



Regional Programmatic Approach on Climate Action (RPACA)

Annex 2: Feasibility Study

September 2026

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Acronyms

ADB	Asian Development Bank
ADF	Asian Development Fund
ADFIP	Association of Development Financing Institutions in the Pacific
AE	Accredited Entity
AF	Adaptation Fund
AFD	Agence Française de Développement
AMA	Accreditation Master Agreement
ANU	Australian National University
AOSIS	Alliance of Small Island States
AR6	Sixth Assessment Report (IPCC)
BAU	Business as usual
BRED	Banque Régionale d'Escompte et de Dépôts
BSP	Bank of the South Pacific
CAIP	Climate Adaptation Investment Planning
CBIT	Capacity-building Initiative for Transparency
CCFAH	Commonwealth Climate Finance Access Hub
CDRA	Climate and Disaster Risk Assessments
CFAMS	Pacific Climate Finance Access and Mobilisation Strategy
CFAN	Climate Finance Access Network
CFMCA	Coalition of Finance Ministers for Climate Action
CMAP	Climate Macro-Assessment Programme
CNA	Capacity Needs Assessment
COPB	Country operations business plans
CPS	Country Programme Strategies
CROP	Council of Regional Organisations of the Pacific
CRVA	Climate risk and vulnerability assessment
CSO	Civil society organisation
DBSI	Development Bank of Samoa Incorporated
DFI	Development Finance Institution
DMC	Developing member country (of ADB)
DMF	Design and monitoring framework
DRF	disaster risk finance
DRFI	Disaster Risk Finance & Insurance
DRM	disaster risk management
DRR	disaster risk reduction
DSS	Decision Support Systems
EE	Executing entity
EEZ	Exclusive Economic Zone
EL	Expected loss
ENSO	El Niño–Southern Oscillation
ESF	Environmental and Social Framework
ESG	Environmental, social and governance
ESMF	Environmental and Social Management Framework
ESMP	Environmental and Social Management Plans
ESMS	Environmental and Social Management Systems
ESS	Environmental and Social Standard
EU	European Union
EWS	Early Warning Systems

FAA	Funded activity agreement
FAO	Food and Agriculture Organisation
FCAS	Fragile and Conflict-Affected States
FEMM	Forum Economic Ministers Meeting
FEOM	Forum Economic Officials' Meeting
FI	Financial Institution
FPIC	Free, Prior and Informed Consent
FRDP	Framework for Resilient Development in the Pacific
FSM	Federated States of Micronesia
GAAP	Gender Analysis and Action Plan
GAP	Gender Action Plan
GCCA	Global Climate Change Alliance
GCCA+ SUPA	GCCA Scaling up Pacific Adaptation Project
GCF	Green Climate Fund
GDP	Gross Domestic Product
GEDSI	Gender Equality, Disability, and Social Inclusion
GEF	Global Environment Facility
GESI	Gender Equality, Disability, and Social Inclusion
GFC	Green Finance Centre
GGF	Green Guarantee Facility
GGGI	Global Green Growth Institute
GIS	Geographical information systems
GM	Grievance Mechanism
GTCA	Gender-Transformative Climate Action
HGI	Higher Ground Initiative
IDF	Insurance Development Forum
IFC	International Finance Corporation
IFRS	International Financial Reporting Standards
IMF	International Monetary Fund
IPCC	Intergovernmental Panel on Climate Change
IPP	Indigenous Peoples Plan
IRMF	Integrated Results Management Framework
ISSB	International Sustainability Standards Board
ITCZ	Intertropical Convergence Zone
IWRM	Integrated water resources management
JNAP	Joint National Action Plan
KJIP	Kiribati Joint Implementation Plan for Climate Change and Disaster Risk Management
KMAP	Knowledge Management Action Plan
LDC	Least Developed Countries
LGD	Loss given default
LIDAR	Light detection and ranging
MDB	Multilateral development banks
M+E	Monitoring and Evaluation
MEL	Monitoring, Evaluation and Learning
MERL	Monitoring, Evaluation, Research and Learning
MFI	Multinational financial institution
MHM	Menstrual Hygiene Management
MLD	millions of litres per day
MOF	Ministry of Finance

MRV	Measure, results and verification
MSME	Micro, Small and Medium Enterprises
MTFF	Medium-Term Fiscal Framework
MW	Megawatts
NAP	National Adaption Plan
NDA	National Designated Authorities
NDC	Nationally Determined contribution
NGFS	Network for Greening the Financial System
NIE	National Implementing Entity
NIP	National Infrastructure/Investment Plan
NPL	Non-performing loan
NRW	Non-revenue water
O+M	operation and maintenance
OCR	Ordinary capital resources
PAC-INFRAT	Pacific Infrastructure Risk Advisory and Transfer Support Service
PACC	Pacific Adaptation to Climate Change
PCCC	Pacific Climate Change Centre
PCCR	Pacific Climate Change Roundtable
PCG	partial credit guarantee
PCRAF	Pacific catastrophe risk assessment and financing initiative
PCRAFI	Pacific Catastrophe Risk Assessment & Financing Initiative
PCREEE	Pacific Community Centre for Renewable Energy and Energy Efficiency
PCRIC	Pacific catastrophe risk assessment and financing initiative
PD	Probability of default
PEBACC	Pacific Ecosystem based Adaptation to Climate Change
PEFA	Public Expenditure and Financial Accountability
PFI	Pacific Financial Institutions
PFM	Public Financial Management
PFRI	Pacific Fiscal Resilience Initiative
PFRP	Pacific Fiscal Resilience Platform
PFTAC	Pacific Financial Technical Assistance Centre
PIC	Pacific island country
PICAP	Pacific Insurance Climate Adaptation Programme
PICS	Pacific Island Countries
PIFS	Pacific Islands Forum Secretariat
PIM	Public Investment Management
PIMA	Public Investment Management Assessment
PIU	Project implementation unit
PLGED	Pacific Leaders Gender Equality Declaration
PMU	Project management unit
PNG	Papua New Guinea
PPA	Pacific Platform for Action on Gender Equality and Women's Human Rights
PPP	Public-private partnership
PRCOP	Pacific regional community of practice
PRF	Pacific Resilience Facility
PRIF	Pacific Region Infrastructure Facility
PROP	Pacific Islands Regional Oceanscape Programme
PRP	Pacific Resilience Partnership
PV	Photovoltaic

PWD	People with disabilities
RAP	RPACA Advisory Panel
RBV	Reserve Bank of Vanuatu
RCM	Regional coordination mechanism
RMI	Republic of the Marshall Islands
RPACA	Regional Programmatic Approach on Climate Action
RROI	resilience return on investment
RSC	RPACA Steering Committee
RSF	risk-sharing facility
SAFER	Supporting Sustainable and Adaptive Financing for Entrepreneurial Resilience in the Pacific
SCRA	System-scale climate risk assessments
SDG	Sustainable Development Goals
SEAH	Sexual Exploitation, Abuse and Harassment
SEP	Stakeholder Engagement Plan
SIDS	Small Island Developing States
SILAG	Somare Institute of Leadership and Governance
SMS	smart messaging services
SOAS	School of Oriental and African Studies
SOGIESC	Sexual Orientation, Gender Identity and Expression, and Sex Characteristics
SOPAC	Standard Operating Procedures
SOPAC	Applied Geoscience and Technology Division
SPC	Pacific Community
SPCZ	South Pacific Convergence Zone
SPREP	Secretariat of the Pacific Regional Environment Programme
SSP	Shared Socioeconomic Pathway
SST	Sea Surface Temperature
SUPA	Scaling Up Pacific Adaptation
TA	Technical Assistance
TOR	Terms of Reference
TPC	Tropical Cyclone
TVET	technical and vocational education and training
TWG	Technical Working Group
UN	United Nations
UNCDF	United Nations Capital Development Fund
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNEP-FI	United Nations Environment Programme - Finance Initiative
UNESCAP	United Nations Economic and Social Commission for Asia and the Pacific
UNFCCC	United Nations Framework Convention on Climate Change
UPNG	University of Papua New Guinea
USD	United States Dollars
USP	University of the South Pacific
WASH	Water, Sanitation and Hygiene
WE	Women's Entrepreneurship, Livelihoods, Enhanced Inclusive Finance, and Adaptive Development Project
WFP	World Food Programme

