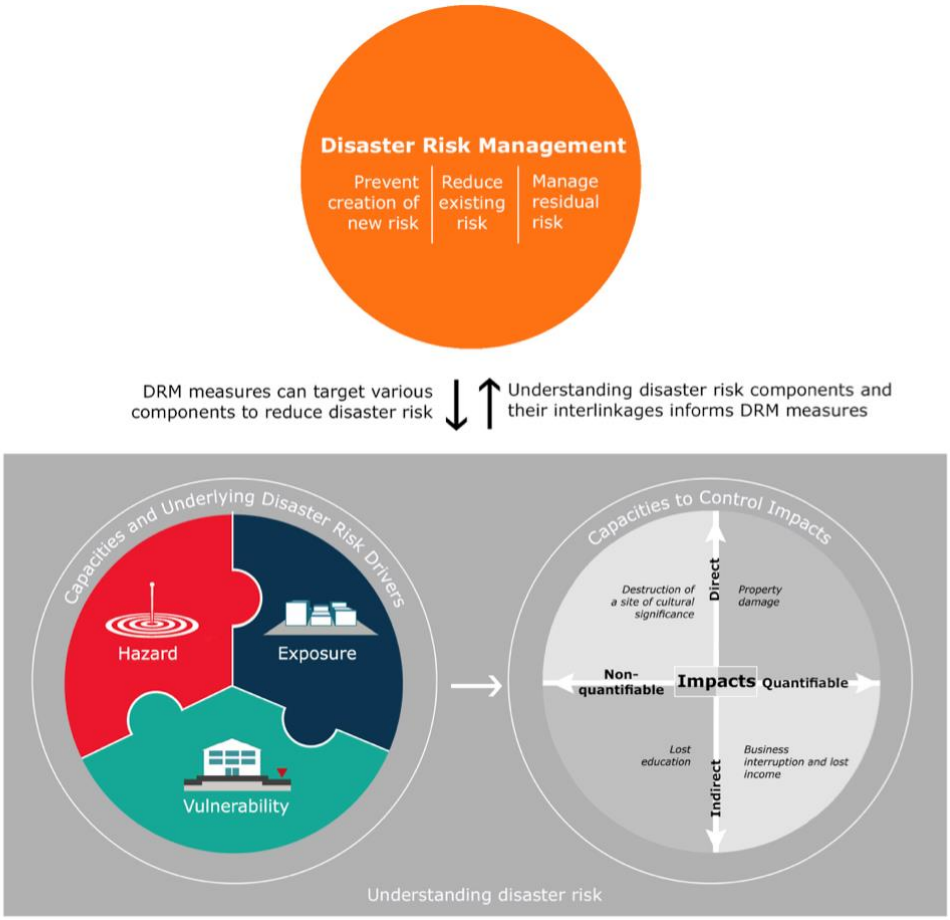


Figure 5: *Holistic understanging of disaster risks empowers effective and comprehnsive disaster risk management (Source National Disaster Risk Assessment guidelines UNDRR, 2017)*

Activity 2.1.5: Harmonise climate data and information management

92. Difficulty in accessing and sharing data across government services, as well as lack of data standardisation is a major barrier hampiring the development of effective risk assessment, climate and ocean services and warning products, which often require the integration and analysis of multiple data sets. In support of the observation and monitoring action “address environmental data needs” recommended under the Pacific Roadmap for Strengthened Climate Services (PRSCS) the programme will support the development and/or implementation (for countries already equipped with a plan) of a National Data and Information Strategic Action Plan for improved climate-related and disaster data management, governance and enhanced inter-sectoral communication. This activity will build on the results of the CIS-Pac 5 programme and the GEF-funded “INFORM” project. Two immediate benefits will be greater availability of essential data for planning climate change interventions and infrastructure investments, and improved tracking and reporting of progress against the UNFCCC and other climate-related multi-lateral environmental agreements and conventions. As usable data from climate-sensitive sectors becomes available (for some sectors and countries directly through this Programme’s inputs), the potential will be created for overlay of datasets such as climate and disease incidence in such a way that risks can be predicted. National Statistics Offices (NSOs) are fully engaged with and leading the implementation of the “Inform” project through: i) setting up national data management and governance networks; ii) design and use of cloud-based national environmental databases and reporting tools; iii) facilitating the collection and management of national environmental statistics; and iv) design and validation of national State of Environment (SoE) reporting templates. Lessons learnt from the “INFORM” project will be utilised when working with national statistics offices (NSOs) and other data custodians as part of the Programme.

Activity 2.1.6: Mainstream climate risk information and strengthen capacity of planners and other relevant Pacific SIDS staff

93. On-the-job training for mainstreaming of the disaster risk management into planning will be provided to staff across multiple agencies. Existing training institutions such as the University of the South Pacific and the Pacific Climate Change Centre including mentoring work attachment with entities such as SPREP and SPC and programme partners such as CSIRO will provide online and in-person training on hazard mapping, disaster risk assessment, integrated river basin management, integrated coastal zone planning, community-based adaptation, ecosystem-based adaptation and other relevant topics.

Output 2.2 Impact-based multi-hazard forecasting and early warning systems established and operational

94. This output will strengthen regional and national severe weather forecasting and warning systems using impact-based approaches, vulnerability assessments and the climate modelling downscaling that will better prepare communities and industries to deal with high impact and severe weather events, floods and coastal damages.

95. The WRP adopted a flexible and scalable approach given the diversity in capacity and service delivery across the region: developing a system that will enable the delivery of essential services to all countries regardless of their NMHS's level of capability and capacity. The approach is based on cascading forecasts from Global Production Centres (GPC) to Regional Centres and then forecasts and warnings issued locally from NMHSs. This will be achieved building on the WMO Severe Weather Forecasting Demonstration Project (SWFDP, now SWFP) that provides warning and general forecast information through MetConnect, implemented by MetService New Zealand. The approach for cascading forecasts at the national level has shown to be effective via the WMO Coastal Inundation Forecasting Initiative (CIFI).

96. This approach, to some extent, is already in place through RSMCs in Fiji, Wellington and Darwin and the National Oceanic and Atmospheric Administration (NOAA) National Weather Service (NWS) Office in Guam, together with delivery mechanisms such as the SWFP. However, it needs strengthening in three areas: the integrating capability between global, regional and national forecasting processes that can deliver automated and consistent forecasts and warnings which will free up forecasters for higher priority tasks; improving the breadth and depth of forecasting services within NMHSs; and a well-supported delivery platform, the Pacific Weather Exchange. Once improved, it will provide NMHSs with access to a greater suite of high quality NWP products.

97. The concept of operations, illustrated by Figure 6, is relies on three main components: 1) World Meteorological Centres (WMC), 2) Regional Centre(s), which include Regional Specialised Meteorological Centres (RSMC) and 3) NMHS providers, producing, exchanging and transmitting data in a cascading forecast process. All three components are underpinned by the Global Basic Observation Network (GBON) which provides the necessary observational data and linked by the WMO Information System.

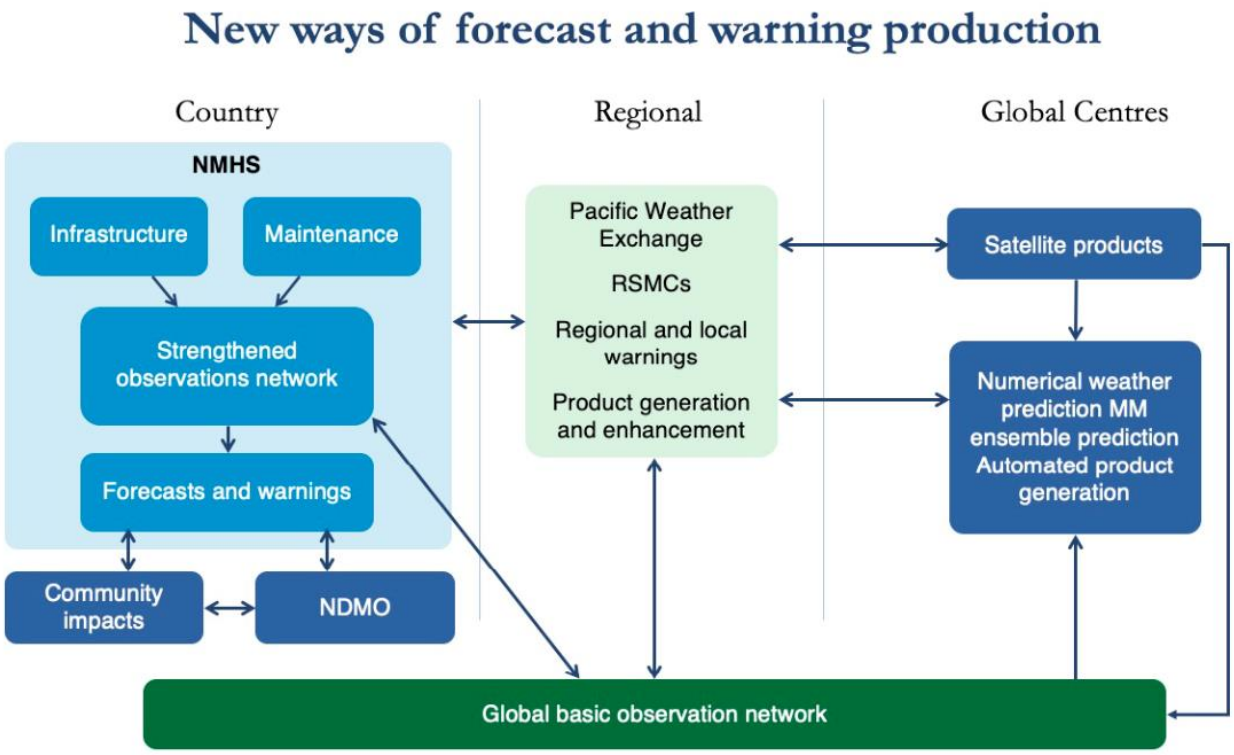


Figure 6: *Concept of operations (Weather Ready Pacific programme document)*

Activity 2.2.1: Strengthen coordination and governance at regional and national levels

98. As multi-hazard early warning systems require multiple agencies to be engaged at all levels, strengthening coordination arrangements and effective governance is critical. This includes supporting and strengthening governance and institutional arrangements, leadership, planning, and management of NMHSs and NDMOs and providing a key coordination function in partnership with the Pacific Meteorology Desk Partnership (PMDP) and the Pacific Meteorological Council (PMC).

99. Indicative sub-activities include:

(i) Developing /strengthening a Pacific Meteorological Leadership Programme to cover aspects of governance, strategic planning, financial management, and communication.
(ii) Conducting workshops between NMHSs and NDMOs, and other key stakeholders to improve governance, coordination and delivery mechanisms so that pathways for forecasts and warnings are highly effective.
(iii) Developing standard operating procedures so that there are no bureaucratic delays in getting life-saving early warning messages out to end-users.

Activity 2.2.2: Improve climate and ocean modelling and impact-based forecasting

100. The programme will develop a comprehensive suite of automatically generated forecast and warning products for NMHSs. This will also include sea level products that highlight areas at risk of coastal inundation. This will enable every country to access reliable, accurate, localised forecasts and warnings via a centralised data and forecast platform, the Pacific Weather Exchange, with individual countries then able to direct their resources to where in the meteorological value chain they see national capability can add most value, particularly into impact- based forecasting and warning. The objective is to ensure that forecasts and warnings are more accurate, localised and timely, and forecasts and warnings are available to every Pacific Island nation regardless of national capacity challenges.

101. Indicative sub-activities include:

(i) Contribute to the development of a comprehensive numerical weather prediction suite of automatically generated forecast and warning products for all NMHSs based on post-processing of numerical weather prediction, including 7-day forecasts for as many individual locations as required by each NMHS.
(ii) Contribute to the development of a regional data exchange platfrom, the Pacific Weather Exchange, to contain and transmit these new products, and/or the enhancement of existing delivery systems.
(iii) Produce of advanced impact-based warnings products that can be tailored by forecasters from each NMHS as required and as capacity permits to suit the requirements of NDMOs and community users of warnings throughout the region. This will enable better community preparation for high impact weather events which will lead to greater resilience.
(iv) Develop 7-day public and marine weather forecasts derived from multi-model ensembles that contain estimates of uncertainty, that can be modified by forecasters as required which will provide the community and various industry sectors with information that will enable them to make improved decisions about weather critical activities.
(v) Improve ocean forecast and warning systems which will enable better preparation for high impact weather events by those industry sectors and communities that have direct links to the ocean and blue economy which, in turn, will lead to greater resilience.
(vi) Developing new, and enhancing existing multi-hazard (impact-based) CLEWS tailored for priority sectors, with emphasis on multi-hours/days forecasting of tropical cyclones, and where appropriate other climate variables including extreme temperature floods, and coastal hazards (e.g., waves, storm surges)

Activity 2.2.3: Advancing and fostering the use of climate and climate change science in the Pacific for decision making

102. In line with the Pacific Climate Change Research Roadmap (SPREP Pacific Climate Change Centre), the focus of this activity will be on the development and/or strengthening of multi-disciplinary (including climatology, oceanography, hydrology and meteorology), multi-sectoral, multi-time scale (sub-seasonal/multi-day, seasonal, multi-decadal) climate and climate change information services. This will involve review, analysis, documentation and incorporation of the latest climate and associated environmental data and research findings for the Pacific to ensure that all the services provided are scientifically robust, continuously technically improved/updated, and thereby informed by the latest and most innovative scientific understanding and applied knowledge across multiple (climatological, meteorological and oceanographic) disciplines.

103. Global climate change models are not sufficiently accurate for SIDS and need to be supplemented by downscaled climate change modelling and projections. A key activity, therefore, is developing and providing downscaled (< 20km grid size) multi-decadal projections for temperature, rainfall, drought, tropical cyclones, sea level anomalies and coral bleaching risk, where technically feasible, taking into account regional and national topographies and micro-climates, and supported by guidance on uncertainties, confidence and relevance of different downscaling and alternative methods (including statistical, dynamical and/or combinations), for developing finer scale projections; with emphasis on climate vulnerable "hot spots". Furthermore, the projections currently available are based on CMIP 5, so a key aspect will be the implementation of the CMIP 6/7 updates and development of new CORDEX downscaling domain for the Pacific. This will enable the production of climate change projections for sea level rise, precipitation, change in frequency and intensity of cyclones that will be more accurate and usable to inform climate change risk assessments.

104. The results from this activity are cross-cutting and are designed to be complementary across multiple scientific disciplines and thereby facilitate operational synergies, including meeting the needs of multiple targeted end users and over multiple timeframes (weather through to climate change). A key requirement for this activity will be access to high speed computing infrastructure and in-country observed station climate data.

105. At present there are a multitude of different websites, portals and platforms all contributing variously to this need, however with very limited coordination, quality control and technical support. This activity will also aim to leverage learnings and capabilities developed through GCF-funded initiatives such as the VanKIRAP project (see for example the Vanuatu climate futures portal[50]) to enhance the end-user experience for accessing and applying climate change science and science-based services, particularly in terms of the use of CMIP-CORDEX-based projections and sectoral risk-based applications as part of PICs NAPs.

106. Implementation will require the scientific and technical expertise of a consortium of leading research organizations in climate and climate change with solid experience and presence in the Pacific region. The arrangements foreseen will be fully articulated in the proposal development phase.

107. Indicative sub-activities include:

(i) Implementation of CMIP 6/7 updates for the climate change projections and development of new CORDEX downscaling domain for the Pacific
(ii) Improving the understanding of large-scale climate processes influencing variability and extreme events such as the El Niño Southern Oscillation (ENSO) and South Pacific Convergence Zone (SPCZ) to strengthen reliability and utility of climate early warning systems (CLEWS), seasonal forecasts and multi-decadal projections
(iii) Improving utility and functionality of existing seasonal climate impact forecasts with emphasis on integrated downscaled (statistical, dynamical and hybrid) forecast methods up to 7-9 months where technically feasible for tropical cyclones, rainfall, drought, sea level and coral bleaching risk
(iv) Developing tailored, localized application-ready climate projection data sets for use in climate vulnerability/impact assessments for relevant sectors building on the experience of the VanKirap Project[51]
(v) Developing (risk assessment-based) extreme sea level probabilities and coastal inundation impact hazard maps for the “hot spots” identified in Output 2.1 to estimate coastal inundation risk and identification of vulnerabilities for a range of sectors as part of relevant CLEWS and longer-term adaptation and disaster management planning. This will involve applying relevant techniques, models and in-situ observations and an appropriate modelling platform. Outputs are designed to inform risk assessments for sector specific climate change action plans and disaster risk reduction plans, with emphasis on the climate vulnerable “hot spots”
(vi) Undertaking hydrodynamic assessment of coral reef health and vulnerability to the slow-onset impacts of ocean warming and acidification through analysis, reporting and CIS application of regional and downscaled climate models and relevant real-time climate and ecosystem observations; identifying trigger points and associated metrics to inform management options at national and local community levels.
(vii) Upscale and development of the Pacific CC portal as the primary regional platform for accessing visualised and spatially-referenced climate intelligence (climate change data and information services) across the Pacific

Activity 2.2.4: Engage end-users (sectors, communities and private entities) in the design of bespoke information products, tools, forecasts and warning services

108. Experience from the pacific and global best practices have shown that engaging end users in the early stages of multi-hazard early warning systems design can substantially improve their effectiveness. This will allow to design products and services that meet the actual needs of users, increasing usability, uptake and ultimately effectiveness. Each end-user group has specific information needs for early warnings as well as appropriate responses. For example, farmer groups may be interested in warnings of drought, which are of limited interest for the aviation sector.

109. As shown by promising experiences in Vanuatu and Tonga, a two-way flow of information can also strengthen their accuracy and uptake, including inputs from traditional knowledge regarding

[50] https://vanclimatefutures.gov.vu/dashboard/home
[51] https://vanclimatefutures.gov.vu/dashboard/regional-summaries

observed triggers for extreme climate events. Engagement will therefore also be an opportunity to empower end users to become information providers and play an active role in the forecast and warning services (See also Activity 2.2.5).

110. Activities will build on existing engagement and consultation mechanisms, as well as on regional experience in integrating traditional knowledge in the forecasting process. This activity is linked with Output 2.3 and related activities.