PART 1 THE CLIMATE RATIONALE

1 Regional Context

The Regional Programmatic Approach to Climate Action (RPACA) programme targets the 14 countries in the Pacific region. The Pacific Island Countries (PICs) are spread across a vast expanse of the Pacific Ocean – split into twelve smaller island states (PICs-12) and two larger countries and economies (Fiji and Papua New Guinea). The countries account for a very small share of the world's land area and population but account for a large proportion of the earth's ocean areas. PICs contribute a negligible proportion of greenhouse gas emissions yet face disproportionately high climate risks.

The PICs are home to around 12 million people, with Papua New Guinea the most populous. The Pacific societies are culturally rich and diverse. Generally, they have strong customary land tenure rights, deep communal ties, and a high reliance on natural ecosystems for livelihoods and food security. Their populations are generally young and growing fast, although many countries face increasing internal migration, urbanisation and international migration, much of which is climate driven. These demographic shifts also carry differentiated impacts, with women, youth, persons with disabilities, and SOGIESC groups facing heightened risks of exclusion during climate-driven migration and urbanisation and women and girls facing increased risks of gender-based violence and sexual exploitation in contexts of displacement and overcrowded urban settlements. Table 1 provides summary data on the countries.

Table 1: Summary Data on the 14 Participating Pacific Island Countries

Country	Population	Land Area (km ²)	GDP per Capita (US\$, current)	No. of Islands (of which inhabited)	EEZ (million km ²)
Cook Islands	24,500	236	23,000	15 (11)	2.0
Federated States of Micronesia	105,381	701	4,200	127 (65)	3.0
Fiji	882,570	18,274	6,500	211 (125)	1.3
Kiribati	125,392	811	2,500	33 (21)	3.5
Marshall Islands (RMI)	39,500	181	7,200	34 (24)	2.0
Naoero	12,111	21	13,700	1	0.3
Niue	1,666	260	16,000	1	0.4
Palau	17,861	459	15,600	33 (15)	0.6
Papua New Guinea (PNG)	12,917,840	462,840	3,100	437 (150)	3.1
Samoa	210,672	2,935	5,100	7 (2)	0.12
Solomon Islands	783,313	28,400	2,000	415 (150)	1.6
Tonga	99,896	747	4,900	124 (36)	0.7
Tuvalu	10,004	26	5,700	10 (10)	0.9
Vanuatu	334,665	12,190	3,500	81 (65)	0.7

EEZ= exclusive economic zone, and GDP = gross domestic product.

Note: Figures are the latest approximations available and rounded.

Sources: Asian Development Bank [Key Indicators](#); and P. Nunn et al. 2016. Classifying Pacific Islands. *Geoscience Letters* 3(1).

The PICs-12 are characterised by small populations, geographic remoteness, high exposure to climate and disaster risks, and persistent institutional and human capacity constraints. Fiji and Papua New Guinea (PNG), while facing their own development challenges, have larger economies and stronger institutional capacities, and frequently serve as regional hubs for service delivery, capacity building, and programme implementation.¹ Table 2 provides information on the fourteen countries, indicating shared and differentiated aspects between the PICs-12, Fiji, and PNG. The differences in

¹ Asian Development Bank. 2018. *Strategy 2030: Achieving a Prosperous, Inclusive, Resilient, and Sustainable Asia and the Pacific*. Manila; and Asian Development Bank. 2021. *Pacific Approach, 2021–2025*. Manila.

economy size and financial access, institutional capacities, and locations leads to operational implications for development partners, including project structures and choice of financial instruments.

Table 2: Pacific Island Countries: Categorisation and Key Characteristics

Country Grouping and Countries	Core Characteristics	Operational Implications
All 14 Pacific Island Countries (PICs)	- Shared exposure to climate change, disaster risk, and external shocks. - Common development challenges linked to remoteness and scale. - Diversity in capacity, population size, and economic structure.	- Justifies a differentiated but integrated Pacific regional strategy. - Supports a hub and spoke model for regional programs. - Enables combining national investments with regional solutions.
PICs-12: Smaller Pacific Island Countries Cook Islands; Federated States of Micronesia; Kiribati; Republic of the Marshall Islands; Naoero; Niue; Palau; Samoa; Solomon Islands; Tonga; Tuvalu; Vanuatu	- Small populations and limited domestic markets. - Geographic remoteness and dispersion. - High vulnerability to climate change and disaster risks. - Narrow economic bases and high aid dependence. - Persistent institutional and human capacity constraints.	- Strong reliance on grants and highly concessional finance. - Need for simplified project design and implementation arrangements. - High value of regional and multi-country approaches. - Emphasis on shared services, pooled expertise, and capacity supplementation.
Larger Pacific Island Countries Fiji and Papua New Guinea	- Larger populations and land areas. - More diversified and complex economies. - Greater institutional depth and absorptive capacity. - Stronger private sector presence. - Regional connectivity and leadership roles	- Able to support larger and more complex investment projects. - Serve as regional hubs for training, procurement, and service delivery. - Platforms for regional public goods and knowledge sharing. - Opportunity to support regional spillovers to smaller Pacific Island Countries.

Source: Asian Development Bank

All PICs economies are vulnerable to external shocks, given their high reliance on natural resources for their economic activity and high import reliance. Economic diversification is limited by distance to markets, small populations, high transport and energy costs, and constrained private sectors. The economies are characterised by high levels of subsistence and reliance on natural resources, including small-scale agriculture, marine and coastal fisheries, particularly tuna resources within vast exclusive economic zones, tourism (Fiji, Samoa, Palau, Tonga, and Cook Islands), and natural resource extraction (PNG). Climate-related hazards (e.g., frequent cyclones, rainfall-induced floods and landslides, heat-induced coral bleaching, droughts) directly impact core economic sectors, particularly agriculture, fisheries, and tourism. In most countries, the public sector is one of the largest sources of employment, and foreign aid and remittances play an important role in financing development and social services.

PICs are also characterized by a fragile infrastructure that is often concentrated in coastal areas, their limited institutional and technical capacity, high costs of service delivery due to remoteness and fragmentation, food, water, and energy insecurity, and the high levels of dependence on external finance and development assistance. The increasing impacts of climate change exacerbate these challenges, notably increasing fiscal pressures, with reduced income generation due to shifting growing seasons or lower marine stocks, high and recurring disaster recovery costs, threatening any long-term development gains. These systemic constraints are not socially neutral as they disproportionately affect women, persons with disabilities, elderly populations, and remote households, requiring inclusive infrastructure and service delivery standards, and exposing governance gaps where women, youth, persons with disabilities, and SOGIESC groups are often excluded from formal decision-making processes on land, finance, and adaptation planning.

The PICs also share significant opportunities. They have vast potential natural resources – for example renewable energy potential (solar, wind, hydro, ocean) and globally significant ocean resources and biodiversity assets. They also benefit from diverse and deep traditional knowledge of resource management. There is a high political commitment to environmental stewardship and climate action. And there are many active regional institutions and coordination mechanisms.