111. Indicative sub-activities include:

(i) Engage end-users though iterative participatory design workshops in reviewing existing information products, tools, forecasts and warning services and indentify required improvements and un-met requirements.
(ii) Conducting workshops to identify the types of messages and delivery formats that will lead to effective response actions
(iii) Forming and/or strengthening community groups to participate in the programme, as well as providing targeted training to community focal points/leaders
(iv) Identify relevant information that can be collected in a decentralized way at community level and channelled to NMHSs and NDMOs for integration in forecasting and warning procedures
(v) Establishing agreements between NMHSs and NDMOs and sector representatives, including the need for (and possible payment for) tailor-made early warning advisories
(vi) Maintain the engagement through follow up workshops for prototyping and testing of products and services

Activity 2.2.5: Document and integrate traditional knowledge of climate and ocean in impact-based forecasting and early warning services

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

113. This activity will support the integration of TK into NMHS products, services and tools to significantly improve forecast communication while expanding the spatial and temporal relevance of the forecasts and increasing community acceptance of NMHS materials. The One Pacific Programme will facilitate engagement with community elders to discuss the types of information that local communities use, their traditional methods of forecasting and how TK can be applied to and complement scientific forecasts. Such discussions are envisaged to generate local acceptance of technically derived climate forecasts, so that communities trust NMHS's information and act on their advice to improve their climate risk preparedness and response capacity. Support for TK under this Programme builds upon previous work undertaken through the Climate and Oceans Support Program in the Pacific (COSPPac) and the VanKIRAP project, Figure 7.

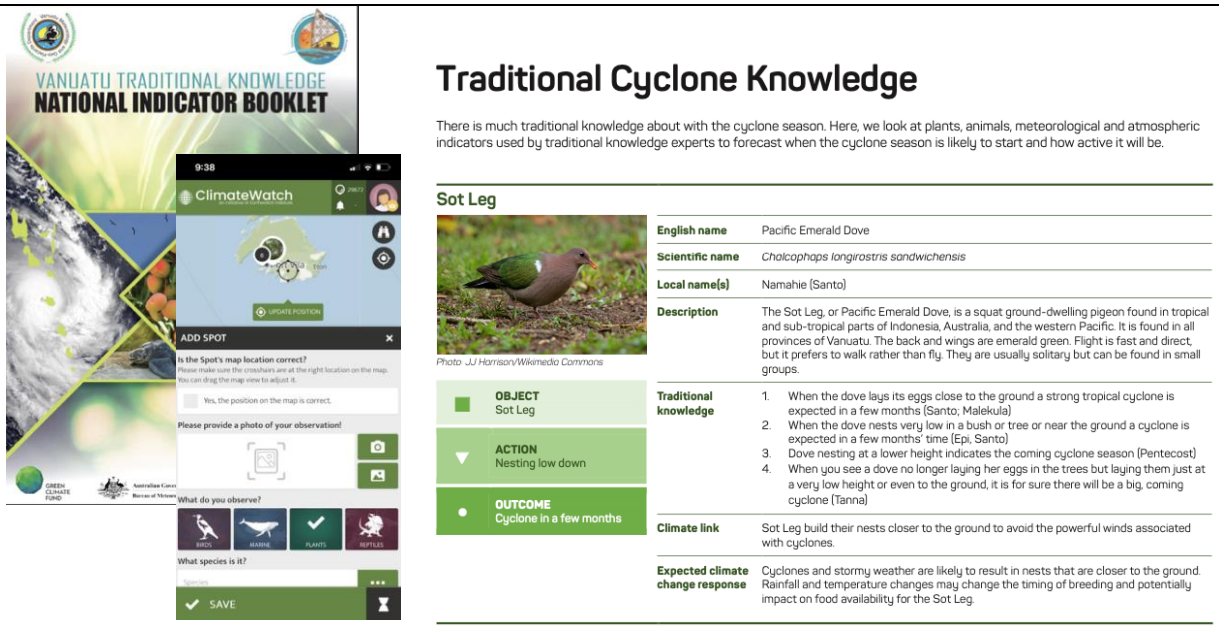


Figure 7: *TK climate information and communication tools developed with the support of the VanKIRAP project*

114. Indicative sub-activities include:

(i) Identify local communities that use traditional knowledge for weather and climate forecasting
(ii) Develop and support the implementation of Traditional Knowledge Strategy and Implementation plans, similarly to the one developed in Vanuatu with the support of the VanKIRAP project
(iii) Document the traditional indicators used, e.g. behaviours of plants and animals, wind direction, stars;
(iv) Integrate traditional and contemporary seasonal forecast methods in the CIEWS. This required development of a local traditional indicator monitoring network to assess the reliability of the forecasts and the spatial extent of their accuracy;
(v) Develop information and communication products and tools (e.g. mobile apps, data base, reports) incorporating traditional knowledge of climate and hazards, enabling the decentralized collection of data by communities through a citizen science approach (such as the Vanuatu Climate Watch App[52]).
(vi) Ensure a secure, culturally sensitive, and easy to use system is available to store the collected information;
(vii) Facilitate and promote regional exchange of experiences and tools on TK integration in CIEWS

Output 2.3 Forecast and Early Warning communication systems enhanced

115. Collection of massive amounts of climate-related information is of little use if that information does not reach the far corners of the Pacific region, in a form that vulnerable communities can understand and immediately apply to protect themselves and their natural and physical assets. This output will focus on user-cerntered design of dissemination and communication mechanisms for warnings, coordinating and integrating sustainable disaster risk management actions, and building local capacity to improve community preparedness and disaster risk reduction for multiple climate-related hazards.

116. Consultations during the development of the WRP indicated a shortage of IT staff including an increased demand and load on existing IT infrastructure and data management systems due to the expanding observation network with modern instrumentation that transmits more frequent

[52] https://library.sprep.org/sites/default/files/2023-10/ClimateWatchVanuatu_31SPREP_side-event.pdf

observations. Similarly, outputs generated from external products such as data rich high resolution Numerical Weather Prediction (NWP) model output requires enhanced IT infrastructure and support. The existing infrastructure in some of the countries was not designed with this new load and are generally only receiving a small proportion of the investment necessary to keep pace with these expanding bandwidth requirements, making upgrades difficult and expensive (Table 6).

Table 6. Information Technology Infrastructure for CLEWS in Pacific SIDS (Source: Weather Ready Pacific)

	CI	FSM	Fiji	Kir	Nauru	Niue	Palau	PNG	Samoa	SI	Tonga	Tuv	Van
Sufficient IT infrastructure													

Key	
	Existing organisation, capacity, processes or equipment are well developed/strong
	Existing organisation, capacity, processes or equipment are moderately developed
	Existing organisation, capacity, processes or equipment are limited in their development

117. While not all the new observations are making it into the WMO Information System (WIS) for global consumption, there has been progress in ensuring the data is entered into climate databases such as CLiDE. Refurbishing existing IT infrastructure and expanding it where necessary to support the strengthened forecast and warning services will also ensure that the expanded observational data can be effectively and efficiently transmitted to global observing networks. The support for observation infrastructure and observations being delivered to global observing networks needs to complement the WMO SOFF initiative.

118. The infrastructure for disseminating forecasts and warnings to communities, especially those in the most remote islands, remains a challenge, particularly reaching outlying and remote islands. Traditional means such as radio and messages sent to individual villages are still important in many places and these approaches are being strengthened by additional, robust technologies such as “chatty beetles” (a portable Iridium satellite terminal that permits text-based alerts and messaging in remote locations, where communication options are limited). Increasingly forecasts and warnings are also being disseminated through digital technologies utilising websites, SMS, dedicated apps and social media (e.g. Facebook).

119. Internet and mobile networks are also expanding across the Pacific and uptake is rapidly increasing, though costs are high, and reliability limited, in many areas. Mobile phones and smart phones are increasingly common in more remote communities, which is enabling the delivery of forecasts and warnings. However, further improvements are needed in satellite coverage for digital phone networks and in affordability of phones and plans in remote communities. This is critical because distribution of forecasts and warnings is increasingly utilising digital technologies and to facilitate this, it is strongly recommended that warnings messages are delivered by NMHSs in Common Alerting Protocol (CAP) to enable the messages to be distributed on and by any digital platform. CAP is a digital format for exchanging emergency alerts and allows a consistent alert message to be disseminated simultaneously over multiple communications pathways both in the region of impact but also through Global Warning Centres. A single emergency alert can trigger a variety of public warning systems, increasing the likelihood that people receive the alert by one or more communication pathways. CAP can:

- Add rich multimedia such as photographs, maps, streaming video and audio
- Geographically target emergency alerts to a defined warning area. This is limited only by the capacity of the delivery system used
- Serve the needs of people who are deaf, hard of hearing, blind or have low vision
- Send alerts in multiple languages

120. In addition, CAP enables the easy exchange of warnings between countries and the integration of these warnings into national and international platforms such as WMO’s Severe Weather Information System.

121. At the national level, consultations with Vodafone Pacific have provided options and their plans for expansion in the region. This includes the Opencode iCBC which is used to broadcast warning messages to a single or multiple areas of interest in the event of emergency, natural disasters, national crisis, etc. The warning messages will be received by all mobile devices (2G, 3G, 4G, and 5G) in the target areas. The Opencode iCBC allows government entities and mobile operators to use cell broadcast mobile channel to deliver public safety, warnings and other useful information, to mobile subscribers located in specific geographical area(s). Such systems and their applicability will be further assessed and rolled out as practical and aligned to Vodafone Pacific expansion plans across the Pacific. Figure 8 provides a schematic on the mentioned system.

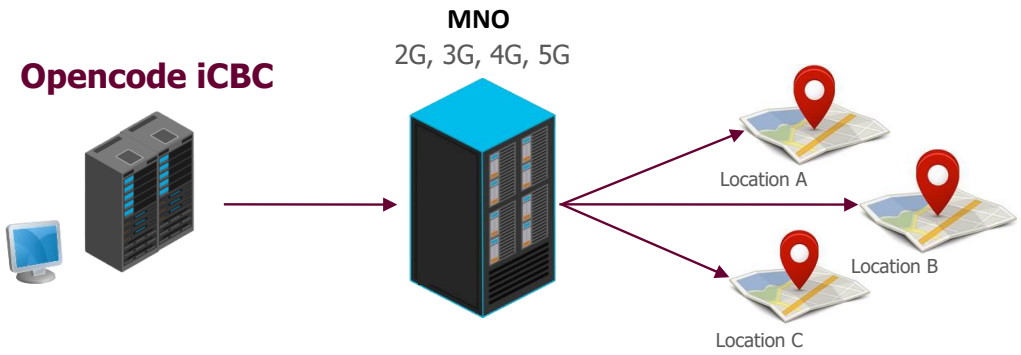


Figure 8: *iCBC Implementation (source: Vodafone inputs to the One Pacific Programme)*

122. Improving the safety and livelihoods of Pacific communities, forecasts and warnings must be delivered in a timely manner and must be communicated in a way that facilitates action responses from individuals, communities, government and industries. This information will provide those exposed to a hazard with a better understanding of the risk and will enable them to take appropriate action. However, impact-based forecasts requires that NMHSs put a greater emphasis on service delivery. Moving beyond weather forecasting requires effective partnerships with NDMOs, many different government agencies and understanding the needs of end-users.

Activity 2.3.1: Improve communication and delivery of forecasts and Early Warnings to end users to reach the last-mile

123. Based on the consultations there is a good understanding across NMHSs to be able to deliver impact-based forecasts but at present the ability to deliver these impact-based forecasts is limited. Most NMHSs expressed a desire for further training in the use of risk, impact and response-based approaches to forecasts and warnings. In this area, a key challenge consistently raised in the consultations was the need to better translate technical terms in forecasts and warnings into locally relevant impact messages because many technical terms do not exist in local languages. Further, traditional knowledge approaches to communicating weather and other extreme events need to be better incorporated into warnings and preparedeness messages delivered by NMHSs and NDMOs. This activity is linked to Activity 2.2.4 and 2.2.5.

124. Indicative sub-activities include:

(i) End-user workshops to identify types of messages that will lead to response actions. User groups of forecasts and warnings, include aviation, tourism, agriculture, fisheries, maritime transport, energy, community/village, women's groups, and organisations representing people with disabilities. The focus will be on how to better deliver information (what channels) and messages and develop content that is response oriented in a local context with appropriate impact statements.

(ii) Training of NMHS and NDMO staff in development of impact-based messages including the use of traditional knowledge and how to reach groups disproportionately affected by extreme events, including women, children and people with disabilities.

(iii) NMHS training workshops in the use of the WMO Common Alerting Protocol.
(iv) Workshops between NMHSs and NDMOs to improve governance and delivery mechanisms so that pathways for forecasts and warnings are highly effective.
(v) Develop last-mile communication strategies based on understanding of last-mile connectivity (which population groups can be reached by different communication channels) and tailored to the differential needs of specific groups (including women and men, elderly people and children, people with disabilities, and remote island populations).
(vi) Upgrade last-mile communications infrastructure through equipment maintenance and upgrade; establishment of backup systems and processes; and the development of additional communication channels to improve coverage and resilience to impacts on infrastructure.
(vii) Enhance communication channels and early warning systems through the development of multiple- channel climate and ocean information products (e.g. for social media, mobile, radio, television and website applications) leveraging on cloud architecture and communication backbone.
(viii) Identify opportunities to utilise private sector resources to disseminate warnings, such as mobile- cellular, television, radio broadcasting and social media. The identification of appropriate private sector partners could be facilitated by the market assessment that will be undertaken under Activity 3.2.1.

Output 2.4 Preparedness and response capabilities strengthened, including anticipatory actions

125. Over the past few decades, most Pacific SIDS have prepared disaster risk and reduction management plans. These were however prepared with limited data and are often lacking the latest scientific information about climate hazards and related risks which will be developed under Output 2.1 “Climate related disaster risk knowledge improved”, including for example the results of downscaled climate models or accurate LiDAR mapping of coastlines. Through this output the programme will undertake a comprehensive review of existing plans and where necessary assist the countries to revise them. Plans, however, are of limited use if they are not implemented, so this component will also strengthen capacities at the community level to participate in climate adaptation interventions, simulate emergency responses (e.g., for cyclone preparedness) to test the efficacy of the communication systems, and demonstrate good practices in responding to CLEWS.

Activity 2.4.1: Enhance preparedness and response capabilities

126. Under this Activity, the OPP will support countries to review and improve the arrangements for disaster risk reduction and engage with communities at the last mile to enhance preparedness and response actions at the local level. Where disaster risk reduction and management plans already exist, these will be reviewed and updated to take into account the latest risk knowledge produced under Output 2.1. Where such plans have not been prepared, assistance should be provided to local governments or communities to hire the necessary technical assistance to prepare the plans.

127. Indicative sub-activities include:

(i) Review existing disaster risk reduction and management plans, policies and legislation, and when needed update them based on the latest scientific information and best practices, including community engagement and gender and disability aspects
(ii) Preparing new disaster risk reduction and management plans where they don’t already exist or are no longer fit for purpose
(iii) Facilitate public participation in the upgrading or preparation of the disaster risk reduction and management plans
(iv) Capacity building for disaster response, ensuring that plans are well known by the local community members, especially the most vulnerable who may be severely disadvantaged and disproportionately affected by extreme events
(v) Assessment of community-level communications and response actions, and organization of drills to test and optimise the effectiveness of early warning dissemination processes, preparedness and response actions.

Activity 2.4.2: Conduct public awareness and education campaigns on climate hazards and risks

128. The OPP will support public awareness and education campaigns to enhance community knowledge and understanding of climate hazards and the potential impacts on lives and livelihoods of local populations. Communities will be educated on how warnings will be disseminated, which sources are reliable and how to respond. The OPP will ensure the use of targeted approaches to improve awareness of climate hazards and risks tailored to the specific needs of vulnerable groups (e.g. women, children, older people and people with disabilities). The interventions will include the delivery of school and community-based activities for climate change awareness, and training and capacity building workshops on climate hazards and disaster risk reduction.

129. Indicative sub-activities include:

(i) Preparing brochures, posters, and video materials for schools and for adult education campaigns in appropriate languages.
(ii) Conducting regular classes in school, accompanied by drills, to explain what their family should do in the case of receiving an early warning message.
(iii) Conducting adult education campaigns for the vulnerable community groups, paying particular attention to disadvantaged or disabled community members and those who may not have sufficient mobility to participate in emergency drills.
(iv) Identifying communities or sector units that have faced an extreme event and have survived intact and able to recover their normal operations quickly after the event.
(v) Documenting their stories including prior knowledge of the risks and appropriate responses, preparations, receipt of the early warnings, and timelines of the response and recovery phases.
(vi) Using this information on successful responses to extreme events for subsequent education campaigns and media outreach.

Activity 2.4.3: Support the establishment of forecast based financing and anticipatory actions

130. Anticipatory Action[53] is gaining increasing momentum across the development, humanitarian, and resilience- building landscape as an effective approach to prevent or mitigate the impacts of disasters. Forecast-based Financing (FbF) by the IFRC emerged as an anticipatory approach as early as 2007 and has been further developed and tested through pilot projects globally. The approach is based on a simple principle: linking early warning information and foreseeable impacts to pre-emptive action. It is seen as a way of better protecting lives and livelihoods – rather than waiting for the worst to materialise. Anticipatory Action is an activity that takes place prior to an extreme weather event and is based on a forecast trigger, to mitigate the anticipated impact on food security, lives and livelihoods[54]. Research on the eco-nomics of Early Action indicates that initiatives not only have economic value but also change social norms and behaviours[55]. Tropical cyclones and droughts are respectively the sudden and slow onset disaster for which developing Anticipatory Action is most relevant in the Pacific. Due to the small island geography prevailing in Pacific countries and data gaps, specific challenges in establishing effective triggers have been identified. For example, predicting with sufficient accuracy where a Tropical Cyclone may hit is particularly difficult. Some countries also lack drought forecasting capabilities.

[53] Anticipatory Action in the region has been more commonly known as Early Warning Early Action (EWEA) or Forecast-based Financing.
[54] de Wit, S (2019), Getting ahead of crises: A thesaurus for anticipatory humanitarian action
[55] The Economics of Acting Early Evidence of climate and disaster actions in the Pacific, Australia Pacific Climate Partnership, 2024; On the front foot: Envisioning a model for anticipatory action in the Pacific, HAG, PIANGO & FAO, 2023

Figure 9: *Coordination of actors in establishing anticipatory action built and owned by Pacific stakeholders (Source: HAG, PIANGO & FAO, 2023).*

131. While aspects of Anticipatory Action exist in the Pacific (early warning systems, preparedness/quick response actions, and funding pools), they are often not streamlined in a system. There are some pilot experiences of establishing formal mechanisms in the Solomon Islands and Fiji[56]. The CIS-Pac5 programme has also initiated work for developing anticipatory actions in the 5 programme countries. In March 2023, the first Pacific Week of Anticipatory Action in Fiji brought together over 80 participants, including representatives from national meteorological services, national disaster management offices, and Pacific national societies, representing 15 PICs and regional partners. The second forum was organized in April 2024, with consensus emerging on the need for anticipatory actions to be Pacific built and owned. It is also critical to build on existing networks and mechanisms at regional and national level rather than establishing new structures. These conclusions are in sync the evidence emerging from recent studies on Anticipatory Action in the region, that as illustrated by Figure 9 all stakeholders must collaborate on a Pacific-tailored and Pacific-owned anticipatory action model[57].