PICs are among the most climate-vulnerable in the world. They lie mostly within the tropical cyclone belt. They experience hot, humid climates, high levels of daily and seasonal rainfall variability, and strong exposure to El Niño–Southern Oscillation (ENSO) effects. The highest point on many islands is only a few meters above sea level, making them extremely vulnerable to sea-level rise, coastal erosion, saltwater intrusion, and storm surge.

Climate hazards compound existing socio-economic vulnerabilities and can create new categories of vulnerability and new vulnerable groups. Major climate related vulnerabilities include:

- **Coastal exposure:** More than half of Pacific populations live within 1.5 km of the coast, making communities highly vulnerable to inundation and storm surges.
- **Economic dependence on natural resources:** Agriculture, fisheries, and tourism, all climate-sensitive sectors, account for a large share of GDP and employment.
- **Population displacement:** Rising seas and coastal erosion are already forcing relocation of villages in Fiji, Tuvalu, and Kiribati, with loss of ancestral land and cultural heritage.
- **Food and water insecurity:** Saline intrusion into groundwater and declining fish stocks threaten nutrition and health security.
- **Health impacts:** Climate change increases risks of vector-borne diseases, heat stress, and mental health burdens associated with displacement.
- **Socio-economic vulnerabilities** such as geographic isolation, dependence on climate-sensitive sectors, tenure insecurity, and limited access to credit or finance further magnify these risks.

The impacts are not socially or economically neutral with women and girls, persons with disabilities, people of diverse sexual orientation and gender identity, elderly populations, poor and single-headed households, and communities in remote or under-served areas facing intersecting vulnerabilities and compounded risks.

The unique characteristics and circumstances of the Pacific island countries are recognized globally and by the Asian Development Bank (ADB). At ADB and under the United Nations Framework Convention on Climate Change (UNFCCC), all the Pacific island countries are classified as small island developing states (SIDS). Seven are classified as fragile and conflict affected states (FCAS).² Three are classified as least developed countries (LDC).³ Given the unique circumstances of PICs, differentiated approaches are enshrined within and encouraged by various international agreements and frameworks, such as the Sustainable Development Goals (SDGs), the Paris Agreement on Climate Change and the Sendai Framework for Disaster Risk Reduction. Regional GESI frameworks such as the Pacific Leaders Gender Equality Declaration (PLGED), the Pacific Platform for Action on Gender Equality and Women's Human Rights (PPA) and the Pacific Disability Inclusive Humanitarian and Resilient Development Strategy complement these global mandates, requiring that adaptation pathways embed equity and inclusion as core resilience foundations.

A recent assessment of regional delivery frameworks (including across the Pacific) looked at the extent to which SIDS-led regional frameworks can enhance development and climate change efforts.⁴

² Federated States of Micronesia, Kiribati, Marshall Islands, Nauru, Papua New Guinea, Solomon Islands, and Tuvalu.

³ Kiribati, Solomon Islands, and Tuvalu.

⁴ Economist Impact. 2026. *Financing SIDS' blue development: An assessment of regional delivery frameworks*. Back to Blue initiative, Economist Impact & The Nippon Foundation.

Notable amongst the eleven findings were: business-as-usual is broken - a systems change is required; funders must take a radically different approach to coordination; the need for a strategic approach to capacity development; and the need to move from rhetoric to fundamental design actions to 'crowd in' the private sector. In summary, "... regional frameworks will be transformative only if they are able to reconfigure the ways in which funding decisions are made, capital is coordinated and long-term outcomes are delivered. An incremental increase in funding would be widely welcomed but will not be enough on its own to address the ongoing structural barriers." Gender equality and social inclusion must be positioned as systemic reforms, not incremental add-ons, if regional frameworks are to deliver equitable resilience outcomes. This requires embedding equity and inclusion into governance, finance, and infrastructure systems from the outset, ensuring that adaptation pathways are transformative rather than tokenistic.

As illustrated earlier (Table 1), the PICs share many common characteristics and challenges, but they also demonstrate much heterogeneity. This affects their access to resources as well as implementation costs. Different countries, or groups of countries, may have differing hazards, vulnerabilities, options or adaptation pathways. And this impacts how the countries should respond to climate change. This can lead to multi-country or sub-regional country groupings that may be used as starting points for assessing, designing or implementation actions. By way of example, Figure 1 illustrates how the 14 PICs can be categorised into five types in terms of their physical geography, with differential exposure to hazards and the types of climate impacts. Figure 2 illustrates how the countries may be grouped by leading economic sectors – which may affect vulnerability and possible adaptation pathways.⁵

Figure 1: Island Type Classifications in Pacific Island Countries

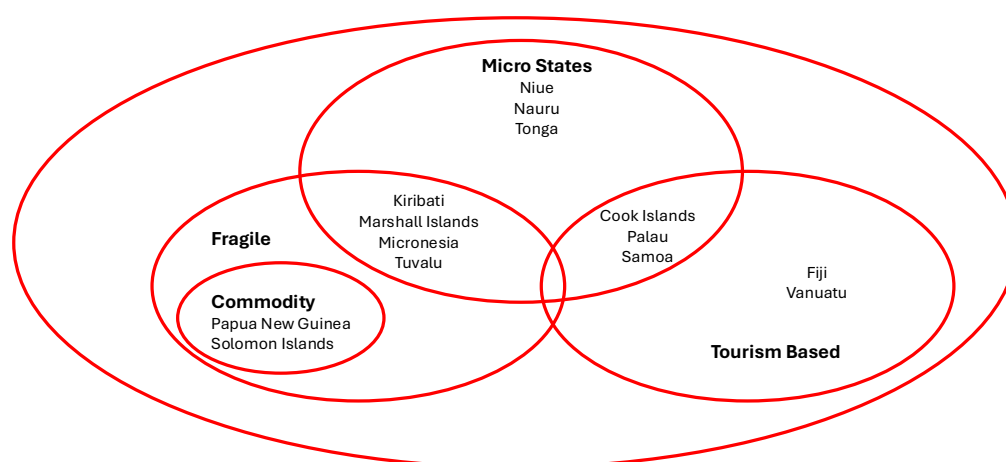


Source: Adapted from IPCC (2022)⁶

⁵ This typology is to support the exposure and vulnerability discussion and to guide interventions. However, it is noted that there is also variability within countries that should be fully considered. For example, of the 15 islands in the Cook Islands, nine are atolls or sand cays, five are high islands and one is mixed.

⁶ Mycoo, M., M. Wairiu, D. Campbell, V. Duvat, Y. Golbuu, S. Maharaj, J. Nalau, P. Nunn, J. Pinnegar, and O. Warrick, 2022: Small Islands. In: *Climate Change 2022: Impacts, Adaptation and Vulnerability*. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change

Figure 2: Sectors Driving the Economy Across Country Groups



Source: Asian Development Bank.

Other factors which may group the Pacific Countries include:

- **Debt Stress level**⁷: Cook Islands, Micronesia (FSM), Marshall Islands (RMI), Naoero, Niue, Palau, Samoa, Solomon Islands face moderate stress; whereas Fiji, Kiribati, PNG, Tonga, Tuvalu and Vanuatu face high debt stress. Thus, all PIC face debt stress and increasing fiscal pressures, affecting their adaptive capacities and reduces financially feasible adaptation options at this time;
- **Climatic zone**: FSM, Palau and RMI lie in the Intertropical Convergence Zone (ITCZ); Naoero and Kiribati in the Equatorial zone; the northern Cook Islands, Samoa, and Tuvalu lie in, or just north of, the South Pacific Convergence Zone (SPCZ); Niue, Fiji, Vanuatu, Tonga, parts of Solomon Islands and the southern Cook Islands to the south of the SPCZ; and finally PNG and parts of Solomon Islands lie the Asia-Australian Monsoon zone. The climatic zone will determine to some extent how global climate change translates into local climate change and how hazards evolve.⁸

⁷ International Monetary Fund (IMF). 2023. *Article IV Reports*. Washington, D.C.; IMF. 2024. *Article IV Reports*. Washington, D.C.; Asian Development Bank. 2024. *Debt Sustainability Analysis – Niue*. Manila; Asian Development Bank. 2024. *Debt Sustainability Analysis – Cook Islands*. Manila; and IMF . 2025. *Article IV Reports*. Washington, D.C.

⁸ McGree, S., Smith, G., Chandler, E., Herold, N., Begg, Z., Kuleshov, Y., Malsale, P. and Rittman, M. (2022). *Climate Change in the Pacific 2022: Historical and Recent Variability, Extremes and Change*. Climate and Oceans Support Programme in the Pacific (COSPPac), Pacific Community (SPC), Suva, Fiji..

2 Climate Change and Future Climate Drivers

2.1 Regional Climate Setting

The climate of the PICs is governed by a complex and tightly coupled ocean–atmosphere system that operates across regional to basin-wide scales. Unlike continental regions where land–atmosphere interactions dominate, the Pacific climate is fundamentally shaped by ocean processes, with sea surface temperature, atmospheric circulation, and large-scale climate variability exerting primary control over environmental conditions. This results in a climate system characterised by relatively stable thermal conditions, high humidity, and pronounced variability in rainfall and storm activity.⁹

At the core of this system are several key climate drivers, including air temperature, sea surface temperature, the hydrological cycle (as expressed through rainfall), and large-scale circulation patterns such as the El Niño–Southern Oscillation (ENSO), the Intertropical Convergence Zone (ITCZ), and the South Pacific Convergence Zone (SPCZ). These drivers do not operate independently. Rather, they interact dynamically, with changes in one component influencing the behaviour of others. For example, increases in sea surface temperature enhance atmospheric moisture availability, which in turn affects rainfall intensity and the development of tropical cyclones.¹⁰ This interconnected structure means that climate change in the Pacific is best understood as a systemic transformation of the entire climate regime rather than a series of isolated changes in individual variables.

A defining feature of the Pacific climate system is its sensitivity to relatively small changes in underlying drivers. Because baseline conditions are already warm and moisture-rich, incremental increases in temperature or ocean heat content can lead to significant changes in atmospheric processes. This sensitivity is particularly evident in the behaviour of convective rainfall systems and the formation of extreme weather events.¹¹ As a result, climate change impacts in the Pacific are often expressed through changes in variability and extremes rather than through uniform shifts in mean conditions.

Climate variability in the Pacific is strongly influenced by ENSO, which represents the dominant mode of interannual variability. ENSO events alter the distribution of sea surface temperature across the equatorial Pacific, leading to shifts in atmospheric circulation, rainfall patterns, and storm activity. During El Niño phases, warmer conditions in the central and eastern Pacific are typically associated with reduced rainfall in parts of the western Pacific, while La Niña phases tend to produce the opposite pattern.¹² These shifts can have significant implications for water availability, ecosystem processes, and climate conditions across PICs. Importantly, ENSO variability interacts with long-term climate change, meaning that future ENSO events will occur within a warmer and more moisture-laden climate system.

⁹ Intergovernmental Panel on Climate Change. 2021. Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report. Cambridge University Press, Chapter 1 and 12; and Regional Climate Consortium for Asia and the Pacific. 2021. Climate Change in the Pacific: Scientific Assessment and New Research.

¹⁰ Regional Climate Consortium for Asia and the Pacific. 2021. Climate Change in the Pacific: Scientific Assessment and New Research and; and Intergovernmental Panel on Climate Change. 2021. Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report. Cambridge University Press, Chapter 8 and 9.

¹¹ Intergovernmental Panel on Climate Change. 2021. Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report. Cambridge University Press, Chapter 8.

¹² Intergovernmental Panel on Climate Change. 2021. Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report. Cambridge University Press, Chapter 4; and World Bank. 2023. Climate Change Knowledge Portal (CCKP): Pacific Island Country Profiles and Climate Data. Washington DC.

Box 1: ENSO Variability, Strong El Niño/La Niña Impacts, and the Emerging 2026–27 Event

El Niño and La Niña are the warm and cool phases of the El Niño–Southern Oscillation (ENSO), the dominant driver of interannual climate variability across the Pacific. The table below summarizes typical ENSO-phase impacts on Pacific Island Countries (PICs).

ENSO Phase / Dimension	Typical Impacts on Pacific Island Countries
ENSO overview	El Niño and La Niña are the warm and cool phases of the El Niño–Southern Oscillation (ENSO), which alternates on a 3–7-year cycle and is the dominant driver of interannual climate variability across the Pacific. ENSO shifts rainfall distribution, sea surface temperature, tropical cyclone activity, and short-term sea levels, meaning PICs face recurring, bidirectional hydrological extremes (both drought and flood risk) rather than a single hazard.
El Niño – climate changes, hazards and vulnerability	Warmer central/eastern Pacific waters are typically associated with reduced rainfall and drought hazard in the western Pacific, historically most acute in Micronesia (FSM, Palau, RMI), with elevated risk also expected across PNG, Solomon Islands, Vanuatu, Fiji, Tonga, Samoa, Niue, and the Cook Islands. El Niño also tends to shift tropical cyclone activity eastward into the central Pacific and causes sea levels to fall in parts of the western Pacific while rising in the eastern Pacific. Some central Pacific atoll states (e.g., Kiribati, Tuvalu) instead experience above-average rainfall during El Niño, underscoring country-specific variability in hazard exposure and vulnerability.
La Niña – climate changes, hazards and vulnerability	La Niña broadly reverses El Niño patterns: above-average rainfall and elevated flood hazard in parts of the western Pacific. Tropical cyclone activity tends to concentrate in the western Pacific rather than shifting eastward, and sea levels tend to rise in the western Pacific and fall in the eastern Pacific – the opposite of the El Niño pattern. Some atoll states that are wetter during El Niño can instead experience drier conditions during La Niña, reinforcing the need for country-specific monitoring of changing hazard exposure rather than a uniform hazard assumption.
Pacific SIDS impacts	El Niño-driven drought and heat stress reduce agricultural and fisheries productivity, raise public health risks such as heat-related illness and reduced water quality, and stress water, energy, transport, health, and education infrastructure. These impacts are not evenly distributed, and are most acute for Pacific SIDS, given their limited economic diversification, freshwater resources, and infrastructure constraints. Drought and water security is typically the greatest risk, particularly for Micronesia (FSM, Palau, RMI), with elevated risk also expected across PNG, Solomon Islands, Vanuatu, Fiji, Tonga, Samoa, Niue, and the Cook Islands, where past strong El Niño events caused prolonged water shortages, crop failures, and emergency water distribution. Food security is affected through reduced yields of staple crops (taro, cassava, yam, breadfruit, banana) and livestock, and changes in fisheries, while WATSAN failures drive diarrheal and other waterborne disease and disrupt schools and health facilities, especially in outer islands and where WASH infrastructure is already weak (FSM, RMI, Kiribati). Ecosystem and tourism impacts include wildfires in Melanesia/PNG and coral bleaching affecting tourism-dependent economies. La Niña-driven above-average rainfall and flooding similarly affect food systems (through waterlogging and crop damage), public health (increased risk of vector- and water-borne disease following flooding), ecosystems (sediment and nutrient runoff affecting coastal and marine systems), and infrastructure (transport disruption from flood damage, urban flooding, water supply contamination, and additional strain on energy, health, and education services). While many Pacific SIDS are expected to become drier than average under El Niño, Tuvalu and parts of the central equatorial Pacific can