132. The OPP therefore will build on the Impact based forecasting and early warning capacities strengthened through Outputs 2.1 and 2.2, and use a bottom up approach in supporting the operationalisation of Early Actions, engaging with countries based on their interest and commitment to establsh Anticipatory Action systems. It will focus on helping countries in

[56] Fiji adopted in 2024 a national Anticipatory Action Framework for Tropical Cyclones, which is the first such mechanism in the Pacific.
[57] On the front foot: Envisioning a model for anticipatory action in the Pacific, HAG, PIANGO & FAO (2023),Humanitarian Horizons, Melbourne: HAG

developing, strengthening and bringing together the building blocks of early action: 1) risk information and triggers 2) Anticipatory Actions 3) financing mechanisms. These blocks are often existings but they are not connected in a systematic way nor supported by strong institutional and governance arrangements. During projct development, activities will be furhter scoped based on emerging eveidence in the region, best practice and in-depth consultations with interested countries and key partners at regional and global level (PIANGO, IFRC, FAO, WFP, UNDRR, WMO, AHP).

133. Indicative sub-activities include:

(i) Review in-country exsisting systems, coordination mechanisms and building blocks for anticipatory action, including community based mechanisms and traditional knowledge and prepare country specific feasibility studies
(ii) Organise awareness raising, sensitisation and trainings on Anticipatory Action for relevant stakeholders.
(iii) Support the development of national roadmaps for Anticipatory Action, building upwards from the community level, where anticipatory action elements already exist.
(iv) Support the operationalisation of coordination and financing mecanisms, building as much as possible on existing structures.
(v) Explore the potential for innovative financial solutions such as anticipoatory micro insurance productus targeted to communities
(vi) Reinforce the enabling framework by supporting the review and revision of relevant laws and policies (DRM, Climate, Early Warning and Finance) to integrate Anticipatory Action
(vii) Develop Early/Anticipatory Action Protocols depending on the results of the Roadmap and the capacity building activities
(viii) Develop case studies in partnerhsip with interested countries to build evidence to show how anticipatory action can work in the Pacific
(ix) Facilitate experience and knowledge exchence within the region and with other SIDS

Component 3: CIEWS for resilient infrastructure and financial decisions

Output 3.1 Climate resilience of critical infrastructure, sectors and supply chains improved

Activity 3.1.1: Integrate climate risk information and early warnings in the planning and management of critical ecosystems, infrastructure and supply chains

134. Under Output 2.1 the OPP will support the development of country specific systems analysis to identify critical infrastructure (e.g. Hospitals, Airports, Ports, Electricity, Fuel Depots, etc.) and supply chains (e.g. food, energy, medical supplies) at risk from climate hazards. The risks analysis will be used to inform investment decisions, management of existing assets and preparation of contingency plans. The forecasts and warnings produced by the CIEWS established under Output 2.2 will feed into the operation of the emergency and contingency plans.

135. Indicative sub-activities include:

(i) Review avaialble decision support tools at regional and global level to integrate climate risk infomration in sectoral investments (e.g. World Bank Climate and Disaster Risk Screening Tools[58]) and assess their relevance and applicability in the pacific context
(ii) Adapt and customise existing tools, and if required, develop new tools to facilitate the integration of integrate climate risk infomration in sectoral investment planning, with particular focus on critical infrastructure, supply chains and priority sectors (e.g. tourism and fisheries). This will not be limited to new investments and will include assessing how the use of CIEWS information can be used to improve the management and climate resilience of existing infrastructure. The programme will

[58] https://climatescreeningtools.worldbank.org/

build, upscale and expand based on the results of the VanKIRAP project (e.g. integration of climate information on the planning and design of infrastructure[59]).

(iii) Analyse critical supply chains simulate impact of disruptions due to climate hazards, prepare and support the implementation of contingency plans.

(iv) Inform the identificaiton of investments required to protect critical infrastructure.

(v) Review and if required amend national policies, spatial planning and building codes to improve climate resilience of critical infrastructure.

Output 3.2 Resilience financing fostered

136. Long-term sustainability of climate services established under Output 1.2 and Impact-Based Multi-Hazard Early Warning Systems under Component 2 will depend on strengthened institutional and stakeholder partnerships as a result of the NFCSs. Considering the specific context of the pacific and the cascading architecture of the Impact-based multi-hazard forecasting and early warning systems defined by PMC through WRP, the long-term sustainability of services and infrastructure will require that the regional components are adequately financed alongside the national ones (see Output 2.2).

Activity 3.2.1: Develop financing strategies and solutions for enhanced resilience financing

137. The focus of this Activity is the development of financing strategies, policies, partnerships and approaches at regional and national levels to ensure that NMHSs and NDMOs have the means to sustain and ensure the ongoing operation of their mandated services in order to manage climate related risks. This will include identification of opportunities for private sector engagement and investment based on detailed market assessments. Compatibly with national policies on data access and provision of public services options for diversification of sources for funding will be explored, including through cost-recovery mechanisms from sectors and provision of services to the private sector to inform financing and investment decision making.

138. Indicative sub-activities include:

(i) Assess the added value of climate information provided by NMHSs to priority sectors.

(ii) Conduct market assessments to explore viable opportunities for commercialization of climate information services to sectors and business segments such as supporting revenue generation from CIEWS data provision to the maritime, fishing and aviation businesses.

(iii) Design and operationalize with participating countries provisions for long term financing arrangements of the regional components of the system, such as the regional Pacific Weather Exchange, operations of the forcasting services provided by the RSMCs, the regional instrument calibration center in Fiji and the regional facility for maintainance of hydromet equipments.

(iv) Develop, review and support the implementation of national policies for financing climate services, EWS, Anticipatory Actions and DRR.

(v) Support the integration of CIEWS generated information into development and sectoral planning through the production of bespoke analytical reports and user friendly tools.

(vi) Explore the feasibility and pilot the development of financing mechanisms (e.g. resiliency funds) and innovative products (e.g. bonds) to contribute to financing service provision.

(vii) Explore and broker possible partnerhips with the maritime, fisheries and aviation business for the exchange of data for services (e.g. companies may provide data from their vessels in return for services such as processed information, forecasts and alerts)

(viii) Integrate the information produced by the CIEWS developed under components 1 and 2 in the development and operationalization of insurance and financing mechanisms to reduce risks and barriers to investment.

(ix) Assess the possiblity to expand insurance products for loss and damange such as parametric insurance[60] and low-cost livelihood protection schemes (e.g. PCRIC)

[59] https://vanclimatefutures.gov.vu/dashboard/infrastructure ; https://vanclimatefutures.gov.vu/dashboard/tourism

[60] Parametric loss and damage insurance schemes as a means to enhance climate change resilience in developing countries, Broberg, 2019 https://www.tandfonline.com/doi/full/10.1080/14693062.2019.1641461

(x) Engage with the private sector to develop new financing mechanisms for the sustainability of CIEWS.
(xi) Support innovation in climate and digital technology (including local innovation and market accelerators).

Component 4: Programme management and crosscutting activities

Output 4.1 Programme effectively and efficiently managed

Activity 4.1.1: Manage the programme effectively and efficiently

139. The effective and efficient management of the One Pacific Programme will require close coordination with the implementation of the WRP and EW4ALL. Good balance between regional and country level management will have to be ensured. To this effect the OPP will establish a AE/IE Task Management Team (TMT) at SPREP to have the overall coordination and management of execution agreements with executing entities and execution partners. It is proposed that the AE/IE TMT at SPREP will have a TMT Manager /TMT-lead, Finance Specialist, Administration /Coordination Officer and a MERL Officer. As required, the execution entities and execution partners may place in country coordinators to drive the activities and facilitate institutional capacity development. During proposal development, possible arrangements for resource sharing with WRP and EW4ALL will be assessed and established accordingly. Dedicated systems and decentralised IT tools to manage and administer the OPP will be operationalised during the start-up phase building on, and when required, improving the systems used by SPREP.

140. The AE/IE TMT will be responsible for financial management and reporting to SPREP, GCF NDAs and the GCF, in line with relevant GCF and SPREP policies, and as outlined in the GCF-SPREP Financing Administrative Agreement (FAA). The AE/IE TMT will also be conducting annual progress assessments and organise interim, mid-term and final evaluations in coordination with the GCF Independent Evaluation Unit (IEU).

Output 4.2 Technical Assistance and crosscutting activities delivered

Activity 4.2.1: Deliver regional technical assistance across the programme

141. Given the high degree of integration and interdisciplinarity of the OPP, its successful execution will depend on the horizontal integration of several cross-cutting dimensions across programme activities including the following:

(i) Regional harmonisation of equipment, data processing, modelling and communication protocols
(ii) Traditional Knowledge
(iii) Innovation, financing and upscaling
(iv) Institutional strengthening, capacity development and trainings
(v) Knowledge management and sharing
(vi) Monitoring, evaluation and learning

142. The following dimensions will be covered by the WRP technical team:
- Forecast Production and Forecast 4 Communication
- Infrastructure, capacity development and training
- Environmental and Social Safeguards Officer
- Gender Equality, Disability and Social Inclusion (GEDSI)
- Communications

143. These activities will be delivered through the execution entities and partners having execution agreements with SPREP – these execution agreements will be managed by the AE/IE Task Management Team. The proposal development phase will articulate the specifics of the execution of activities mapped to the appropriate entities and or partners.

144. The scope of the capacity development and training programme will be further defined in consultation with WRP, EW4ALL and WMO during proposal development considering that these are still conducting joint needs assessments in coordination with the SOFF.

145. Given the programme duration of 10 years, it is anticipated that the capacity development plan will be developed for an initial four years, with a second plan prepared at year five based on the results of the interim evaluation in year three. The support provided will complement rather than replace existing training such as with the WMO Regional Training Centres in the Asia-Pacific region, WMO and other training courses, and the programmes provided by the Pacific International Training Desk in Hawaii. It is expected that the WRP will lead on the delivery of the planned Pacific Meteorological Leadership Programme to cover aspects of governance, strategic planning, financial management, and communication.

146. The indicative scope of capacity development and trainings includes:

- Training of engineers on the installation and maintenance of equipment /instruments
- Conducting training of WMO standard forecasters using a hybrid model of online courses complemented with an intensive face to face component
- Training of staff (especially meteorologists, oceanographers and hydrologists) in countries severely impacted by coastal inundation
- Developing a twinning program to provide mentoring from highly developed hydro-meteorological services
- Improving the understanding of large-scale climate processes influencing variability and extreme events
- Providing training of NMHS and NDMO staff in the development of impact-based messages including the use of traditional knowledge and how to reach vulnerable groups disproportionately affected by extreme events, including women and people with disabilities
- Training workshops in the use of the WMO Common Alerting Protocol
- Online and in-person training on hazard mapping, integrated river basin management, integrated coastal zone planning, community-based adaptation, ecosystem-based adaptation and other relevant topics
- Form and/or strengthen community groups to participate in the programme, as well as providing targeted training to community focal points /leaders
- Field-level training on disaster risk reduction, preparedness and response, and use of early warning information and best practices
- Adult education campaigns for the vulnerable community groups, paying particular attention to disadvantaged or disabled community members and those who may not have sufficient mobility to participate in emergency drills

Theory of Change

147. The One Pacific Programme aims to shift from the current “business as usual”, characterised by the poorly coordinated use of insufficient climate and ocean information towards a new paradigm in which accurate, timely and actionable information is used for policy, planning, warnings and investment decisions, and enables sectors, communities and industries to adapt to increasing climate variability and change therefore increasing resilience and reducing loss and damage.

148. To effect this transformation, the One Pacific Programme will address the key barriers to adaptation described in detail in section B.1 related to: i) Policies and institutions; ii) Infrastructure and data; iii) Technological and human capacities; iv) Engagement, gender and traditional knowledge; v) Resilience financing.

149. The programme will put in place a comprehensive set of actions to address identified barriers and achieve the programme goal using the following overarching Theory of Change:

150. ***If*** *NMHS and NDRMs in pacific countries are enabled to deliver effective and sustained climate and ocean information services and multi-hazard early warnings to priority sectors and vulnerable populations,* ***then*** *climate resilience of communities and sectors will be improved and loss and damage lessened trough reduced exposure,* ***because*** *the observation infrastructure has been improved and forecasting capacities strengthened through a robust and adapted regional*

architecture, warnings reach isolated communities and are understood and acted upon, and policy and financing mechanisms are in place to ensure continuity and sustainability of operations.

151. **The theory of change diagram is provided in Annex 2.** The One Pacific Programme theory of change will be further developed and refined during proposal development.

152. The One Pacific Programme will establish/strengthen integrated climate and ocean information services. This will be achieved through the four inter-related components, which also aim at creating enabling conditions for scaling up and replicating the impacts. The programme components are based on the pillars of Global Framework for Climate Services, a UN-wide initiative coordinated by the World Meteorological Organization (WMO) and the EW4ALL and the GCF sectoral guide for CIEWS.

Governance and implementation arrangements

153. SPREP is an intergovernmental agency and centre of excellence that provides assistance and technical advisory services to Pacific SIDS in the protection and management of their environment to ensure they achieve sustainable development – these are guided by the SPREP Strategic Plan (2017-2026). SPREP is host to the Pacific Climate Change Centre (PCCC) the regional centre of excellence for climate change information, research and innovation, the Pacific Met-Desk, as well as the Traditional Knowledge Database[61]. SPREP as the lead Pacific organisation in climate change and meteorology work will build on the achievements and leverage its expertise and capacities as the proposed accredited entity for the One Pacific Programme. The role of SPREP will be critical during the design and implementation of activities aimed at ensuring long term sustainability of the interventions.

154. The presence of the WMO Pacific Office and UNEP Pacific Office including the placing of project management units at SPREP for: the Weather Ready Pacific, the GCF funded Van-KiRAP project, the Intra-ACP Climate Services and Related Applications (ClimSA) programme, and the GCF funded CIS-Pac 5 programme provides an environment conducive to fostering partnerships and collaboration in implementation across multiple related projects and programmes.

155. To ensure integration with the WRP and minimise the proliferation of ad-hoc structures, the OPP governance arrangements at regional level will be allied on the arrangements foreseen for WRP[62] as illustrated by Figure 10. The WRP Steering Committee currently includes:

- all members of the Pacific Meteorological Council
- chair of the Regional Disaster Managers Meeting and a second representative
- development Partners and Donors representatives – it is expected that the key investors in Weather Ready Pacific will have a seat on the Steering Committee
- Weather Ready Pacific Programme Manager

156. The WRP Liaison Platform should be seen as a forum for existing regional and global mechanisms and organisations to guide and align to WRP, and for WRP to communicate with and influence outside the program itself. More specifically, the WRP Liaison Platform is designed to:

- enhance engagement between WRP and Partners beyond the PMC, NDMOs, CROP agencies and current WRP donors;
- mitigate against redundancy with other regional and global initiatives, and;
- maximise the benefits to the Pacific meteorology and disaster management sectors through leveraging new and existing initiatives and funds.

[61] The Traditional Knowledge Database was developed by the Australian Bureau of Meteorology as part of the COSPPac Programme and currently maintained by the SPREP Information Technology (IT) team, and was initially piloted in five countries – Vanuatu, Niue, Samoa, Solomon Islands, and Tonga. The Database is installed within the NMHSs and can be used by countries to collect and store traditional knowledge information that can help with weather forecasting and observations. https://library.sprep.org/content/database-traditional-knowledge-weather-and-climate-pacific

[62] Weather Ready Pacific Governance document, PMC, 2024

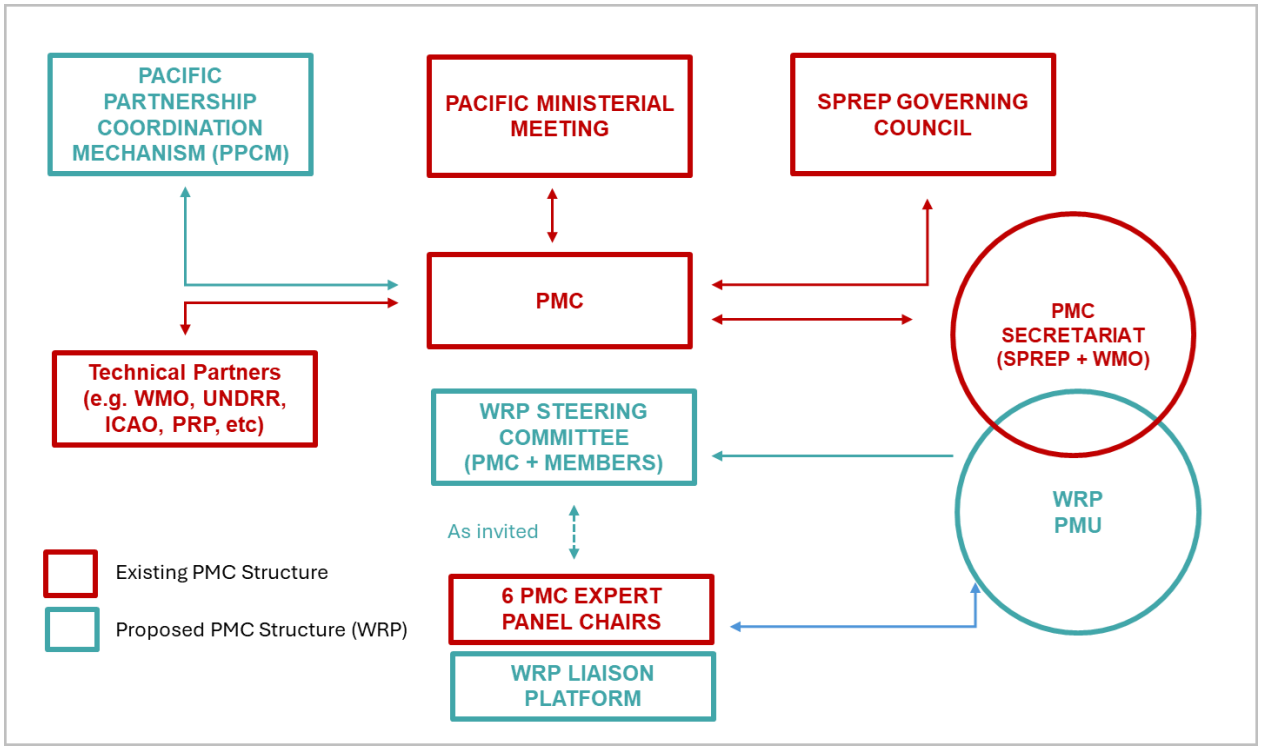


Figure 10: *WRP governance arrangements*

157. It should be noticed that as previously mentioned in the document, a revision of the WRP governance arrangements is foreseen to align with the EW4ALL and in particular to ensure better representativity of key stakeholders for DRR, civil society and communities. The arrangements proposed for the One Pacific Programme anticipate this revision, by already including NDMOs representatives in the Steering Committee. Based on the experience of the GCF-UNEP CIS-Pac 5 programme, there is the need to include the GCF NDAs (national designated authorities) in the structure.