	instead experience above-average rainfall, underscoring the need for country-specific monitoring and preparedness planning across both ENSO phases. Tropical cyclone activity tends to shift eastward within the Pacific during El Niño, leading to greater likelihood of more severe events in countries such as the Cook Islands, Niue, Samoa, Tonga and Tuvalu.
Strong El Niño and La Niña – historical impacts and the pending 2026–27 event	Strong ENSO events have historically produced severe, widespread impacts: the 2015–16 Strong El Niño affected more than 60 million people globally and caused widespread losses to agriculture, water resources, and livelihoods across Asia and the Pacific; the 1997–98 event caused an estimated US\$34 billion in global economic losses, while the 1982–83 and 1997–98 events generated longer-term global economic impacts exceeding US\$4 trillion and US\$5.7 trillion, respectively. Strong La Niña events have similarly been associated with major flooding, elevated tropical cyclone activity, and agricultural disruption in the western Pacific, though with less consistently quantified global loss estimates than strong El Niño events. As of August 2026, NOAA and the WMO have confirmed that a Strong El Niño is underway and forecast to persist through early 2027, with a greater than 90% likelihood of a very strong event during October–December 2026 that could rank among the strongest on record. Pacific SIDS are assessed as disproportionately exposed given their limited economic diversification, geographic constraints, freshwater resources, and infrastructure capacity, and the pre-existing impacts of the Middle East conflict on supply chains and resources.

FSM = Federated States of Micronesia, PIC = Pacific Island Country, PNG = Papua New Guinea, RMI = Republic of the Marshall Islands, RPACA = Regional Programmatic Approach on Climate Change Adaptation, SIDS = small island developing states, WASH = water, sanitation and hygiene.

Sources: National Oceanic and Atmospheric Administration (NOAA), Climate Prediction Centre. 2026. ENSO Diagnostic Discussion. 9 July 2026; International Federation of Red Cross and Red Crescent Societies (IFRC). 2026. El Niño Underway in Asia Pacific, Red Cross Red Crescent Steps Up Early Action to Protect Millions at Risk. ReliefWeb. 30 June 2026; United Nations Office for the Coordination of Humanitarian Affairs (UNOCHA). 2017. Enhancing Resilience to Extreme Climate Events: Lessons from the 2015–2016 El Niño Event in Asia and the Pacific. Bangkok; Callahan, C.W. and J.S. Mankin. 2022. The Economic Impacts of El Niño and La Niña Have Lasted for Centuries. Science. 378(6625), pp.1485–1491.

The ITCZ and SPCZ are also critical components of the Pacific climate system. These convergence zones represent regions of enhanced atmospheric convection and are primary drivers of rainfall across the region. Their position and intensity are influenced by sea surface temperature gradients and atmospheric circulation patterns. Small shifts in these systems can result in substantial changes in rainfall distribution, particularly for island groups located near their margins.¹³ Understanding the behaviour of these convergence zones is therefore essential for interpreting both current climate variability and future change.

Climate change is altering the fundamental behaviour of these drivers. Rising greenhouse gas concentrations are leading to increases in air temperature and ocean heat content, intensification of the hydrological cycle, and ongoing sea-level rise.¹⁴ These changes are not linear or uniform; they involve feedbacks and interactions that amplify or moderate different aspects of the climate system. For example, warming temperatures increase atmospheric moisture capacity, which enhances rainfall intensity, while also increasing evaporation and contributing to drought conditions during dry periods. Similarly, rising sea surface temperatures provide additional energy for tropical cyclone development, influencing storm intensity and rainfall.

¹³ Intergovernmental Panel on Climate Change. 2021. *Climate Change 2021: The Physical Science Basis*. Contribution of Working Group I to the Sixth Assessment Report. Cambridge University Press, Chapter 12.

¹⁴ Intergovernmental Panel on Climate Change. 2022. *Climate Change 2022, Summary for Policymakers*; and Intergovernmental Panel on Climate Change. 2021. *Climate Change 2021: The Physical Science Basis*. Contribution of Working Group I to the Sixth Assessment Report. Cambridge University Press, Chapter 1.

A critical implication of these changes is the transition toward a non-stationary climate system, in which historical climate patterns are no longer reliable indicators of future conditions.¹⁵ This shift is particularly important for infrastructure planning and development in PICs, where design standards and risk assessments have traditionally been based on historical observations. As climate drivers continue to evolve, the baseline conditions that underpin these systems are changing, increasing the likelihood that existing infrastructure and services will be exposed to conditions beyond their original design basis. These risks are compounded for social infrastructure such as schools, health facilities, and community services, where disruption can reduce access to education, health care, and water, sanitation, and hygiene (WASH) services, disproportionately affecting women, youth, persons with disabilities, elderly populations, and households in remote or insecure tenure contexts, while also heightening risks of gender-based violence and sexual exploitation in overcrowded shelters and disrupted service environments. They also expose governance gaps, as adaptation and infrastructure standards are often set without meaningful participation of women, youth, persons with disabilities, and SOGIESC groups, limiting accountability and equity in resilience planning.

To capture the range of possible future climate conditions, this assessment adopts a dual-scenario framework based on Shared Socioeconomic Pathways (SSPs). Two scenarios are used: SSP2-4.5, representing a moderate stabilisation pathway with partial mitigation of greenhouse gas emissions, and SSP5-8.5, representing a high-emissions pathway with limited mitigation.¹³ This approach is consistent with international climate assessment practice and provides a basis for evaluating both central and upper-bound climate risks.

Under SSP2-4.5, climate drivers continue to change significantly, with increases in temperature, ocean heat content, and rainfall intensity. However, the magnitude of change is moderated relative to higher emissions scenarios, providing greater scope for adaptation within existing systems. Under SSP5-8.5, changes are more pronounced, with higher temperatures, stronger ocean–atmosphere interactions and accelerated sea-level rise. These conditions represent a more extreme but plausible future, particularly relevant for long-lived infrastructure and systems with limited flexibility.

Another key characteristic of future climate conditions is the increasing importance of compound processes, where multiple drivers interact to produce complex outcomes. For example, higher sea surface temperatures combined with increased atmospheric moisture can lead to more intense rainfall during tropical cyclones, while rising sea levels amplify coastal water levels during storm events.¹⁶ Such compound events heighten social vulnerability by disrupting essential services and livelihoods, reducing coping capacity, and widening inequities among already marginalised groups. These interactions highlight the need to consider climate drivers in an integrated manner, rather than as independent variables.

From a regional perspective, the manifestation of these drivers varies across PICs due to differences in geography, ocean exposure, and atmospheric conditions. Atoll and low-lying island systems are particularly influenced by ocean processes, while high volcanic islands exhibit greater interaction between oceanic and topographic influences. Larger island systems display additional complexity due to their spatial diversity. These geographic differences also shape social vulnerability, with atoll communities facing existential risks of displacement and loss of ancestral land, disproportionately affecting women, elderly persons, and households with insecure tenure. Despite these differences, the underlying drivers of climate change - temperature, sea surface temperature, rainfall processes, and circulation patterns - are consistent across the region and provide a common framework for understanding future climate conditions.

¹⁵ Intergovernmental Panel on Climate Change. 2021. *Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report*. Cambridge University Press, Chapter 1; and Pacific Region Infrastructure Facility (PRIF). 2021. *Guidance for Managing Sea Level Rise Infrastructure Risk in Pacific Island Countries*. PRIF, Sydney/Manila.

¹⁶ Regional Climate Consortium for Asia and the Pacific. 2021. *Climate Change in the Pacific: Scientific Assessment and New Research*; and Intergovernmental Panel on Climate Change. 2021. *Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report*. Cambridge University Press, Chapter 11.

In summary, the climate of the Pacific is governed by a set of interrelated drivers that are undergoing significant change under the influence of global warming. These changes are altering the baseline conditions of the climate system, increasing variability, and intensifying extreme processes. Historical climate patterns are no longer reliable indicators of future conditions. The importance of compound processes is being increasingly understood. The use of SSP2-4.5 and SSP5-8.5 scenarios provides a structured approach to understanding the range of possible futures, while the integration of multiple climate drivers highlights the systemic nature of climate change in the Pacific. This foundation provides the basis for the detailed analysis of individual drivers presented in the following sections.

2.2 Temperature

Air temperature is a primary climate driver across the PICs, influencing atmospheric stability, moisture capacity, evaporation, and the broader functioning of the climate system. In the Pacific context, temperature plays a particularly important role because it operates within a climate regime that is already warm, humid, and strongly influenced by the surrounding ocean. As a result, even relatively modest increases in temperature can produce significant changes in environmental conditions, especially where systems are already operating close to physical or biological thresholds, with heightened risks of heat stress for elderly persons, outdoor workers, pregnant women, and those with chronic health conditions.¹⁷

Temperature acts not only as a direct indicator of climate change but also as an amplifier of other climate drivers. Rising air temperatures increase the capacity of the atmosphere to hold water vapour, strengthening the hydrological cycle and contributing to changes in rainfall intensity and variability.¹⁸ At the same time, higher temperatures increase evapotranspiration rates, influencing soil moisture, freshwater availability, and energy balances across terrestrial and coastal systems. In this way, temperature is a cross-cutting driver that affects multiple components of the climate system simultaneously.

In the Pacific, the influence of temperature is closely linked to ocean–atmosphere interactions. While the ocean moderates temperature variability compared to continental regions, it also creates a tightly coupled system in which changes in air temperature are closely aligned with changes in sea surface temperature.¹⁹ This coupling reinforces warming trends and enhances the transfer of heat and moisture between the ocean and atmosphere. As a result, temperature change in the Pacific is not isolated but occurs as part of a broader shift in the thermodynamic structure of the climate system.

Temperature also influences atmospheric circulation and the behaviour of key convergence zones. Changes in thermal gradients can affect the positioning and intensity of the ITCZ and SPCZ, with implications for rainfall distribution across the region.²⁰ Although these processes are complex and influenced by multiple factors, temperature remains a fundamental control on the energy available for atmospheric motion and convection.

A defining characteristic of temperature change in the Pacific is its role in shifting baseline climatic conditions. Because the region experiences relatively low seasonal temperature variation, increases in mean temperature can lead to a redefinition of what constitutes “normal” conditions. This shift has implications for ecosystems, infrastructure, and human systems that have adapted to historically stable temperature ranges, including increased energy demand for cooling and reduced productivity in schools and workplaces, which can exacerbate inequities for poorer households, women, and youth. As temperatures rise, these systems may experience increasing stress even in the absence of extreme events while also heightening risks of gender-based violence and sexual exploitation in overcrowded or poorly ventilated shelters and service facilities. Governance gaps are evident, as

¹⁷ Intergovernmental Panel on Climate Change. 2021. *Climate Change 2021: The Physical Science Basis*. Contribution of Working Group I to the Sixth Assessment Report. Cambridge University Press, Chapter 8 and 12.

¹⁸ Regional Climate Consortium for Asia and the Pacific. 2021. *Climate Change in the Pacific: Scientific Assessment and New Research*.

¹⁹ Intergovernmental Panel on Climate Change. 2021. *Climate Change 2021: The Physical Science Basis*. Contribution of Working Group I to the Sixth Assessment Report. Cambridge University Press, Chapters 1, 8, 9 and 12.

²⁰ Intergovernmental Panel on Climate Change. 2021. *Climate Change 2021: The Physical Science Basis*. Contribution of Working Group I to the Sixth Assessment Report. Cambridge University Press, Chapter 4.

adaptation measures such as cooling infrastructure, energy subsidies, and school retrofits are often planned without meaningful participation of women, youth, persons with disabilities, and SOGIESC groups, limiting accountability and equity in resilience planning.

2.2.1 Historic Trends

Observed temperature records across the Pacific indicate a clear and sustained warming trend over recent decades. Instrumental data and global climate analyses show that surface air temperatures across the region have increased broadly in line with global averages, with warming rates typically in the range of approximately 0.1°C to 0.2°C per decade since the mid-twentieth century.²¹ While the magnitude of warming varies between locations due to differences in ocean influence, elevation, and local climatic conditions, the overall trend is consistent across PICs.

The historical warming signal is evident in both mean and extreme temperature metrics. There has been a notable increase in minimum temperatures, leading to more frequent warm nights and reduced night-time cooling.²² This is an important characteristic in tropical environments, where night-time cooling plays a key role in regulating heat stress. Reduced cooling increases cumulative thermal exposure for both human populations and natural systems. Heat stress risks are particularly acute for the elderly, children, and persons with disabilities, while women and youth engaged in outdoor labour or caregiving roles also face heightened exposure due to limited cooling options, especially in poorer households without electricity or air-conditioning.

Changes in extreme temperature events have also been observed. The frequency of hot days has increased, while the occurrence of unusually cool conditions has declined.²³ These changes are consistent with global patterns identified in climate assessments and reflect the overall upward shift in the temperature distribution. In practical terms, this means that conditions that were previously considered extreme are becoming more common, while new extremes are beginning to emerge.

Historical warming has influenced other aspects of the climate system. Higher temperatures have contributed to increased atmospheric moisture, supporting more intense rainfall events under favourable conditions. At the same time, increased evaporation has contributed to drying during periods of low rainfall, particularly in areas with limited water storage.¹¹ This dual effect highlights the role of temperature in amplifying hydrological variability.

The interaction between temperature and ENSO variability is also evident in the historical record. Temperature anomalies associated with ENSO events now occur on top of a warmer baseline, increasing the absolute magnitude of conditions experienced during these events.¹² This means that El Niño-related warm periods, for example, are now hotter than they were in the past, with implications for associated climate processes.

From a regional perspective, historical warming has already begun to alter the environmental conditions experienced across PICs. These changes are reflected in multiple datasets, including country-level climate profiles and regional assessments, which consistently identify rising temperature as a key trend influencing climate variability and system behaviour.⁸ The historical record therefore provides clear evidence that the Pacific climate system is undergoing a measurable and ongoing transformation.

²¹ McGree, S., Smith, G., Chandler, E., Herold, N., Begg, Z., Kuleshov, Y., Malsale, P. and Rittman, M. (2022). *Climate Change in the Pacific 2022: Historical and Recent Variability, Extremes and Change*. Climate and Oceans Support Programme in the Pacific (COSPPac), Pacific Community (SPC), Suva, Fiji and World Bank. 2023. *Climate Change Knowledge Portal CCKP: Pacific Island Country Profiles and Climate Data*. Washington, DC.

²² Footnote 10, Chapter 11 Intergovernmental Panel on Climate Change. 2021. *Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report*. Cambridge University Press, Chapter 11.

²³ Intergovernmental Panel on Climate Change. 2021. *Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report*. Cambridge University Press, Chapter 1.