158. The One Pacific Programme implementation arrangements in Figure 11 below outlines the OPP arrangements with WRP PMU which at the governance level will be aligned with Figure 10 noting that there is proposed revised WRP governance arrangements mentioned above.

159. During the proposal preparation additional scoping will be conducted to further define mechanisms to streamline the operationalisation of the governance arrangements (e.g. organisation of pre-Steering Committee prep meetings with larger participation of executing partners and stakeholders, back-to-back organisation of WRP and One Pacific Programme Steering Committee(s)). The regional level governance will be underpinned by national level arrangements for coordination, defined based on the specific context in each country. These will also build whenever possible on existing coordination mechanisms for climate services delivery and disaster management and will include membership of the GCF NDAs. For the CIS-Pac 5 countries and Vanuatu, existing mechanisms will be used. The objective of national level coordination arrangements will be to facilitate programme implementation and interinstitutional coordination.

In addition to the NMHSs, NDMOs and National Sectoral Departments/Agencies, a wide partnership across the public and private sectors and civil society will be required to execute this ambitious initiative. Discussions have been initiated with potential partners and executing entities on their respective roles in the execution of the One Pacific Programme interventions at the regional and national levels. Potential partners identified include:

- Global and regional: WMO, BOM, NOAA, MetNZ, Meteo France, UK Met Office, KMA-KMI, APCC, UNDRR, NIWA, CSIRO, SPC, GNS-NZ, WFP, ITU, IFRC, NRC, IOM, UNICEF, WFP, FAO, UNOCHR, PECRIC USP

- Civil society: PIANGO, World Vision, Caritas, local CSOs, Australian Humanitarian Partnership
- Private sector: Pacific Islands Private Sector Organisation (PIPSO), IT/AI companies developing leading technologies relevant for climate risk management (e.g. Tomorrow.io, Goolge, SIA – Korea, KMI), telecom companies (e.g. Vodafone Pacific, StarLink), maritime and aviation industry, insurance (Pacific Catastrophe Risk Insurance Company- PCRIC; Munich Re; Zurich Resilience Solutions)
- Universities and research: UNU, University of the South Pacific
- National Regional and National telecom authorities
- Financing: World Bank, ADB, Bezos Earth Fund, Global Adaptation and Resilience Investment (GARI) working group, Vanuatu Business Resilience Council (VBRC), Connecting Business Initiative (CBi)

The partnerships will be further developed during proposal development and firmed up through partner agreements that will articulate responsibilities in the execution of interventions.

160. The proposed implementation arrangements are described in Figure 11. SPREP as direct access entity /accredited entity (AE) and implementing entity (IE) will be implementing the programme and sign a funded activity agreement (FAA) with the GCF. SPREP as the AE/IE will establish a One Pacific Programme Task Management Team, OPP TMT, with proposed composition of a Task Manager /OPP Team-Lead, Finance Specialist, Administration and Coordination Officer and a Monitoring, Evaluation, Review and Learning (MERL) Officer to implement the SPREP-GCF FAA. The OPP TMT will lead, manage and coordinate the implementation phases with executing entities (EE) and executing partners (EP) through execution agreements (EA) and provide reporting requirements to SPREP, GCF NDAs and the GCF as outlined in the FAA.

161. Three external evaluations are foreseen, an interim evaluation (year 3), mid-term (year 5-6) and a final evaluation (year 10). The TORs and design of the evaluation will be agreed with the GCF and the IEU by year 2 of implementation.

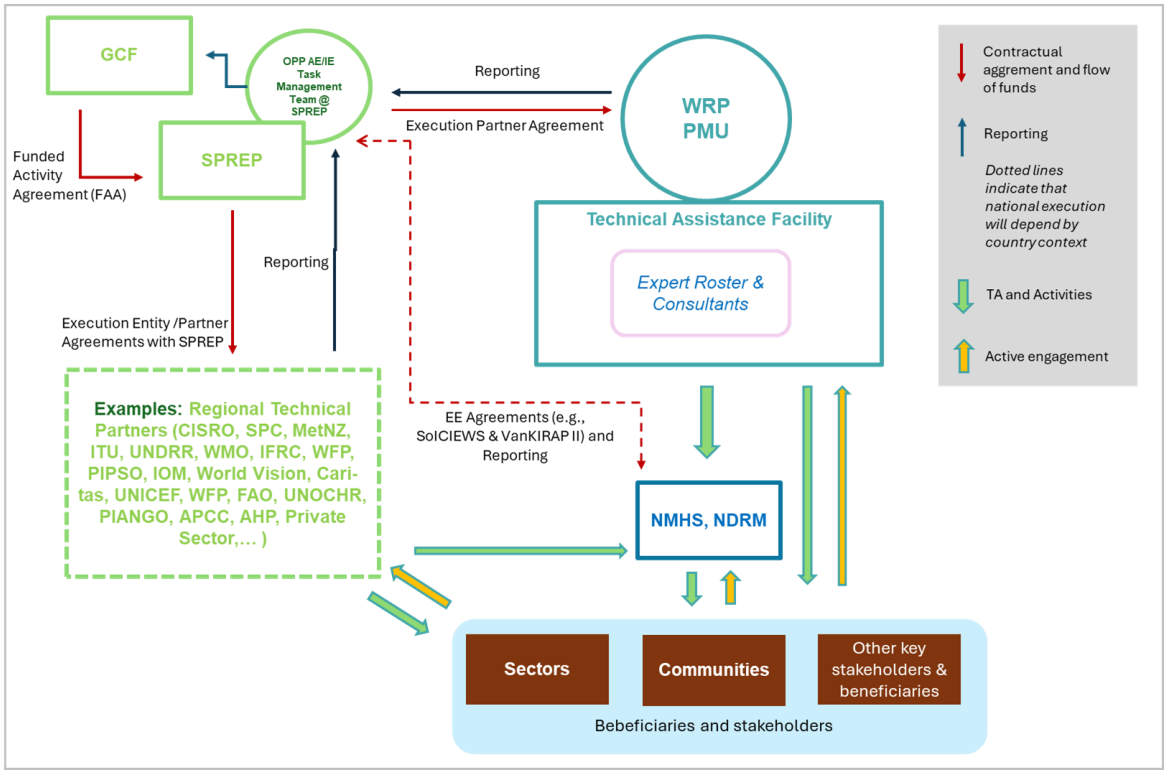


Figure 11: *Proposed implementation arrangements for the One Pacific Programme with SPREP clearly identified as the accredited entity*

162. As the experience of the GCF-UNEP CIS-Pac5 programme has shown, establishing suitable administrative arrangements and procedures as well as recruitment can be very time consuming in the pacific context given existing capacities and the requirement to comply with the complex GCF policy and administrative framework.

163. The One Pacific Programme will be implemented in three phases allowing a start-up (12-18 months) and closure timeframe (12 months) as illustrated by Table 7. With such a magnitude and a programmatic approach, and a Pacific first in scale with the GCF in such a focus area, the start-up phase provides the required time for setting up the Team, organising logistics and agreements at the regional and national levels, etc., allows on-ground activities to be planned well for effectiveness and efficiency within and outside the OPP, and have the on-ground activity-timelines to be completed within the 7.5 years.

Table 7. Proposed implementing phases for the One Pacific Programme

Key Elements /Phases	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Start up										
Roll-out Activities on ground										
Wrap-up, Terminal Evaluation & Closure										
	Start-up	On-ground activities								Closure

164. During proposal development, country work plans will be developed for each participating country. These country work plans will include bespoke GEDSI, environment and social management plans and country-specific implementation plans.

165. **Financial risks**: a financial risk is that the OPP will provide expensive hydrometeorological equipment that will not be maintained beyond the life of the programme due to the limited financial resources in the responsible government agencies. The programme will address this critical issue by establishing standardised protocols and specifications for procurement, including negotiation of regional agreements for warranty and maintenance. The OPP will also establish a regional facility to coordinate procurement and maintenance of equipment and infrastructure. The OPP will assist appropriate national authorities to present or develop a business case including cost recovery that will minimise such risks, demonstrating to the national governments the likely future loss and damage costs if an effective early warning system is not maintained in comparison to the relatively small financial need for maintaining the equipment, replacing damaged equipment, and continuing the outreach and communication to remote vulnerable communities, sectors and industries.

166. Further, the One Pacific Programme proposes an investment that will be funded by GCF and co-financed with multiple financing sources mobilised in a coordinated way under the umbrella of the Weather Ready Pacific and the global EW4ALL initiative. As a flagship in this focus-area, the OPP anticipates to effectively leverage development partners including the private sector to support and implement the required interventions for the region.

167. **Operational risks**: such a programme will need a robust governance arrangement to coordinate and ensure that the programme achieves its primary objectives. It is anticipated that there will be multiple executing entities and partners, and technical agencies including bilateral and development partners to deliver and co-finance the programme. Efficient management systems and reporting tools will be also crucial to enable the smooth operation of such initiative spanning several countries and sectors. Strong leadership from the PMC will be central in maintaining the required level of national and regional coordination as well as of political support. Communities that are most in need of an effective climate information services and early warning systems are the hardest to reach both physically and through the telecommunication system. Dedicated efforts will be deployed to ensure that these remote communities are not neglected simply because they are difficult to reach.

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

168. **Alignment with GCF investment criteria:** The One Pacific Programme will meet all the GCF investment criteria for climate change adaptation, as indicated below.

169. **Impact potential:** The Pacific population is at risk from climate-related hazards such as cyclones, storm surges, coastal inundation, floods and droughts. The most vulnerable groups include the populations living within 1-5km off the coastal zone, estimated at 57-90% of a total population of about 8.3 million people[63] and communities close to streams subject to flash flooding. Women, children, elderly people and people living with disabilities are particularly at risk from the negative impacts of climate change. The One Pacific Programme includes targeted interventions tailored to the specific needs of these groups.

170. The World Risk Report 2023 states that Oceania stands out in terms of lack of coping capacity. The most vulnerable Pacific SIDS is PNG with a world risk index (WRI) of 26.30 and ranked 12 in the world and the least being Nauru at WRI of 1.00 and ranked 180[64]. The main contributor to deaths and financial losses in the Pacific region is tropical cyclones[65]. As stated in the 2023 UNDRR Global Assessment Report[66], the concentration of assets and essential infrastructure such as airports, water storage, sanitation, hospitals and clinics, schools, cyclone shelters, fishing boats, inter-island ferries and often food gardens along the coasts means that risk is heavily influenced by exposure.

171. The adaptive capacity of these remote communities will be strengthened through awareness raising, outreach and regular drills on how to respond to each type of warning. By linking the GIS hazard mapping overlays and the downscaled climate change models, locking in long-lived, climate vulnerable infrastructure such as ports and airports can be avoided. In the most vulnerable remote communities, a gender-sensitive approach to early warning communications in local dialects will ensure that the warnings are not only received but also acted on in a timely manner. The relevant government agencies that each have an important part of the EWS will be strengthened and enabled to act more cooperatively and develop a seamless EWS that will reach all parts of the country. The climate information collected remotely and analysed at the central government hub is expected to be used in clear and timely decision making.

172. The One Pacific Programme aims to reduce the expected losses of lives and economic assets due to the impact of climate hazards and extreme climate-related disasters and enhance adaptive capacity at regional, national, subnational and community level.

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

174. Supporting the Pacific to achieve international standards will have a transformative impact on managing climate and weather risks along with a better understanding of long-term climate change impacts. This will be facilitated through the existing regional cooperation mechanisms such as the Pacific Meteorological Council (PMC).

[63] PLOS ONE, 2019. Coastal Proximity of populations in 22 Pacific Island Countries and Territories
[64] Bündnis Entwicklung Hilft and Ruhr University Bochum, 2023, World Risk Report 2023
[65] Giorgetti, A. (2018). Preliminary Cost-Benefit Analyses of Early Warning Systems for the Mitigation of Natural Disasters. Timor Leste, Papua New Guinea, Solomon Islands, Vanuatu and Fiji. Final Report prepared for WMO, February 2018; Subbiah, A., Bildan and L., Narasimhan, R. (2008). Background Paper on Assessment of the Economics of Early Warning Systems for Disaster Risk Reduction. World Bank Group for Disaster Reduction and Recovery
[66] https://www.undrr.org/gar/gar2023-special-report

175. Interventions are expected to achieve transformative impacts through innovative approaches such as introducing cost-effective modern technology wherever feasible to reduce costs and increase accuracy of observations; and developing innovative modern communication systems to close the loop between information providers and end-users, which will ensure that the climate information services reach all end-users expeditiously, including end-users in remote island locations. Moreover, the One Pacific Programme will create an enabling environment for a new innovative business model for providing climate information services by NMHSs to climate-sensitive sectors and the private sector, which will contribute to long-term sustainability beyond the duration of the Programme.

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

177. **Sustainable development:** The One Pacific Programme will contribute to long-term social, economic and environmental benefits from avoided human and economic losses and healthier ecosystems for the participating Pacific SIDS. Interventions are fully aligned with the Sustainable Development Goals (SDGs), the Paris Agreement, the Sendai Framework for Disaster Risk Reduction and the SAMOA Pathway. It will contribute to countries' progress towards many of the SDGs in the areas of disaster risk reduction, ecosystem protection, climate change adaptation, health and sustainable economic development. Through the proposed interventions, the One Pacific Programme will contribute to: SDG 3 Good Health and Well-being; SDG 5 Gender Equality; SDG 10 Reduced Inequalities; SDG 13 — Climate Action; SDG 14 - Life Below Water; and SDG 15 - Life on Land.

178. The increased availability and use of actionable climate information can significantly improve natural resource management, from climate risk-informed policymaking to conservation and arresting biodiversity loss. The establishment of hydrological and ocean information services – including lagoon health monitoring, habitat mapping and shoreline analysis – will facilitate improved management of coastal habitats and inform sustainable fisheries and tourism practices that minimise environmental impacts.

179. The generation of impact-based forecasts, decision-support systems and advisories tailored to natural resource-dependent sectors such as agriculture and fisheries will contribute to the rapid identification of weather and climate hazards that pose environmental risks and consequently inform the safeguarding of natural resources and biodiversity. For example, well managed agriculture, using rainfall prediction to determine crops most likely to succeed, reduces the pressure to convert forests to marginal arable land as well as increases food security. Furthermore, detailed climate information is necessary for comprehensive environmental impact assessments and can inform energy management decisions to improve efficiency and reduce greenhouse gas emissions. At the global scale, the increased generation of data will contribute to enhanced global forecasting accuracy, which in turn improves the ability to predict and mitigate the impacts of impending extreme climate events that may be hazardous to natural environments across the world.

180. Several social co-benefits will be derived from the activities, increasing the liveability of islands. In particular, *Component 2, Output 2.4 preparedness and response capabilities strengthened, including anticipatory actions* has a major focus on interventions to strengthen resilience of

communities and other end users to climate-related hazards, which will significantly enhance their livelihoods and reduce losses of lives and damage to assets. Enhanced response capacities among end users of early warning systems will also have health benefits as impacts of climate-related hazards on population are reduced. Moreover, the improvement in weather forecasting and the prediction of severe weather events, mainly under Component 1, has wide-ranging social implications, among them better crop management giving better harvests, and improved local climate adaptation planning. These co-benefits help avoid economic losses that can otherwise lead to socio-economic related health impacts. Furthermore, the One Pacific Programme will lead to employment opportunities for residents, both in infrastructure building, and monitoring positions. These opportunities will directly and indirectly improve residents' socio-economic circumstances through local wealth streams.

181. **Needs of recipients:** The most vulnerable communities, industries and sectors depend on timely warnings of potential climate-related extreme events. Armed with such warnings and the knowledge and resources to respond to those warnings can make the difference between life and death, as well as minimising loss and damages to public and private assets.

182. The high vulnerability to climate change impacts and climate-related hazards of Pacific SIDS arises from:

- The geography, which maximises their exposure to ocean changes. Pacific atoll islands are less than a kilometre wide and effectively consist of long coastlines. Land mass accounts for only around 2% of the entire Pacific region[67].
- Most people depend on subsistence agriculture and fishing for their livelihoods and their profitable industries, notably tourism, are very climate sensitive. They are remote from markets and have small populations and narrow resource bases.
- Pacific SIDS are resource-limited, lack resilience to shocks and have small economies with many pressing claims on public funds.
- Effective, timely communication of climate forecasts and extreme weather warnings requires expensive but robust technology and human resources, both limited in Pacific SIDS.
- In some Pacific SIDS, vulnerable groups such as women, children, old people and people living with disabilities have limited access to or interaction with the public domain and their requirements for information and resources are often overlooked.

183. Needs of communities and other stakeholders are central to this One Pacific Programme, which has strong elements on climate information products and outreach for informed adaptation actions, as well as multi-hazard early warning systems at national and community levels. The need for these is illustrated by the 2015 UNISDR Global Assessment Report[68], which highlights that the number of people exposed to floods and tropical cyclones in the Pacific each year is estimated to have increased by around 70% since 1980. Relative to capital investment or social expenditure, SIDS top all of the regional risk rankings.

184. At the institutional level, Pacific NMHSs and NDMOs have achieved some progress in institutional capacity, technical meteorological and climatological capacity, project delivery, project management and communication skills during the last ten years, with support from Australia and New Zealand. However, with the resources available to them, they remain far from able to consistently deliver the climate services or any of the national ocean services that their populations urgently need. Nonetheless, the NMHSs have reached a level of competence from which a Programme simultaneously addressing the structural obstacles to end-to-end service provision can effect a lasting systemic change. This can only be achieved through strengthening the institutional capacity of existing national organisations, if the change is to be sustained and self-perpetuating, as this Programme is designed to achieve.

185. **Country ownership:** The Pacific Islands Integrated Vulnerability Assessment Framework supports the operationalisation of the Framework for Resilient Development in the Pacific (FRDP,) which "advocates for the adoption of integrated approaches whenever possible, for coping with and managing climate change and disaster risks, in order to make more efficient use of resources".

[67] http://www.sprep.org/attachments/Publications/PECCO_lr.pdf Page 26
[68] https://www.preventionweb.net/english/hyogo/gar/2015/en/gar-pdf/GAR2015_EN.pdf

186. The One Pacific Programme is an outcome of a series of consultations with Pacific SIDS including those that resulted into the Weather Ready Pacific and the most recent in May 2024 in Samoa with the Met-Directors and NDAs. Further, Pacific SIDS were also party to the consultations in the review of the Pacific Islands Meteorology Strategy with their interests and priorities reflected in the current PIMS 2017–2026, including the development of the Pacific Roadmap for Strengthened Climate Services 2017–2026.

187. **Efficiency and effectiveness:** Pacific SIDS are becoming increasingly connected via modern communication systems. The investment through the One Pacific Programme will directly address financial, technical, capacity and coordination barriers to the effective delivery of climate information and multi-hazard early warning services in the region. This builds on ongoing similar interventions as discussed earlier. Although direct revenue will not be an immediate realisation of this investment, the One Pacific Programme is expected to explore and develop approaches and information products with commercial value that will enable cost recovery options and private sector engagement beyond the implementation timeline. Cost-Benefit Analysis (CBA) during the PPF phase will consider other Pacific SIDS not participating in the UNEP implemented GCF funded multi-country programme.

188. It is of interest that the CBA conducted for the UNEP-GCF programme in five Pacific SIDS reveals the feasibility of the GCF investments by calculating the economic internal rate of return (EIRR) and economic net present value (NPV). The CBA shows that, assuming a 10-year useful life of proposed interventions at a 9% discount rate (as recommended by ADB 2017), all discounted NPVs are positive. The EIRR exceeds the discount rates in each instance making all proposed investments economically viable. Sensitivity analysis has been used to test uncertainty for key parameters such as a decrease in benefits or an increase in investment costs. Although the EIRR decreased with those simulated cost benefit changes, the EIRR remained above the 9% threshold in all cases, demonstrating that the proposed investment will be both cost-effective and efficient, in addition to the delivery of considerable social benefits. The benefits calculated in the CBA take the form of avoided economic damages and losses. Avoided economic damages include impacts on infrastructure and physical assets, particularly contents, and crops.

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

189. The One Pacific Programme is developed based on consultations held with key stakeholders as follows:

- 16 Pacific SIDS during the development of the Weather Ready Pacific for investment from November to December 2020.
- GCF and a working group of accredited entities currently implementing CIS and EWS projects /programmes at the Pacific Programming Dialogue held in June 2021.
- NDAs, NMHS and NDMOs and potential technical partners from 25 October to 12 November 2021 through SPREP Circulars to countries and virtual meetings as requested by countries.
- Extensive coordination and consultations with the Weather Ready Pacific, the CIS Pac-5 UNEP programme, the VanKIRAP project, ClimSA project and WMO Pacific Office during a series of meetings from February 2024 to date.
- Coordination with the UNDP global EW4ALL programme in April 2024.
- Consultation with Met Directors and NDAs in Apia Samoa on 3 and 6 May 2024.
- Discussions and inputs/comments from UNDRR, ITU and CSIRO in May 2024.
- Ongoing discussions with WMO, ClimSA project team and UNDEP CIS-Pac5 team and a SPREP to date.

190. The Weather Ready Pacific has been endorsed by the Pacific Meteorological Council, Forum Economics Ministers, Forum Officials' Committee, Pacific Islands Forum Leaders and the SPREP Meeting in September 2021. The Weather Ready Pacific has commenced implementation with initial investments from New Zealand and Australia with the PMU housed at SPREP. With most Pacific SIDS' GCF Country Programmes having prioritised climate information services and early warning systems, the One Pacific Programme will be further socialised with the NDAs to facilitate the discussions and endorsement through the respective Pacific SIDS "no objection letter" processes.

191. Through formal engagement with the countries (NDAs, NMHS and NDMOs) and potential partners such as Vodafone Pacific, Pacific Aviation Safety Organisation (PASO), Regional Maritime Safety Programme, and International Federation of Red Cross including NIWA, CSIRO and NOAA, SPREP has discussed components relevant to their mandates – this was conducted between 25 October to 12 November 2021, and recently with the EW4ALL pillar Leads, the Korean Meteorological Institute and the Asia Pacific Climate Centre in May to July 2024.

192. The consideration of best practices and on-ground experience by other similar projects/programmes as highlighted by the respective progress reports and project/programme reviews and evaluations also supplements the consultations conducted with the countries. The mechanisms under the Pacific Met-Desk partnership arrangements have also contributed to ongoing discussions between countries, partners and SPREP in the development of the concept note.

193. Additional consultations with stakeholders are planned for the One Pacific Programme during the proposal development phase to provide specific activity design including implementation and executing arrangements that are conducive to the region.

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

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

194. The One Pacific Programme investment draws from current projects/programmes under implementation, those initially in the pipeline for GCF financing including the Weather Ready Pacific (WRP). For the purpose of this concept note the approach to co-financing is outlined in Table 7. These details will be validated in the proposal development phase.

Table 7. Co-financing proposal (indicative)

Component(s)	Description of co-financing	Amount (USD)
1, 2 & 4	Weather Ready Pacific	38,000,000
4	Targeting the OPEX part of equipment with calculations based on national budget allocations, cost recovery & equipment warranty over a period of 7 years	5,000,000
2	Other partners and initiatives such as Adaptation Fund for SC 2.4, KMA-KMI, EW4ALL pillar-leads, etc.	15,000,000
OPP Team	Targeting executing entities, executing partners, etc	2,000,000
Total	*The actual co-financing including other financing instruments will be finalised at the proposal development phase*	*60,000,000*

195. The indicative budget proposed for the One Pacific Programme is presented in Table 8.

Table 8. Indicative Budget for the One Pacific Programme

Component /Output	Indicative cost (USD million)	GCF financing		Co-financing		
		Amount (USD million)	Financial Instrument	Amount (USD million)	Financial Instrument	Name of Institutions
Component 1: Enhance Climate Information Services and modernise regional and national hydromet services	69,000,000	49,000,000	Grant	20,000,000	Cash (parallel activities)	WRP
Component 2 Establish Impact-Based Multi-Hazard Early Warning Systems and Early Action	65,800,000	52,800,000	Grant	13,000,000	Cash (parallel activities)	WRP
				15,000,000	Cash (parallel activities)	AF, EW4ALL & KMI
Component 3 CIEWS for resilient infrastructure and financial decisions	19,000,000	19,000,000	Grant	-	-	-
Component 4 Crosscutting regional support and programme management	27,200,000	17,200,000	Grant	5,000,000	Grant/cash	PICs (OPEX)
				5,000,000	Cash (parallel activities)	WRP
Sub-total 1	*196,000,000*	*138,000,000*		*58,000,000*		
OPP Team (10%)	15,800,000	13,800,000		2,000,000	In-kind	Executing entities/ partners
Sub-total 2	**211,800,000**	**151,800,000**		**60,000,000**	Estimated co-financing	
AE/IE (7%)	*10,626,000*	*10,626,000*				
Overall total	222,426,000	162,426,000				

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

196. The costed One Pacific Programme (OPP) interventions were based on the GCF-UNEP CIS Pac-5 programme and the GCF-SPREP VanKIRAP project experience estimating a USD 152 million investment over 10 years. Recent estimates of average annual losses (AAL) in GDP in Pacific SIDS due to natural disasters are in the order of USD 1,073 million[69] (cyclones 50%, flood 15%, earthquake 15%, and drought 20%). These estimates do not include losses of life or disruptions to livelihoods and social cohesion. If the improved services and delivery of forecasts and warnings from NMHSs could prevent just 5% of these losses that represents a positive return on investment. That superficial assessment of benefit is likely very conservative as other economic analyses of NMHS improvements to reduce disaster losses in developing countries show a Benefit-Cost Ratio ranging from 4:1 to 36:1. Clearly, the human and financial cost of not acting is much higher than the cost of acting through the investments proposed in this programme. While the economic rationale is obvious, Pacific SIDS are reeling from the recent COVID-19 pandemic, which has devastated international tourism and the national economies dependent on that income. It may take the Pacific SIDS 5-10 years to recover from such economic downturn.

197. The proposed investment under the One Pacific Programme will contribute to the Weather Ready Pacific through targeted areas and aligned to the CIEWS sector guide including the upscaling from ongoing projects/programmes. A key rationale for such investment is strengthening the cascading forecasting system that links World Meteorological Centres, Regional Centre(s), which include Regional Specialised Meteorological Centres (RSMC) and NMHSs. To some extent this is already in place through RSMCs in Fiji, Wellington and Darwin and the National Oceanic and Atmospheric Administration (NOAA) National Weather Service (NWS) Office in Guam, together with delivery mechanisms such as the SWFP. However, it needs strengthening in three areas: the integrating capability between global, regional and national forecasting processes that can deliver automated and consistent forecasts and warnings which can be used either as guidance or as products for users at the discretion of each NMHS, potentially will freeing up forecasters for higher priority tasks; improving the breadth and depth of forecasting services within NMHSs; and a well-supported delivery platform, the Pacific Weather Exchange. It will provide NMHSs with access to a greater suite of high-quality NWP products.

198. A comprehensive financial analysis in the PPF phase will provide a clearer indication for alternate financing of some components of the One Pacific Programme. The concept note development phase has reached out to non-traditional partners and potential co-financing for the One Pacific Programme and there is considerable interest in participating. The concept note development exercise has also identified bilateral programmes that are ongoing or planned.

199. Without the proposed programme, a “business as usual” scenario is likely to continue, characterised by the poorly coordinated use of insufficient climate data and information. NMHSs will continue to generate basic weather forecasts and useful seasonal rainfall predictions but their information will be based on incomplete data (particularly for ocean areas) and it will not always reach its intended audiences in good time or in a useful form. The roles of agencies responsible for disaster preparation and warnings will often remain unclear and they will operate reactively in the absence of reliable forecasts. Data critical to adaptation planning will be lost or forgotten, or not collected, and maladaptation may result. Communities will find traditional forecasting systems less and less reliable but will not be able to understand the technically worded information available, or how they should use it. NMHSs’ traditional development partners will continue their support, addressing some of the obstacles to effective adaptation, but underlying barriers will remain and undermine the sustainability of efforts. Severe hardship and loss of lives, assets and livelihoods will escalate as extreme events become more common and less predictable. Maladaptation and inadequate disaster responses are likely to result, and the participating countries’ development progress will be halted or even reversed.

[69] https://www.unescap.org/sites/default/d8files/IDD-APDR-Subreport-Pacific-SIDS.pdf

200. Pacific SIDS have been party to conventions and treaties such as the SOLAS Convention[70], the Pacific Islands Civil Aviation on Safety and Security Treaty, and the Convention on International Civil Aviation Meteorological Services for International Air Navigation are obliged to provided international standard services such as on weather and climate. To be accredited to provide these services and recover costs are challenging to PICs given the limited national capacity and resources available. The rationale for the One Pacific Programme investment in the CIEWS sector is fitting and not only benefits locally but contributes to having the Pacific adhere to international conventions and treaties.

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

201. The One Pacific Programme through the proposed interventions will set up mechanisms such as assisting NMHSs meet international standards (e.g., WMO certified), participation in national budgetary processes, exploring of income generation possibilities through an enhanced NMHS network and improved national and regional networks that will continue to exist post-OPP and sustain the operations and services established by the OPP. As these are sustained, targeted beneficiaries will continue to receive the needed information and services beyond the 10 years timeframe.

202. More specifically,

- Quality assurance/standards – The One Pacific Programme will promote certified training and audits such as by the WMO at various levels. It is anticipated that the approach will enable the participating countries meet international standards that will contribute to quality services required by international conventions and treaties.
- National budgeting – assistance and guidance to participating national government ministries or departments responsible for meteorology and hydrology to propose budgets to the national budgetary process to consider phasing in of operational and maintenance expenditure, as the One Pacific Programme exits, associated with the services rendered.
- Income generation potential – such possibilities will be enhanced through installation of new modern weather and climate instruments/equipment, certification of personnel by WMO through training, satisfactorily meeting international audit requirements such as the WMO audit, and improved quality of services as required by international convention and treaties (e.g., the Convention on International Civil Aviation). These opportunities will lead to the recovery of costs associated with the provision of such services. A market analysis as part of the activities will present these opportunities to the respective governments.
- Coordination mechanisms and networks – the One Pacific Programme will strengthen coordination at the regional and national levels. The regional coordination will focus on, to expand and leverage from the Regional Climate Centre (RCC) and the regional User Interface Platform by the European Union funded Intra-ACP Climate Services and Related Applications (ClimSA) programme. At the national level the One Pacific Programme will leverage from the national User Interface Platforms including the strengthening of the NMHSs, NDMOs and other key stakeholders to sustain the programme interventions and streamline national coordination for an effective and efficient services.
- Engagement and establishment of partners – these are across the service chain providing clear roles that will enhance effectiveness and efficiency beyond the One Pacific Programme timeframe.

203. Through the strengthened strategic planning and improved governance arrangements, it is expected that the national governments will become more aware of the preventative approach to the expected future loss and damage caused by climate change and will be more willing to allocate financial resources to maintain and expand the climate information services and EWS. The avoided losses to the economy will increase the financial resources available to government revenue to maintain and expand the observation systems and reach out to an increasing number of remote, vulnerable communities, scaling up from the experience under this programme.

[70] The SOLAS Convention in its successive forms is generally regarded as the most important of all international treaties concerning the safety of merchant ships. The first version was adopted in 1914, in response to the Titanic disaster, the second in 1929, the third in 1948, and the fourth in 1960

D. Supporting documents submitted (OPTIONAL)

☒ Map indicating the location of the project/programme
☐ Results of environmental and social risk screening
☒ Annex 1 WRP Implementation Plan
☒ Annex 2 Theory of Change

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 ☐

Map of the Pacific Islands


The Pacific Islands
Philippine Sea
South China Sea
North Pacific Ocean
South Pacific Ocean
Indian Ocean
Coral Sea
Tasman Sea
PHILIPPINES
Manila
Luzon
Northern Mariana Islands (U.S.)
Saipan
Hagåtña
Guam (U.S.)
Challenger Deep (world's greatest ocean depth, -10924 m)
FEDERATED STATES OF MICRONESIA
Wake Island (U.S.)
Johnston Atoll (U.S.)
MARSHALL ISLANDS
Majuro
Kwajalein
Entwetak
Pohnpei
Palikir
CAROLINE ISLANDS
Melekeok
PALAU
Kingman Reef (U.S.)
Palmyra Atoll (U.S.)
Honolulu
Oahu
Maui
Hawaii
Kauai
CLARION FRACTURE ZONE
CLIPPERTON FRACTURE ZONE
Kiritimati (Christmas Island) (KIRIBATI)
LINE ISLANDS
KIRIBATI
Tarawa
KIRIBATI (GILBERT ISLANDS)
Howland Island (U.S.)
Baker Island (U.S.)
Jarvis Island (U.S.)
RAWAKI (PHOENIX ISLANDS)
Yaren District
NAURU
Banaba
Equator
Okino-tori-shima (JAPAN)
Kao-hsiung
Hong Kong S.A.R.
Macau S.A.R.
Luzon Strait
MARIANA TRENCH
PHILIPPINE TRENCH
Sulu Sea
Palawan
Panay
Cebu
Samar
Iloilo
Bacolod
Negros
Cagayan de Oro
Mindanao
Davao
Zamboanga
BRUNEI
Bandar Seri Begawan
MALAYSIA
Borneo
Celebes Sea
Manado
Halmahera
Ternate
Molucca Sea
Samarinda
Balikpapan
Palu
Banjarmasin
Celebes
Buru
Ceram
Kendari
Sorong
Biak
Ambon
Makassar
Jaya Sea
Banda Sea
Java
Bali
Sumbawa
Flores
Surabaya
Denpasar
Lombok
Sumba
INDONESIA
Dili
TIMOR-LESTE
Kupang
Timor
Timor Sea
Arafura Sea
Ashmore and Cartier Island (AUSTRALIA)
Darwin
Gulf of Carpentaria
Jayapura
Wewak
Bismarck Sea
New Ireland
PAPUA NEW GUINEA
Madang
Mount Hagen
Lae
New Guinea
New Britain
Port Moresby
Awara
Torres Strait
Bougainville
Solomon Sea
SOLOMON ISLANDS
Honiara
Guadacanal
SANTA CRUZ ISLANDS
TUVALU
Funafuti
Tokelau (N.Z.)
Swains Island
Rotuma
Wallis and Futuna (FRANCE)
Mata-Utu
SAMOA
Apia
Pago Pago
American Samoa (U.S.)
Cook Islands (N.Z.)
ÎLES MARQUISES
SOCIETY ISLANDS
Papeete
Tahiti
ARCHIPEL DES TUAMOTU
French Polynesia (FRANCE)
Mururoa
ÎLES TUBUAI
Adamstown
Pitcairn Islands (U.K.)
Avarua
Niue (N.Z.)
Alofi
TONGA
Nuku'Alofa
FIJI
Vanua Levu
Viti Levu
Suva
VANUATU
Port-Vila
New Caledonia (FRANCE)
Noumea
Ceva-i-Ra
Minerva Reefs
Tropic of Capricorn
TONGA TRENCH
NEW CALEDONIA BASIN
LORD HOWE RISE
KERMADEC TRENCH
LOUISVILLE RIDGE
KERMADEC ISLANDS (N.Z.)
Kingston
Norfolk Island (AUSTRALIA)
Lord Howe Island (AUSTRALIA)
Coral Sea Islands (AUSTRALIA)
Great Barrier Reef
Cairns
Townsville
Mackay
Rockhampton
Gladstone
Brisbane
Toowoomba
Gold Coast
Newcastle
Sydney
Wollongong
Canberra
Mount Kosciuszko (highest point in Australia, 2229 m)
Melbourne
Geelong
Adelaide
Whyalla
Broken Hill
Esperance
Perth
Rockingham
Bunbury
Geraldton
Kalgoorlie
Lake Eyre (lowest point in Australia, -15 m)
Alice Springs
Mount Isa
Port Hedland
AUSTRALIA
GREAT SANDY DESERT
GIBSON DESERT
GREAT VICTORIA DESERT
SIMPSON DESERT
HAMMERSLEY RANGE
KING LEOPOLD RANGE
MACDONNELL RANGE
DARLING RANGE
FLINDERS RANGE
GREAT DIVIDING RANGE
Great Australian Bight
Bass Strait
Launceston
Hobart
Tasmania
NEW ZEALAND
North Island
Auckland
Hamilton
Tauranga
Palmerston North
Hastings
Wellington
Scale 1:41,000,000

Weather Ready Pacific Implementation Plan

ANNEX 1 to One Pacific Programme Concept Note

PACIFIC METEOROLOGICAL COUNCIL

SPREP
Secretariat of the Pacific Regional Environment Programme

Australian Government
Department of Foreign Affairs and Trade

NEW ZEALAND
FOREIGN AFFAIRS & TRADE
Manatū Aorere

Weather Ready Pacific
Implementation Plan

PACIFIC METEOROLOGICAL COUNCIL

SPREP Secretariat of the Pacific Regional Environment Programme

Australian Government Department of Foreign Affairs and Trade

NEW ZEALAND FOREIGN AFFAIRS & TRADE Manatū Aorere

Abbreviations

AUD	Australian dollars
EW4ALL	Early Warning for All
GEDSI	Gender equality, disability and social inclusion
IFRC	International Federation of Red Cross and Red Crescent Societies
ITU	International Telecommunication Union
KRA	Key result area
NDMO	National Disaster Management Organisation
NMHS	National Meteorological and Hydrological Services
PIFS	Pacific Islands Forum Secretariat
PMC	Pacific Meteorological Council
PMU	Project Management Unit
SPREP	Secretariat of the Pacific Regional Environment Programme
UNDRR	United Nations Office for Disaster Risk Reduction
USD	Unites States dollars
WMO	World Meteorological Organisation
WRP	Weather Ready Pacific

1. Executive Summary

In 2021, Pacific Leaders endorsed the Weather Ready Pacific (WRP) Decadal Programme of Investment, which seeks to reduce the human and economic costs of severe weather, water and ocean events across Pacific island communities, by strengthening national meteorological and hydrological organisations and their partnerships with national disaster management organisations. In February 2023, the Government of Australia pledged their support for WRP with a contribution of AUD 30 million. In August 2023 the Pacific Meteorological Council (PMC) requested the Secretariat of the Pacific Environment Programme (SPREP) to develop an implementation plan for WRP for presentation at a PMC out-of-session meeting at the end of October 2023.