2.2.2 Projected Trends

Future projections indicate that temperatures across the Pacific will continue to increase throughout the twenty-first century under all emissions scenarios. The magnitude of warming depends on global greenhouse gas trajectories, with significant differences between moderate stabilisation and high-emissions pathways. For the purposes of this assessment, projections are considered under SSP2-4.5 and SSP5-8.5 to capture a range of plausible future conditions.

Under SSP2-4.5, mean air temperatures across PICs are projected to increase steadily, with warming of approximately 1.2°C to 1.8°C by the mid-twenty-first century relative to a late twentieth-century baseline, and further increases toward approximately 2°C to 3°C by 2100.¹⁷ These changes represent a substantial shift in baseline climatic conditions, even under a moderated emissions pathway. The projected warming is expected to occur across all seasons, with relatively small seasonal variation due to the oceanic influence on regional climate.

Under SSP5-8.5, temperature increases are significantly greater. Projections indicate warming of approximately 1.5°C to 2.5°C by the 2050s and approximately 3°C to 5°C by the end of the century across much of the Pacific.¹² These increases reflect continued accumulation of greenhouse gases and represent an upper-bound scenario for climate change impacts. The higher level of warming under SSP5-8.5 leads to more pronounced changes in climate processes and increases the likelihood of extreme conditions.

Projected warming is expected to be spatially variable, with land areas generally warming more rapidly than adjacent ocean surfaces.¹³ This has important implications for settlements and infrastructure, which are typically located on land and may therefore experience higher effective warming than regional ocean-based averages might suggest. Coastal urban areas, where population and infrastructure are concentrated, may experience particularly significant thermal stress due to local conditions such as limited vegetation and heat retention in built environments. Thermal stress in dense urban settings also has equity dimensions. Poorer households and informal settlements often lack cooling options, while schools and health facilities face increased strain, reducing safe learning and care environments for women, youth, persons with disabilities and increasing health risks for elderly persons and those with chronic illnesses. Informal market vendors, particularly women and youth, face disproportionate livelihood losses when extreme heat reduces safe operating conditions in outdoor markets and stalls.

A key feature of projected temperature change is the increase in extreme heat conditions. As the mean temperature rises, the frequency, intensity, and duration of extreme heat events are expected to increase.²⁴ Events that are currently considered rare are projected to become more common, and in some cases new extremes may emerge beyond the historical range. In tropical environments, where humidity is high, the combined effect of temperature and moisture can significantly increase heat stress, with implications for human health and system performance.

Temperature increases are also expected to further intensify the hydrological cycle. Higher temperatures increase atmospheric moisture capacity, contributing to more intense rainfall when precipitation occurs, while also increasing evaporation during dry periods.¹⁸ This reinforces the pattern of increased variability in rainfall, with implications for water availability and climate variability across PICs.

ENSO variability will continue to influence temperature patterns, but future ENSO events will occur within a warmer climate system.²⁵ This means that temperature anomalies associated with ENSO phases will be superimposed on a higher baseline, increasing their absolute magnitude and potential

²⁴ Intergovernmental Panel on Climate Change. 2021. *Climate Change 2021: The Physical Science Basis*. Contribution of Working Group I to the Sixth Assessment Report. Cambridge University Press, Chapters 7 and 11; and Intergovernmental Panel on Climate Change. 2022. *Climate Change 2022: Impacts, Adaptation and Vulnerability*. Contribution of Working Group II to the Sixth Assessment Report. Cambridge University Press, Chapter 15: Small Islands.

²⁵ Intergovernmental Panel on Climate Change. 2021. *Climate Change 2021: The Physical Science Basis*. Contribution of Working Group I to the Sixth Assessment Report. Cambridge University Press, Chapters 8 and 9.

impacts. The interaction between ENSO and long-term warming therefore represents an important aspect of future climate variability.

From a climate driver perspective, projected temperature change represents a fundamental shift in the operating conditions of the Pacific climate system. It affects not only thermal conditions but also the behaviour of rainfall, ocean processes, and atmospheric circulation.

2.3 Sea Surface Temperature

Sea surface temperature (SST) is a dominant climate driver in the PICs, exerting primary control over atmospheric convection, moisture exchange, and large-scale circulation processes. In the Pacific, where the ocean covers the vast majority of the region and land masses are relatively small, SST effectively defines the thermal and dynamic baseline of the climate system. Changes in SST therefore have far-reaching implications, influencing rainfall generation, tropical cyclone development, and the behaviour of key atmospheric features such as the ITCZ and SPCZ.¹¹

SST governs the transfer of energy between the ocean and atmosphere. Warmer sea surfaces increase evaporation, enhancing atmospheric moisture content and contributing to greater convective instability.¹⁸ In tropical environments, where rainfall is largely driven by convection, this relationship is particularly important. As SST increases, the capacity of the atmosphere to produce intense rainfall events also increases, linking ocean warming directly to changes in the hydrological cycle.

The influence of SST is closely tied to large-scale climate variability, particularly the ENSO. ENSO reflects variations in SST across the equatorial Pacific, which in turn drive changes in atmospheric circulation, rainfall distribution, and storm activity.¹⁷ During El Niño conditions, anomalously warm SSTs in the central and eastern Pacific shift convection away from the western Pacific, while La Niña conditions enhance convection in the western Pacific. These shifts have significant implications for rainfall patterns and climate variability across PICs.

SST gradients also play a critical role in determining the position and intensity of convergence zones. The ITCZ and SPCZ are regions of enhanced convection that are highly sensitive to underlying SST patterns.¹² Changes in SST gradients can lead to shifts in the location of these zones, resulting in changes in rainfall distribution across the region. Because many PICs lie near the margins of these systems, even small shifts can lead to substantial changes in local climate conditions.

In addition to its role in atmospheric processes, SST influences oceanic conditions, including stratification, circulation, and marine ecosystem dynamics. While these aspects are not the primary focus of this section, they are important in understanding the broader implications of ocean warming. In particular, changes in SST contribute to the occurrence of marine heatwaves, which are indicative of shifts in baseline ocean conditions and have implications for both ecological and atmospheric processes.

2.3.1 Historic Trends

Observed SST records indicate a clear and sustained warming trend across the Pacific over recent decades. Global ocean observations show that sea surface temperatures have increased at rates broadly consistent with global ocean warming, with typical increases of approximately 0.1°C to 0.2°C per decade since the mid-twentieth century, and accelerated warming since the late twentieth century.²⁶ This warming is evident across the tropical Pacific, although with spatial variability influenced by ocean circulation patterns and ENSO dynamics.

In the western Pacific warm pool, where SSTs are already among the highest globally, warming has been particularly significant.⁸ This region is a key driver of atmospheric convection and rainfall, meaning that changes in SST here have disproportionate effects on regional climate processes. Warmer SSTs in this region enhance moisture fluxes and contribute to stronger convective activity, influencing rainfall patterns across multiple PICs.

²⁶ Intergovernmental Panel on Climate Change. 2021. *Climate Change 2021: The Physical Science Basis*. Contribution of Working Group I to the Sixth Assessment Report. Cambridge University Press, Chapter 9.

Historical SST warming has been accompanied by changes in ocean–atmosphere interactions. Increased SST has led to higher rates of evaporation and greater atmospheric moisture content, which in turn supports more intense precipitation under favourable conditions.²⁷ This relationship is evident in observational datasets, which show that periods of elevated SST are often associated with increased rainfall intensity, particularly during ENSO events.