This document presents the Implementation Plan for WRP starting in 2024 through to 2033. The plan is divided into three main sections: an Overall Implementation Plan covering the period 2024–2033 with an indicative budget of USD 191 million, a Phase 1 Implementation Plan covering the period 2024–2028 with an indicative budget of USD 40 million, and an Inception Phase Implementation Plan covering the period November 2023–December 2024 with an indicative budget of USD 7.7 million.

The three plans are based on the 2021 foundation document entitled "*Weather Ready Pacific – A Decadal Programme of Investment*". The Implementation Plans were developed over a 7-week period and involved several drafts and rounds of consultations with National Meteorological and Hydrological Service (NMHS) directors, development partners, PMC panels, PMC Secretariat, SPREP and others.

The Implementation Plans cover five key result areas (KRA) developed in the 2021 WRP Decadal Programme of Investment: KRA 1: Management and Coordination, KRA 2 Production of Forecasts and Warnings, KRA 3: Communication and Delivery of Forecasts and Warnings to End-users, KRA 4: Infrastructure, and KRA 5: Capacity and Training. Together, these KRAs contribute to the WRP Overall Objective: *Pacific island communities enjoying improved safety, security and prosperity*; and the WRP Strategic Objective: *Communities, government and industries having the systems, forecasts, warnings and information to enact response plans to extreme weather events and in a timely manner.*

All three Implementation Plans are predicated on an overarching principle to address gender equality, disability and social inclusion (GEDSI) goals in recruitment, training, consultation and all WRP activities, and to adopt a people centred approach to the WRP.

The Implementation Plans link closely to the Early Warning for All (EW4ALL) initiative, particularly Pillar 2: Detection, observations, monitoring, analysis and forecasting of hazards and Pillar 3: Warning dissemination and communication.

A risk assessment was conducted as a parallel activity to the preparation of the Implementation Plans and a summary of the operational and financial risks is included in this document.

Start-up support for the Inception Phase of the Implementation Plan is currently being processed through a Grant Arrangement with the Government of Australia and includes the following activities:

i. Recruitment for the Project Management Unit core team: Programme Manager, Technical Adviser Infrastructure and Capacity/Training, Finance Accountant and Finance and Administration Officer.

ii. Consultancy to prepare a strategy for environmental and social safeguards for the WRP.

iii. Consultancy to coordinate and manage the WRP activities while recruitment of the Programme Manager is ongoing.

iv. Consultancy to prepare version 2 of the Implementation Plan (V2) with a full risk evaluation matrix.

v. Consultancy to prepare a "Programme of Work" for the WRP to include revision of the 2021 Decadal Programme of Investment document and in coordination with the Implementation Plan (V2).

vi. Consultancy to prepare a legal agreement for SPREP to host the WRP and a legal and financial framework for the WRP pooled investment fund.

vii. Preliminary activities for KRAs 2, 3, 4 and 5.

This Implementation Plan and its costings are indicative and require revision and updating on at least an annual basis as new information becomes available and new investments are committed.

2. Introduction

Pacific islands are vulnerable to a wide range of weather, climate, hydrological, oceanic and other related environmental extreme and high impact events, including tropical cyclones and typhoons, strong winds, earthquakes, volcanic eruptions, drought, coastal inundation (including storm surges, high waves, ocean swell, and tsunami), high rainfall and floods.

Further, the risks posed by extreme events are increasing as the Pacific region is particularly vulnerable to climate change and it is likely that extreme events will become more intense and/or frequent in the coming decades. Pacific islands will be significantly affected by sea level rise, which will greatly increase the risks posed by coastal inundation events. Climate change and disaster risks undermine the ability of the Pacific region to reach the Sustainable Development Goals.

In 2021, Pacific Leaders endorsed the Weather Ready Pacific (WRP) Decadal Programme of Investment, which seeks to reduce the human and economic costs of severe weather, water and ocean events across Pacific island communities, by strengthening national meteorological and hydrological organisations and their partnerships with national disaster management organisations. This programme of investment ensures that the Pacific participates in and benefits from advances in forecast and warning systems that should ultimately enable increased accuracy, geographic specificity and lead time of forecasts.

This document presents an implementation plan for WRP starting in 2024 through to 2033. The plan is divided into three main sections: an Overall Implementation Plan covering the period 2024–2033, a Phase 1 Implementation Plan covering the period 2024–2028, and an Inception Phase Implementation Plan covering the period November 2023–December 2024.

2.1 WRP Planning Timeline

The key planning activities leading to the start of WRP in November 2023 are shown in the table below.

DATE	ACTIVITY
August 2019	The Pacific Meteorological Council (PMC) at the 5th Biennial meeting (PMC-5) recommended that the Secretariat of the Pacific Regional Environmental Programme (SPREP) commission a study to scope the feasibility for a Decadal Programme of Investment to enable Pacific islands to prepare for and respond to the risks of extreme and high impact events.
April 2021	The scoping and feasibility report, Weather Ready Pacific – a Decadal Program of Investment was produced.
August 2021	At the 51st Pacific Islands Forum Leaders (PIFS) Retreat the Weather Ready Pacific – a Decadal Program of Investment report was endorsed.
February 2023	At the PIFS Special Retreat the Government of Australia pledged their support for WRP with a contribution of AUD 30 million (m).
July–August 2023	Governance model for WRP was prepared.
August 2023	Recommendations of PMC-6 meeting: ▪ Agreed to the governance model variation option. ▪ Agreed to a hybrid investment facility. ▪ Requested SPREP develop an implementation plan for presentation at an out-of-session meeting at the end of October. ▪ Endorsed that Weather Ready Pacific be the key vehicle for implementation of the United Nations Early Warning for All (EW4All) initiative in the Pacific region.
October 2023	Implementation plan presented to PMC 6.2 out-of-session meeting and endorsed.

2.2 Methodology for the Preparation of the Implementation Plan

This implementation plan was prepared over a 7-week period from the end of August to mid-October, 2023, by a consultant supported by the New Zealand Ministry of Foreign Affairs and Trade.

Key activities are listed below:

- Desktop exercise to review key documents, including country reports from PMC-6.
- Consultations with National Meteorological and Hydrological Service (NMHS) directors, development partners, PMC panels, PMC Secretariat, SPREP and others.
- Meeting at SPREP 18–22 September 2023, with representative NMHS directors, development partners and SPREP colleagues to review and prioritise activities for the Implementation Plan.
- Circulation and review of feedback from a virtual questionnaire sent to all NMHS directors.
- Preparation of a draft comprehensive Implementation Plan covering three time periods: Overall Implementation Plan, 2024–2033, Phase 1 Implementation Plan, 2024–2028, and an Inception Phase Implementation Plan, November 2023–December 2024.
- Circulation of drafts of the Implementation Plan to all partners, further consultations and consolidation of feedback.

Prioritisation of activities for the Phase 1 Implementation Plan was determined, to a large extent, by guidance from the participants to the September 2023 meeting as well as the response to the virtual questionnaire sent to all NMHS directors. The summarised results of the questionnaire survey are presented as Annex 1.

2.3 Timeframe for the Preparation of the Implementation Plan

The PMC-6 meeting requested SPREP to develop an implementation plan for presentation at an out-of-session PMC meeting at the end of October 2023. The September meeting at SPREP further clarified that there should be an Overall Implementation Plan covering the 10-year period 2024–2033 and within this there would be a nested Phase 1 Implementation Plan covering the period 2024–2028. The latter plan would be more detailed and would include the committed funds of USD 20 m from the Government of Australia as well as an additional funding of USD 20 m that is under negotiation with other development partners.

During the preparation of the Implementation Plan, negotiations advanced between the Government of Australia and SPREP for a Grant Arrangement to support start-up activities in an Inception Phase. As a result, a third Implementation Plan for an Inception Phase, November 2023–December 2024, was prepared to include committed start-up funds from the Government of Australia as well as additional funding that is under negotiation with other development partners.

3. Programme Description

3.1 Scope of Weather Ready Pacific

The logical framework for the WRP defines the **Overall Objective** for the WRP as follows: *Pacific island communities enjoying improved safety, security and prosperity;* and defines the **Strategic Objective** for the WRP as: *Communities, government and industries having the systems, forecasts, warnings and information to enact response plans to extreme weather events and in a timely manner.*

The outline logical frameworks for the Overall WRP and Phase 1 WRP are presented as Annexes 2 and 3 respectively.

The Implementation Plans cover five key result areas (KRA) developed in the 2021 WRP Decadal Programme of Investment and summarised below.

KRA 1 Management and Coordination

This covers the establishment of a fully resourced Project Management Unit, support for travel, operations, consultations, communications, annual WRP steering committee meetings (virtual and face-to-face) and support for PMC Biennial meetings. Support for start-up secondments or consultancies for start-up and planning activities during inception are included.

KRA 2 Production of Forecasts and Warnings

This covers the development of an open source, suite of automated meteorological, hydrological and oceanographic forecast and warning products; an enhanced data delivery system – the Pacific Weather Exchange; coastal inundation and riverine flood forecasting; provision of additional staff in NMHSs to support ICT and communications; and strengthened aviation weather forecasts.

KRA 3 Communication and Delivery of Forecasts and Warnings to End-users

This involves the close collaboration with NMHS, National Disaster Management Organisations (NDMOs) and EW4ALL partners to prepare and deliver impact-based, location specific warnings, based on assessments and modelling, and incorporating traditional knowledge.

KRA 4 Infrastructure

This covers the enhancement of hydro-meteorological infrastructure networks and associated information technology (IT) including automatic weather stations, automated upper air observation stations, weather watch radars, river and tide gauges, wave buoys, IT infrastructure, data servers; and the establishment of an equipment calibration centre.

KRA 5 Capacity and Training

This covers the establishment of a regional training centre for observers, technicians and IT specialists; training of forecasters to a BIP-M standard; hydrology and hydrography training, professional workshops, twinning programmes and leadership training for mid and senior level NMHS staff.

Combined, these KRAs contribute to the Overall Objective and the Strategic Objective discussed above in the logical framework.

All three Implementation Plans are predicated on an overarching principle to address gender equality, disability and social inclusion (GEDSI) goals in recruitment, training, consultation and all WRP activities, and to adopt a people centred approach to the WRP.

The meetings and consultations guiding the Implementation Plans recognised that all KRAs are important and that activities under each KRA will be started in the Phase 1 Implementation Plan, 2024–2028, with emphasis on: KRA 1 Management and Coordination; KRA 4 Infrastructure; and KRA 5 Capacity and Training, and in the Inception Phase Implementation Plan.

It was also recognised that the effort and cost required for KRA 3: Communication and Delivery of Forecasts and Warnings to End-users, had been underestimated in the 2021 WRP Decadal Programme of Investment document and this has been addressed, to some extent, in the Implementation Plans.

The WRP has been identified as the vehicle for implementation of EW4ALL initiative and this is discussed further in the section below.

3.1.1 Delivery of Early Warning for All

EW4ALL is a global initiative to ensure that everyone on Earth is protected from hazardous weather, water, or climate events through life-saving early warning systems by the end of 2027.

The EW4ALL Action Plan calls for investments of USD 3.1 billion over five years. It leverages existing pooled funding mechanisms, such as the Climate Risk and Early Warning Systems initiative and the Systematic Observations Financing Facility, as well as global multilateral funds including the Green Climate Fund and the development banks.

The EW4ALL initiative is co-led by the World Meteorological Organization (WMO) and the United Nations Office for Disaster Risk Reduction (UNDRR), with support from the International Telecommunication Union (ITU), the International Federation of Red Cross and Red Crescent Societies (IFRC) and other partners.

The initiative has four pillars:

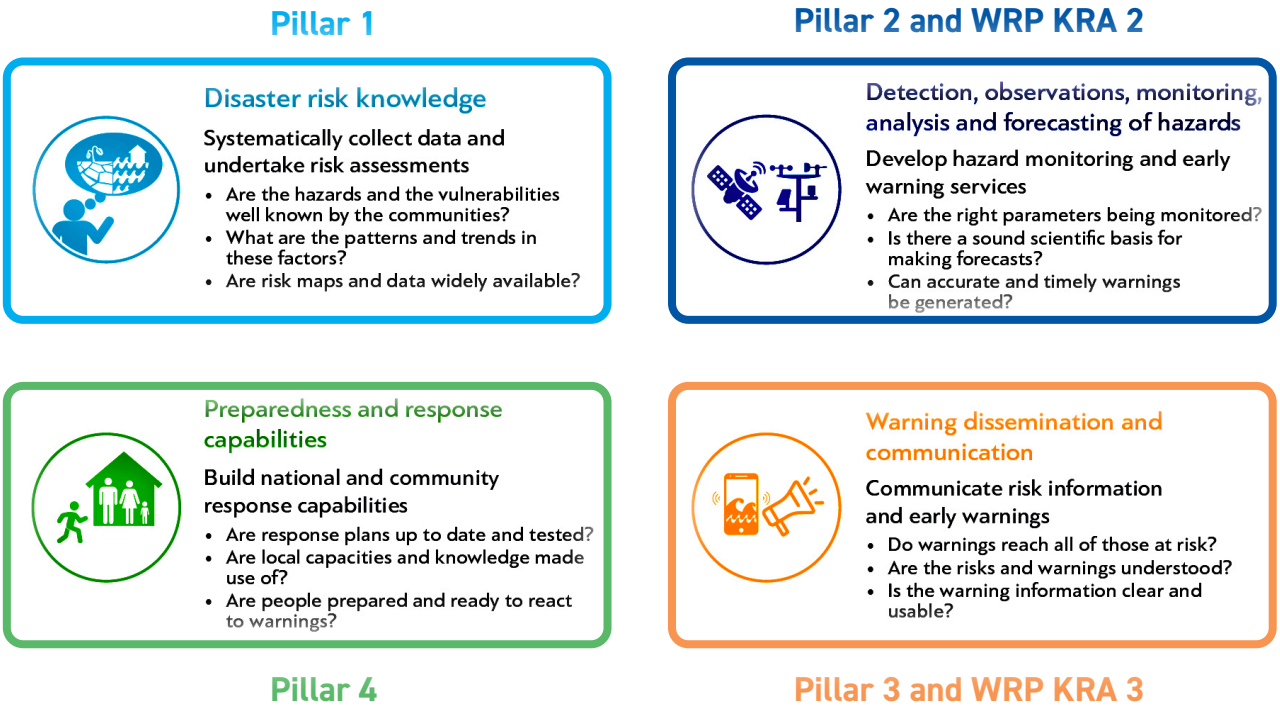
PILLAR 1 Ensuring all countries have access to reliable, understandable and relevant risk information, science and expertise (led by UNDRR).

PILLAR 2 Ensuring all countries have robust forecast and monitoring systems (both soft and hardware infrastructure) and enabling policies to support optimisation and sustainability of hazard monitoring and early warning systems (led by WMO).

PILLAR 3 Using a people-centred approach to ensure that early warnings are effectively and timely disseminated to reach everyone, especially those most at risk (led by ITU).

PILLAR 4 nsuring local governments, communities and individuals at risk have the knowledge and means to take pre-emptive early actions to prepare for and respond to incoming disasters upon receiving warnings (led by IFRC).

During the PMC-6 meeting, August 2023, WRP was endorsed as the vehicle for implementation of the EW4ALL initiative in the Pacific region. The three Implementation Plans presented in this document link Pillar 2 of EW4ALL to WRP KRA 2 Production of Forecasts and Warnings; and Pillar 3 of EW4ALL to WRP KRA 3 Communication and Delivery of Forecasts and Warning to End-users, see the graphic below.



3.2 Indicative Budget

The indicative budgets for the three nested Implementation Plans are shown in the table below.

KEY RESULT AREA (KRA)	OVERALL IMPLEMENTATION PLAN BUDGET USD M	PHASE 1 IMPLEMENTATION PLAN BUDGET USD M	INCEPTION PHASE IMPLEMENTATION PLAN BUDGET USD M
KRA 1: Management and Coordination	20.31	10.15	2.34
KRA 2: Production of Forecasts and Warnings	38.54	8.30	0.30
KRA 3: Communication and Delivery of Forecasts and Warnings to End-users	9.72	2.66	0.96
KRA 4: Infrastructure	96.38	10.58	3.55
KRA 5: Capacity and Training	20.44	5.38	0.23
Contingency and other	5.56	3.00	0.33
TOTAL	**190.95**	**40.07**	**7.71**

4. WRP Implementation Plan

The three Implementation Plans:

1. **Overall WRP**, 2024–2033
2. WRP Phase 1, 2024–2028
3. WRP Inception Phase, November 2023–December 2024

are presented in the following pages.

Annex 4 presents the PMU staff costings for the Overall and the Phase 1 Implementation Plans.

Implementation Plan for the Overall WRP, 2024–2033

The investment packages in the 2021 Decadal Program of Investment have been updated and the total indicative budget is USD 191 m.

There are 5 investment packages (renamed Key Result Areas [KRAs] in this Implementation Plan) and development partners are invited to invest in these packages.

USD 40 m has been committed and is “under negotiation” to start activities in each KRA over the period 2024–2028 (Phase 1).

The Overall Implementation Plan is based on an overarching principle to address gender equality, disability and social inclusion (GEDSI) goals in recruitment, training, consultation and all WRP activities.

ACTIVITY	DURATION (YEARS)	TIMEFRAME	2023 INDICATIVE COST USD M
KRA 1 MANAGEMENT AND COORDINATION			
Support for PMU, travel for PMU, consultations with NMHS, PMC Panels, Liaison Committee and partners, communication activities	10	2024–2033	18.29
Preparatory start-up work in 2024 to prepare: i. "Programme of Work" for the WRP to include revision of 2021 Decadal Programme of Investment document; ii. Implementation plan (V2) and a full risk matrix; iii. legal agreement with SPREP to host the WRP and a legal and financial framework for the WRP pooled investment fund; iv. strategy for environmental and social safeguards for the WRP (including GEDSI); and v. interim project coordination while core PMU staff are recruited.	1	2024	0.55
WRP annual steering committee meetings and support for attendance at PMCBiennial Meetings	10	2024–2033	1.47
SUBTOTAL			**20.31**
KRA 2 PRODUCTION OF FORECASTS AND WARNINGS			
Development of an open source, integrated platform, to analyse and access automated weather and warning products for specific locations. The three components of this activity are: 1. Integration of global/ regional/ national models to deliver automated forecasts and warnings; 2. Improved forecasting services in NMHSs; and 3. A well-supported delivery platform. (Budget includes the initial preparation of a plan and budget for the entire activity).	10	2024–2033	11.00
Strengthen aviation forecasting in aerodrome meteorological offices and meteorological watch offices, as designated in relevant International Civil Aviation Organisation regional air navigation plans.	10	2024–2033	1.98
Strengthen NMHS public forecasting; and marine forecasting (recognising that marine forecasts are targeted at specific stakeholders); and establishment of two-way WMO information systems (WIS) allowing NMHS to share their information worldwide.	10	2024–2033	6.93
Implementation of coastal innundation forecasting in 5 countries including riverine flood forecasting.	10	2024–2033	12.25
Provision of additional ICT staff in each of the 14 NMHS not aligned with the USA National Weather Service or Meteo France and 2 additional ICT staff in Fiji.	10	2024–2033	6.38
SUBTOTAL			**38.54**

ACTIVITY	DURATION (YEARS)	TIMEFRAME	2023 INDICATIVE COST USD M
KRA 3 COMMUNICATION AND DELIVERY OF FORECASTS AND WARNINGS TO END USERS			
Development of a detailed plan and costs for development and delivery of response-based messages and warnings to end-users based on: (1) National workshops with NMHS, NDMO, vulnerable groups and socio-economic sectors to review existing messages and warnings to end-users; and (2) Regional workshop with NDMOs, NMHS, EW4All.	5	2024–2028	0.66
Installation of internet access equipment and operational costs of selected NMHSs and NDMO e.g Starlink.	5	2024–2025	0.50
Preparation of impact-based, location specific warnings, based on assessments and modelling, and incorporating traditional knowledge and GEDSI considerations especially for the most vulnerable groups such as persons with disabilities, children. In collaboration with EW4ALL (pillar 3) partners.	3	2026–2028	3.93
Delivery of the impact-based messaging, translation into local languages, community engagement, mobile apps, public awareness activities including to those end users with no internet.	5	2029–2033	3.93
Review of end-user response to messaging	2	2030–2032	0.50
Trainings of NMHSs and NDMO on the WMO Common Alerting Protocol so that messages can be distributed by/on any digital platform.	10	2024–2033	0.20
SUBTOTAL			**9.72**
KRA 4 INFRASTRUCTURE			
Preparation of national observations network plans for country automatic weather stations; and revitalisatione, upgrade and and expansion of existing network of automatic weather stations in collaboration with the Systematic Observations Financing Facility.	10	2024–2033	12.34
Revitalise, upgrade and and expand existing network of river gauges and rain gauges	9	2025–2033	8.05
Establishment of automated meteorological balloon launching systems in 7 countries (not covered by the Green Climate Fund project)	9	2025–2033	20.52
Development of data capture from aircraft observation using the aircraft meteorological data relay system.	9	2025–2033	0.59
Preparation of a radar network plan and establishment of weather watch radar in 5 countries	9	2025–2033	11.65
Establishment of wave rider buoys and establishment of standard operating procedures.	9	2025–2033	19.75
Establishment of fixed and relocatable tide gauges	9	2025–2033	13.93

ACTIVITY	DURATION (YEARS)	TIMEFRAME	2023 INDICATIVE COST USD M
KRA 4 INFRASTRUCTURE *cont.*			
Establishment of staff resource with SPC to coordinate the ocean infrastructure.	9	2025–2033	0.47
Establishment of high accessibility ICT Infrastructure with cybersecurity at the national level, standalone/online forecaster work stations and technical workshops	9	2025–2033	7.22
Establishment of an Instrument Calibration Centre	9	2025–2033	1.86
SUBTOTAL			**96.38**
KRA 5 CAPACITY AND TRAINING			
Establishment of a Regional Training Centre and the training of observers, technicians and IT specialists	10	2024–2033	4.16
Training of NMHS forecasters to BIP-M standard	10	2024–2033	2.7
QMS Training Programme for Pacific SIDS	5	2028–2033	0.98
Provision of diploma and postraduate certificate training in hydrography and hydrology, and training courses on marine meteorological services and assessment of marine competencies	9	2025–2033	2.44
Specialised regional workshops delivered with national and regional partners, and development and delivery of online training courses	9	2025–2033	8.15
Twinning programme with BOM, NZ Met Service, NIWA and NOAA to provide ongoing mentoring to NMHS	9	2025–2033	0.97
Estabish and deliver a Pacific Meteorology Leadership Programme for mid and senior level staff	10	2024–2033	1.04
SUBTOTAL			**20.44**
Contingency fee (3%)			5.56
OVERALL TOTAL			**190.95**

Implementation Plan for WRP Phase 1, 2024–2028

Combining committed funds of USD 20 m from the Government of Australia and funds from other development partners currently under negotiation.

Total indicative budget for Phase 1 = USD 40 m. Other development partners are invited to invest in Phase 1.

The Phase 1 Implementation Plan is based on an overarching principle to address gender equality, disability and social inclusion (GEDSI) goals in all recruitment, training, consultation and all WRP activities

ACTIVITY	DURATION (YEARS)	TIMEFRAME	2023 INDICATIVE COST USD M
KRA 1 MANAGEMENT AND COORDINATION			
Establishment of PMU, travel for PMU, consultations with NMHS, PMC Panels, Liaison Committee and partners, communication activities	5	2024–2028	8.72
Preparatory start-up work to include: ▪ Preparation of a "Programme of Work" for the WRP to include revision of 2021 Decadal Programme of Investment ▪ Preparation of Implementation Plan V2 including full risk matrix ▪ Preparation of a legal agreement for SPREP to host the WRP and a legal and financial framework for the WRP pooled investment fund ▪ Preparation of a strategy for environmental and social safeguards (including GEDSI) for the WRP ▪ Coordination and management of WRP activities while recruitment of Programme Manager is ongoing.	1	2024	0.55
WRP annual steering committee meetings and support for attendance at PMC Biennial Meetings	5	2024–2028	0.88
SUBTOTAL			**10.15**

ACTIVITY	DURATION (YEARS)	TIMEFRAME	2023 INDICATIVE COST USD M
KRA 2 PRODUCTION OF FORECASTS AND WARNINGS			
Preparation of a plan and costing for an open source, integrated platform, to analyse and access automated weather and warning products for specific locations. The three components of this platform are: ▪ Integration of global/ regional/ national models to deliver automated forecasts and warnings ▪ Improved forecasting services in NMHSs ▪ A well-supported delivery platform - the Pacific Weather Exchange	1	2024	0.10
Establish two-way WMO Information Systems (WIS) allowing NMHS to share their information worldwide	2	2024–2025	0.20
Implementation of coastal innundation forecasting in 2 countries including riverine flood forecasting.	5	2024–2028	4.90
Provision of additional ICT staff in 7 NMHS not aligned with the USA National Weather Service or Meteo France and 2 additional ICT staff in Fiji.	5	2024–2028	3.10
SUBTOTAL			**8.30**
KRA 3 COMMUNICATION AND DELIVERY OF FORECASTS AND WARNINGS TO END USERS			
Development of a detailed plan and costs for development and delivery of response-based messages and warnings to end-users based on: ▪ National workshops with NMHS, NDMO, EW4ALL, vulnerable groups and socio-economic sectors to review existing messages and warnings to end-users. ▪ Regional workshop with NDMOs, NMHS, EW4All.	2	2024–2025	0.66
Installation of internet access equipment and operational costs of selected NMHSs and NDMO e.g Starlink.	2	2024–2025	0.5
Preparation of impact-based, location specific warnings, based on assessments and modelling, and incorporating traditional knowledge and GEDSI considerations especially for the most vulnerable groups such as persons with disabilities, children. In collaboration with EW4ALL.	3	2026–2028	1.00
Delivery of the impact-based messaging, translation into local languages, community engagement, mobile apps, public awareness activities including to those end users with no internet.	3	2026–2028	0.40
Training of NMHSs and NDMO on the WMO Common Alerting Protocol so that messages can be distributed by/on any digital platform.	5	2024–2028	0.10
SUBTOTAL			**2.66**

ACTIVITY	DURATION (YEARS)	TIMEFRAME	2023 INDICATIVE COST USD M
KRA 4 INFRASTRUCTURE			
Preparation of national observations network plans for country automatic weather stations, including status and upgrades needed, as wellas gaps and new installations.	1.6	Nov 2023–June 2025	1.00
Revitalise, upgrade and and expand existing network of automatic weather stations in collaboration with the Systematic Observations Financing Facility.	5	2024–2028	2.00
Preparation of a radar network plan for Tonga and implement the plan as a proof of concept	2	2024–2025	2.50
Establishment of wave rider buoys and establishment of standard operating procedures.	4	2025–2028	2.30
Establishment of staff resource with SPC to coordinate the ocean infrastructure.	5	2025–2028	0.22
Establishment of high accessibility ICT Infrastructure with cybersecurity.	4	2025–2028	0.7
Establish an Instrument Calibration Centre	5	2025–2028	1.86
SUBTOTAL			**10.58**
KRA 5 CAPACITY AND TRAINING			
Establishment of a Regional Training Centre for the training of observers, technicians and IT specialists	5	2024–2028	0.92
Training of technicians and observers at a regional training centre	4	2025–2028	0.48
Training of forecasters to BIP-M standard	5	2024–2028	1.35
Specialised regional workshops delivered with national and regional partners	4	2025–2028	2.03
Development and delivery of online specialised development workshops.	4	2025–2028	
Estabish and deliver a Pacific Meteorology Leadership Programme for mid and senior level staff.	5	2024–2028	0.60
SUBTOTAL			**5.38**
Project Management costs (Current arrangement between the Government of Australia and SPREP, 15%)			3.00
OVERALL TOTAL			**40.07**

Implementation Plan for WRP Inception Phase, November 2023– December 2024 (possibly extending into early 2025)

Grant arrangement from the Government of Australia is being progressed for USD 2.18 m and funding from other partners is under negotiation.

Total indicative budget for Inception Phase = USD 7.71 m. Other development partners are invited to invest in the Inception Phase.

The Inception Phase Implementation Plans is based on an overarching principle to address gender equality, disability and social inclusion (GEDSI) goals in all recruitment, training, consultation and all WRP activities.

ACTIVITY	DURATION (YEARS)	TIMEFRAME	2023 INDICATIVE COST USD M
KRA 1 MANAGEMENT AND COORDINATION			
Establishment of PMU core staff, travel for PMU, consultations with NMHS, PMC Panels, Liaison Committee and partners, communication activities	1.6	Nov 2023–June 2025	1.49
Preparatory start-up work to include: ▪ Preparation of a "Programme of Work" for the WRP to include revision of 2021 Decadal Programme of Investment ▪ Preparation of Implementation Plan V2 including full risk matrix ▪ Preparation of a legal agreement for SPREP to host the WRP and a legal and financial framework for the WRP pooled investment fund ▪ Preparation of a strategy for environmental and social safeguards (including GEDSI) for the WRP ▪ Coordination and management of WRP activities while recruitment of Programme Manager is ongoing.	1	2024	0.55
WRP annual steering committee meeting and support for attendance at PMC Biennial Meeting	1.6	Nov 2023–June 2025	0.30
SUBTOTAL			**2.34**
KRA 2 PRODUCTION OF FORECASTS AND WARNINGS			
Preparation of a plan and costs for the development of an integrated forecast platform for the Pacific region together with partners.	1.6	Nov 2023–June 2025	0.10
Preliminary data collection for coastal innundation forecasting in 1 country including riverine flood forecasting.	1.6	Nov 2023–June 2025	0.20
SUBTOTAL			**0.30**

ACTIVITY	DURATION (YEARS)	TIMEFRAME	2023 INDICATIVE COST USD M
KRA 3 COMMUNICATION AND DELIVERY OF FORECASTS AND WARNINGS TO END USERS			
National consultations with NMHS, NDMO, vulnerable groups and socio-economic sectors to review existing messages and warnings to end-users.	1	Nov 2023–Sep 2024	0.5
Regional workshop with NDMOs, NMHS, EW4All to review existing messaging and develop a plan for preparation and delivery of response based messaging and warnings to end users	0.7	Sep 2024–June 2025	0.16
Development of an engagement strategy to address the needs of specific vulnerable groups e.g. persons with disabilities, children and others.	1.6	Nov 2023–June 2025	0.05
Translation and printing of the COPE initiative books (Helping children COPE with natural disasters and hazards) for 3 countries.	1.6	Nov 2023–June 2025	0.05
Training of NMHSs and NDMO on the WMO Common Alerting Protocol so that messages can be distributed by/on any digital platform.	1.6	Nov 2023–June 2025	0.1
Installation of internet access equipment and operational costs e.g. Starlink in selected countries.	1.6	Nov 2023–June 2025	0.1
SUBTOTAL			**0.96**
KRA 4 INFRASTRUCTURE			
Preparation of national observations network plans for country automatic weather stations, including status and upgrades needed, as well as gaps and new installations.	1.6	Nov 2023–June 2025	1.00
Development of a regionally defined Principles and Standards for observation, communications and ICT infrastructures to maximise the value of investments.	1.6	Nov 2023–June 2025	0.05
Preparation of a radar network plan for Tonga, and installation of the weather watch radar as a proof of concept .	1.6	Nov 2023–June 2025	2.50
Discuss concept for establishing a staff position in SPC to coordinate the ocean infrastructure.	1.6	Nov 2023–June 2025	
Initiate discussions with partners on establishment of an Instrument Calibration Centre	1.6	Nov 2023–June 2025	
SUBTOTAL			**3.55**

ACTIVITY	DURATION (YEARS)	TIMEFRAME	2023 INDICATIVE COST USD M
KRA 5 CAPACITY AND TRAINING			
Workshop in Fiji to advance discussions for the establishment of a Regional Training Centre for the training of observers, technicians and IT specialists	1.6	Nov 2023–June 2025	0.02
2 forecasters trained to BIP-M standard	1.6	Nov 2023–June 2025	0.11
Short term capacity development workshops in collaboration with partners (meteorological and hydrological observations, analysis and modelling)	1.6	Nov 2023–June 2025	0.1
Start discussions with regional institution to estabish a Pacific Meteorology Leadership Programme for mid and senior level staff	1.6	Nov 2023–June 2025	
SUBTOTAL			**0.23**
Project management cost, (Current arrangement between Government of Australia and SPREP, 15%)			0.33
TOTAL			**7.71**

5. Risk Assessment

Risk management is the responsibility of the proposed WRP Steering Committee.

5.1 Risk Assessment (2021)

The 2021 Decadal Programme of Investment document identified the following key risks:

- Lack of legislative and policy frameworks to support NMHSs and/or weak implementation of their strategic plans.
- Limited interaction between NMHSs and NDMOs to ensure delivery of impact messages to end users.
- New infrastructure is not well maintained and fails to deliver expected benefits.
- The proposed approach to cascading forecast development involving global and regional centres and national meteorological services is not accepted by NMHSs.
- Even with comprehensive training programmes in place there is a lack of qualified people to take up all of the new positions proposed.
- Improved impact-based forecasts and warnings do not result in a change to preparedness actions by individuals and communities.
- Complexities of working across a region with different national needs leads to ineffective programme delivery.
- Programme activities are "cherry-picked" by individual donors making it very challenging to maintain programme coherence.
- The benefits of the programme do not endure beyond the decadal period of investment.

5.2 Risk Assessment (2023)

During the preparation of this Implementation Plan, a risk assessment was conducted as a parallel activity. The additional risks are identified below. A revised Implementation Plan (V2) including a full risk evaluation matrix has been identified and costed as an activity to be undertaken at the beginning of the Inception Phase (January to June 2024).

5.2.1 Operational risks

i. **Institutional and legal entity risks**: WRP is not a legal entity and needs a legal framework for its ongoing operations. The Governance Model adopted by the PMC in August 2023 endorses that WRP be established within SPREP. An agreement between SPREP and the foundation investors in the WRP programme is needed to formalise the basic rules under which SPREP would manage a multi-donor pooled investment fund; and clear acceptance by SPREP of all governance arrangements that have been approved for WRP. (Preparation of this agreement has been included as a costed activity under KRA 1 in the Inception Plan).

ii. **Governance risks**: The WRP governance structure was adopted on 29th September at a virtual meeting of the PMC. This adds new functions to the existing bodies that comprise the Regional Hub for Meteorological Services in the Pacific. There is a risk that the large membership and duplication of membership across these bodies will negatively impact efficient and timely decision making. (Review of the governance structure has been included on a 2-yearly basis and may need to be bought forward).

iii. **Existing country level facilities risk**: Existing built infrastructure and services in the countries may not be resilient to natural disasters.

iv. **Expectational risk**: There is a risk that the WRP will create expectations that exceed its mandate or design.

5.2.2 Financial risks

v. **Multi-donor pooled investment fund**: The major risks associated with establishing and maintaining a multi-donor pooled investment fund are:

- Inability to lock-in one or more keystone investors who are willing to fund the establishment of the program until such time as it can clearly demonstrate an acceptable level of “success”.
- Failure to convince additional investors to “buy-in” to the pooled fund.
- Countries actively pursuing bi-lateral project funding rather than supporting the collective pooled fund.
- A weak or ineffective governance structure.

- Disagreements on priorities and work plans.
- Poor or infrequent programmatic and financial reporting.
- Failure to deliver against agreed work plans.
- Host institution support failures.

(Preparation of a financial framework for the Investment facility has been included as a costed activity under KRA 1 in the Implementation Plan).

vi. **Bilateral projects**: Different projects can result in diversity of equipment types thereby challenging communication, maintenance and sustainability.

vii. **EW4ALL and the Systematic Observations Financing Facility**: These two initiatives may compete with the WRP pooled investment fund and clash with the aim of WRP to harmonise infrastructure across all NMHSs.

viii. **Cost escalation due to global inflation and other factors**. (The Implementation Plan is to be reviewed annually).

ix. **Sustainable funding** is a risk and PICS need to consider increasing their recurrent budget funding.

x. **Capital equipment replacement** over the 10-year programme is a risk especially for IT equipment.

6. Conclusion

The WRP is an ambitious, forward-looking intervention that has been several years in the making. Recognising that to date funding for only a small percentage of the intervention has been committed, this Implementation Plan and its costings are indicative and require revision and updating on at least an annual basis as new information becomes available and new investments are committed.

Annex 1

Results of Questionnaire Survey sent to Directors of NMHSs 15 September 2023

- Each NMHS Director was asked to prioritise a maximum of 2 priority activities identified in the four technical areas of investment of the 2021 WRP Decadal Program of Investment Document.
- The table below shows the top four priority activities under each KRA after the responses were compiled.
- These results were used as the basis for discussion and prioritisation at the 18–22 September meeting at SPREP.

PRIORITY	NUMBER OF RESPONSES	AREA OF INVESTMENT
KRA 2 PRODUCTION OF FORECASTS AND WARNINGS		
1	8	Investment in increased use of remotely generated Numerical Weather Prediction products and satellite data and forecast automation in a cascading forecast process.
2	7	Develop a Pacific Weather Exchange that will centralise all the warning information for the Pacific region
3	7	Develop an open source Integrated Forecast Platform (software) for use by members
4	6	Coastal Inundation Forecast Modelling
KRA 3 COMMUNICATION AND DELIVERY OF IMPACT FORECASTS TO END-USERS		
1	11	Development of technologies to deliver information to remote communities (apps)
2	10	Community-based early warning systems that are socially inclusive and incorporate traditional knowledge
3	8	Investment in impact-based forecasting
4	6	NHMS/NDMO and other sectoral cooperation workshops
KRA 4 INFRASTRUCTURE		
1	9	Weather radars
2	7	Ocean observations
3	6	Equipment for long-term maintenance schedule including spare parts
4	6	A regional instrument and calibration centre

PRIORITY	NUMBER OF RESPONSES	AREA OF INVESTMENT
KRA 5	**CAPACITY BUILDING AND TRAINING NEEDS**	
1	8	Training of forecasters to a BIP-M standard
2	6	Establish a Pacific Meteorological Leadership programme
3	5	Support for WMO Regional Training Centre (for observers, technicians and IT specialists)
4	4	Training for electronic technicians in IT skills and data management

Annex 2

Outline Logical Framework for the Overall Implementation Plan

INDICATORS	BASELINES (2024)	TARGETS (2033)
OVERALL OBJECTIVE **Pacific Island communities enjoying improved safety, security and prosperity**		
Verified evidence (statistical, documentary, social media), compared to previous events before WRP, showing: ▪ improved safety (fewer people injured) ▪ less damages (costs). ▪ Number of vulnerable groups responding effectively to warnings.		tba•
SPECIFIC OBJECTIVE Communities, government and industries have the systems, forecasts, warnings and information to enact response plans to extreme weather events and in a timely manner.		
Number of countries with new plans for responding to forecasts and warnings.		5 countries
KEY RESULT AREA 1: MANAGEMENT AND COORDINATION		
▪ PMU established and operating effectively and efficiently. ▪ Evidence of GEDSI incorporated into WRP, especially KRAs 2, 3, 5. ▪ Steering committee meetings held. ▪ WRP Decadal Program of Investment document revised and updated.	 tba 1 1	PMU fully resourced by end 2025. tba 10 meetings: 5 face-to-face, 5 virtual +1 (by end 2024)
KEY RESULT AREA 2: PRODUCTION OF FORECASTS AND WARNINGS		
▪ The Pacific Weather Exchange developed as an open source, integrated platform, to analyse and access automated weather and warning products for specific locations. ▪ Number of automatic weather and warning products developed. ▪ Aviation forecasting strengthened in Regional Specialised Meteorological Centres. ▪ Coastal inundation forecasting applied in selected countries.	1 (Met Connect portal) tba tba 1	Pacific Weather Exchange operational tba In one Regional Specialised Meteorological Centre +5 countries

* tba = to be added

INDICATORS	BASELINES (2024)	TARGETS (2033)
KEY RESULT AREA 3: COMMUNICATION AND DELIVERY OF FORECASTS AND WARNINGS TO END-USERS		
▪ Effective coordination mechanism in place between NHMS, NDMO and EW4ALL partners	0	X coordination meetings
▪ Installation of internet access equipment e.g. Starlink	3	+5 countries
▪ Impact-based, location specific, warnings delivered in selected countries		+5 countries
KEY RESULT AREA 4: INFRASTRUCTURE		
Installation of the following:		
▪ Automatic weather stations		tba
▪ River gauges		
▪ Automatic rain gauges		
▪ Automated meteorological balloon launching systems		
▪ Aircraft meteorological data relays		
▪ Radars		
▪ Tide gauges		
▪ Wave buoys		1
▪ Servers and IT infrastructure		
▪ Forecaster work stations		
▪ Workshops		
▪ Equipment Calibration Centre		
KEY RESULT AREA 5: CAPACITY AND TRAINING		
▪ Pacific Meteorology Leadership course established for mid and senior level staff and delivered.	0	60 participants trained
▪ Number of women and persons with disabilities trained.	0	
▪ Regional training centre established		1
▪ Technicians and observers trained		50 trained
▪ Forecasters trained to BIP-M standard		30 trained
▪ Hydrology and hydrography training delivered		tba
▪ Professional workshops delivered		tba

Annex 3

Outline Logical Framework for the Phase 1 Implementation Plan

INDICATORS	BASELINES (2024)	TARGETS (2033)
OVERALL OBJECTIVE **Pacific Island communities enjoying improved safety, security and prosperity**		
Strengthened regional and national severe weather forecasts supported by enhanced hydrometeorological infrastructure networks and improved capacity of NMHS technicians.		tba*
SPECIFIC OBJECTIVE Communities, government and industries have the systems, forecasts, warnings and information to enact response plans to extreme weather events and in a timely manner.		
▪ Number of countries with preliminary plans in place for responding to forecasts and warnings.		3 countries
▪ Number of vulnerable groups responding effectively to warnings.		
KEY RESULT AREA 1: MANAGEMENT AND COORDINATION		
▪ PMU established and operating effectively and efficiently.		PMU core team resourced by end 2025.
▪ Evidence of GEDSI incorporated into WRP, especially KRAs 2,3, 5.	tba	tba
▪ Steering committee meetings held.	0	5 meetings: 3 face-to-face, 2 virtual
▪ WRP Decadal Program of Investment document revised and updated.	1	+1 (by end 2024)
KEY RESULT AREA 2: PRODUCTION OF FORECASTS AND WARNINGS		
▪ Two-way WMO information systems (WIS) in place allowing NMHS to share information worldwide.	tba	+2 countries.
▪ Coastal inundation and riverine forecasting applied in selected countries.	tba	+16 (2 in Fiji, 1 in each NMHS except for those aligned with US National Weather Service and Meteo France.)
▪ Additional staff in place in NHMS		

* tba = to be added

INDICATORS	BASELINES (2024)	TARGETS (2033)
KEY RESULT AREA 3: COMMUNICATION AND DELIVERY OF FORECASTS AND WARNINGS TO END-USERS		
▪ Effective coordination mechanism in place between NHMS, NDMO and EW4ALL partners	10	X coordination meetings
▪ Installation of internet access equipment, e.g. Starlink.	3	25 installations
KEY RESULT AREA 4: INFRASTRUCTURE		
Installation of the following:		
▪ Automatic weather stations		33
▪ Radars		tba
▪ Wave buoys		10
▪ Servers and IT infrastructure		tba
▪ Equipment Calibration Centre		1
KEY RESULT AREA 5: CAPACITY AND TRAINING (AND ADDRESSING GEDSI CRITERIA)		
▪ Pacific Meteorology Leadership course established for mid and senior level staff and delivered.	0	30 participants trained
▪ Number of women and persons with disabilities trained.	0	1
▪ Regional training centre established		30
▪ Technicians and observers trained		30
▪ Forecasters trained to BIP-M standard		tba
▪ Hydrology and hydrography training delivered		tba
▪ Professional workshops delivered		

Annex 4

Project Management Unit Staff Costings for the Overall and Phase 1 Implementation Plans

PMU Staff Costing for the Overall WRP, 2024–2033

POSITION	NUMBER OF YEARS	TIMEFRAME (YEARS)	TOTAL USD
a. Programme Manager	10	2024–2033	2,131,152
b. Technical Adviser Forecast Production & Forecast Communication	8	2025–2033	1,401,328
c. Technical Adviser Infrastructure & Capacity/Training	10	2024–2033	1,751,660
d. Financial Accountant	10	2024–2033	1,751,660
e. Finance and Administration Officer	10	2024–2033	1,358,220
f. Finance and Administration Assistant	8	2025–2033	319,127
g. Communications Officer	9	2025–2033	1,222,398
h. Monitoring, Evaluation, Research, Learning and Adapting Officer (MERLA)	9	2025–2033	1,222,398
i. Environmental and Social Safeguards Officer (includes Gender Equality, Disability and Social Inclusion functions (GEDSI))	9	2025–2033	1,222,398
j. Resource Mobilisation Officer	8	2026–2033	1,158,552
k. PMC Secretariat Technical Support Officer	9	2025–2033	1,303,371
TOTAL			**14,842,264**

Positions (a) (c) (d) (e) represent the PMU core team who will be recruited over the period November 2023 to mid-2024; other PMU positions may be recruited as necessary in Phase 1: (noting that positions may be renamed, split and additions may be made to the list, e.g. addition of IT expertise)

PMU Staff Costing for the Phase 1 WRP, 2024–2028

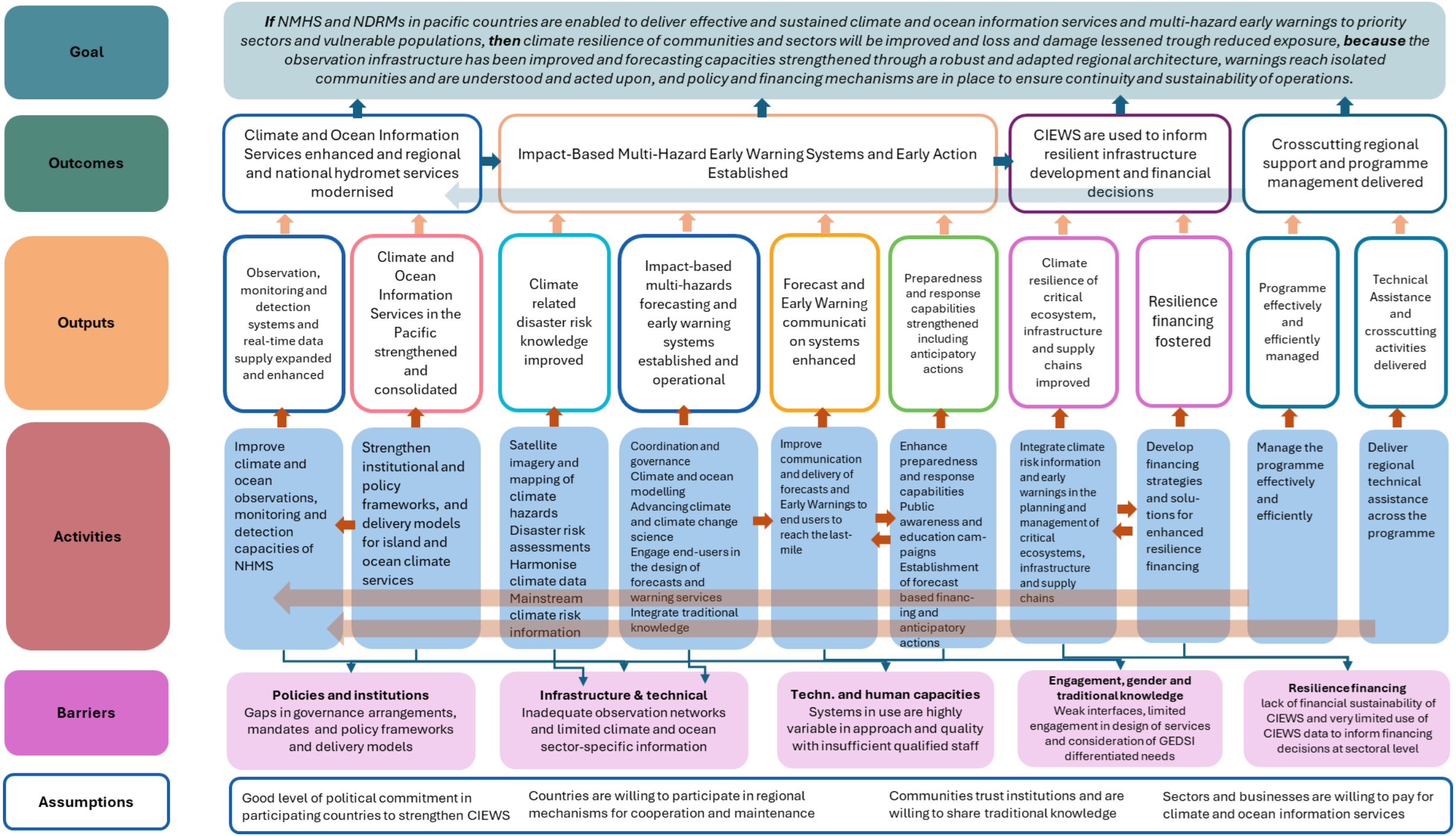
POSITION	NUMBER OF YEARS	TIMEFRAME (YEARS)	TOTAL USD
a. Programme Manager	5	2024–2028	1,034,540
b. Technical Adviser Forecast Production and Forecast Communication	4	2025–2028	700,664
c. Technical Adviser Infrastructure & Capacity Training	5	2024–2028	875,830
d. Finance Accountant	5	2024–2028	875,830
e. Finance and Administration Officer	5	2024–2028	679,110
f. Finance and Administrative Assistant	4	2025–2028	155,564
g. Communications Officer	4	2025–2028	543,288
h. Monitoring, Evaluation, Research, Learning and Adapting Officer (MERLA)	4	2025–2028	543,288
i. Environmental and Social Safeguards Officer (includes Gender Equality, Disability and Social Inclusion functions (GEDSI))	4	2025–2028	543,288
j. Resource Mobilisation Officer	3	2026–2028	434,580
k. PMC Secretariat Technical Support Officer	4	2025–2028	579,440
TOTAL			**6,965,422**

Positions (a) (c) (d) (e) represent the PMU core team who will be recruited over the period November 2023 to mid-2024; other PMU positions may be recruited as necessary in Phase 1: (noting that positions may be renamed, split and additions may be made to the list, e.g. addition of IT expertise).

PACIFIC
METEOROLOGICAL
COUNCIL

Annex 2

One Pacific Programme Theory of Change


Goal
Outcomes
Outputs
Activities
Barriers
Assumptions
If NMHS and NDRMs in pacific countries are enabled to deliver effective and sustained climate and ocean information services and multi-hazard early warnings to priority sectors and vulnerable populations, then climate resilience of communities and sectors will be improved and loss and damage lessened trough reduced exposure, because the observation infrastructure has been improved and forecasting capacities strengthened through a robust and adapted regional architecture, warnings reach isolated communities and are understood and acted upon, and policy and financing mechanisms are in place to ensure continuity and sustainability of operations.
Climate and Ocean Information Services enhanced and regional and national hydromet services modernised
Impact-Based Multi-Hazard Early Warning Systems and Early Action Established
CIEWS are used to inform resilient infrastructure development and financial decisions
Crosscutting regional support and programme management delivered
Observation, monitoring and detection systems and real-time data supply expanded and enhanced
Climate and Ocean Information Services in the Pacific strengthened and consolidated
Climate related disaster risk knowledge improved
Impact-based multi-hazards forecasting and early warning systems established and operational
Forecast and Early Warning communicati on systems enhanced
Preparedness and response capabilities strengthened including anticipatory actions
Climate resilience of critical ecosystem, infrastructure and supply chains improved
Resilience financing fostered
Programme effectively and efficiently managed
Technical Assistance and crosscutting activities delivered
Improve climate and ocean observations, monitoring and detection capacities of NHMS
Strengthen institutional and policy frameworks, and delivery models for island and ocean climate services
Satellite imagery and mapping of climate hazards
Disaster risk assessments
Harmonise climate data
Mainstream climate risk information
Coordination and governance
Climate and ocean modelling
Advancing climate and climate change science
Engage end-users in the design of forecasts and warning services
Integrate traditional knowledge
Improve communication and delivery of forecasts and Early Warnings to end users to reach the last-mile
Enhance preparedness and response capabilities
Public awareness and education cam-paigns
Establishment of forecast based financ-ing and anticipatory actions
Integrate climate risk information and early warnings in the planning and management of critical ecosystems, infrastructure and supply chains
Develop financing strategies and solu-tions for enhanced resilience financing
Manage the programme effectively and efficiently
Deliver regional technical assistance across the programme
Policies and institutions
Gaps in governance arrangements, mandates and policy frameworks and delivery models
Infrastructure & technical
Inadequate observation networks and limited climate and ocean sector-specific information
Techn. and human capacities
Systems in use are highly variable in approach and quality with insufficient qualified staff
Engagement, gender and traditional knowledge
Weak interfaces, limited engagement in design of services and consideration of GEDSI differentiated needs
Resilience financing
lack of financial sustainability of CIEWS and very limited use of CIEWS data to inform financing decisions at sectoral level
Good level of political commitment in participating countries to strengthen CIEWS
Countries are willing to participate in regional mechanisms for cooperation and maintenance
Communities trust institutions and are willing to share traditional knowledge
Sectors and businesses are willing to pay for climate and ocean information services