A notable feature of historical SST change is the increasing frequency and intensity of marine heatwaves. These events, characterised by prolonged periods of anomalously high ocean temperature, have become more common across the Pacific.²⁸ Marine heatwaves are associated with shifts in baseline ocean conditions and are indicative of broader changes in the climate system. While they are often discussed in the context of ecological impacts, they also reflect the extent to which SST has moved beyond historical variability. Marine heatwaves also carry social and economic implications. Declining fisheries and reef health reduce food security and livelihoods, with coastal communities, particularly women and youth engaged in small-scale fisheries and reef-dependent agriculture facing heightened risks to income and nutrition, as declining fisheries and reef health reduce food security and livelihoods, disproportionately affecting coastal communities and low-income households. Men and boys in artisanal fishing and diving also face increased occupational hazards from longer hours and deeper dives in degraded reef systems, while women and girls face heightened risks of gender-based violence and exploitation when declining fisheries drive migration, overcrowding in coastal settlements, and competition over scarce resources. Governance gaps are also evident, as decisions on fisheries management, marine tenure, and adaptation investments are often made without meaningful participation of women, youth, persons with disabilities, and SOGIESC groups, limiting accountability and equity in resource governance.

ENSO continues to dominate interannual SST variability. However, the baseline upon which ENSO operates has shifted due to long-term warming.¹⁰ This means that SST anomalies during ENSO events are superimposed on a warmer ocean, increasing the absolute magnitude of temperature conditions. As a result, the climatic effects of ENSO events may be amplified relative to historical conditions.

The historical record therefore demonstrates that SST in the Pacific is not only warming but also exhibiting changes in variability and extremes. These changes are already influencing atmospheric processes and climate variability across the region, providing a clear indication that the ocean–atmosphere system is undergoing significant transformation.

2.3.2 Projected Trends

Climate projections indicate that SST will continue to increase across the Pacific throughout the twenty-first century under all emissions scenarios. The magnitude of warming depends on global greenhouse gas trajectories, with significant differences between moderate and high-emissions pathways.

Under SSP2-4.5, SST is projected to increase by approximately 0.8°C to 1.5°C by mid-century and by approximately 1.5°C to 2.5°C by 2100 relative to a late twentieth-century baseline.¹⁰ These increases are consistent across climate models and represent a continuation of observed warming trends. While the rate of warming is moderated compared to higher-emissions scenarios, the changes are still substantial in the context of tropical ocean systems.

Under SSP5-8.5, SST increases are significantly greater, with projected warming of approximately 1°C to 2°C by the 2050s and 2°C to 3°C or more by the end of the century.¹⁰ These higher levels of warming reflect continued accumulation of heat in the ocean and represent upper-bound conditions for climate change impacts in the Pacific.

²⁷ Regional Climate Consortium for Asia and the Pacific. 2021. *Climate Change in the Pacific: Scientific Assessment and New Research*; and Intergovernmental Panel on Climate Change. 2021. *Climate Change 2021: The Physical Science Basis*. Contribution of Working Group I to the Sixth Assessment Report. Cambridge University Press, Chapter 8.

²⁸ Intergovernmental Panel on Climate Change. 2019. *Special Report on the Ocean and Cryosphere in a Changing Climate (SROCC)*. Cambridge University Press, Chapter 5.

Projected SST warming has several important implications for the climate system. First, it reinforces the intensification of the hydrological cycle by increasing evaporation and atmospheric moisture content.¹⁸ This contributes to more intense rainfall under convective conditions and amplifies variability in precipitation patterns.

Second, SST warming influences tropical cyclone behaviour by providing additional energy for storm development. While total cyclone frequency may not increase, the intensity of the strongest storms is projected to rise under both SSP2-4.5 and SSP5-8.5 scenarios.²³ This reflects the role of SST as a key driver of cyclone energy. More intense cyclones increase risks for vulnerable groups. Damage to housing, health facilities, and basic services often leaves women, children, and persons with disabilities disproportionately exposed, while recovery processes can deepen inequities in access to shelter, health care, and livelihoods and heighten risks of sexual exploitation and abuse in overcrowded shelters and disrupted recovery environments.

Third, projected SST changes are expected to influence ENSO variability. While there is uncertainty regarding how ENSO frequency and structure may change, future ENSO events will occur within a warmer ocean baseline.¹⁰ This increases the magnitude of SST anomalies and may amplify associated climate impacts, including shifts in rainfall and temperature patterns.

A critical projected outcome is the continued increase in marine heatwaves. Under SSP2-4.5, these events are expected to become more frequent and longer in duration. Under SSP5-8.5, marine heatwaves may become a near-permanent feature in some parts of the Pacific.²⁰ This represents a fundamental shift in ocean conditions and has implications for both ecological systems and atmospheric processes.

Projected SST warming also affects ocean stratification, with warmer surface waters increasing the stability of the upper ocean and reducing vertical mixing.¹¹ This can influence regional circulation patterns and feedback into atmospheric processes, adding complexity to climate system behaviour.

From a climate driver perspective, SST is central to the evolution of future climate conditions in the Pacific. It influences rainfall, cyclone intensity, and climate variability, and interacts with other drivers such as air temperature and sea-level rise.

2.4 Rainfall and Hydrological Variability

Rainfall is a central climate driver in the PICs, governing freshwater availability, ecosystem functioning, and the overall variability of climatic conditions across the region. Unlike temperature, which tends to exhibit relatively smooth long-term trends, rainfall in the Pacific is inherently variable and strongly influenced by large-scale ocean–atmosphere interactions.²⁹ This variability is a defining feature of the regional climate system and is closely linked to the behaviour of the ITCZ, the SPCZ, and the ENSO.

The rainfall regime of the Pacific is predominantly convective. Precipitation is typically generated through short-duration, high-intensity convective processes driven by warm ocean surfaces and moist atmospheric conditions.¹⁸ This contrasts with temperate regions where rainfall may occur over longer durations at lower intensities. As a result, rainfall in PICs is often delivered in bursts, contributing to both high intra-annual variability and strong sensitivity to changes in atmospheric moisture and temperature.

Rainfall processes are closely linked to sea surface temperature and atmospheric thermodynamics. Warmer air can hold more moisture, and higher sea surface temperatures increase evaporation, enhancing the availability of water vapour for precipitation.¹¹ This relationship means that changes in temperature and ocean conditions directly influence rainfall intensity and variability. In the Pacific context, where baseline humidity is already high, this sensitivity is particularly pronounced.

Spatial variability is another key characteristic of rainfall in PICs. The position and intensity of the ITCZ and SPCZ determine the distribution of precipitation across the region, and even small shifts in

²⁹ Pacific Region Infrastructure Facility (PRIF). 2021. *Guidance for Managing Sea Level Rise Infrastructure Risk in Pacific Island Countries*. PRIF, Sydney/Manila.

these systems can lead to substantial changes in rainfall patterns.³⁰ Island topography further modifies these patterns, particularly in high volcanic islands where orographic effects enhance rainfall on windward slopes and reduce it in leeward areas. As a result, rainfall can vary significantly over short distances, contributing to complex local climate conditions.

ENSO remains the dominant driver of interannual rainfall variability. During El Niño events, convection typically shifts toward the central and eastern Pacific, often resulting in reduced rainfall in parts of the western Pacific and increased rainfall elsewhere. During La Niña events, these patterns are generally reversed.¹⁰ These shifts have significant implications for water availability and climate variability across PICs and are a primary source of year-to-year climatic fluctuation.

Rainfall must therefore be understood as a dynamic and highly variable climate driver that integrates multiple components of the climate system. Changes in temperature, sea surface temperature, and atmospheric circulation all influence rainfall behaviour, making it a key pathway through which broader climate change is expressed in the Pacific.

2.4.1 Historic Trends

Historical rainfall records across the Pacific indicate a high degree of variability rather than a consistent long-term trend in total annual precipitation.²³ This variability reflects the dominant influence of ENSO and convergence zone dynamics, which produce significant fluctuations in rainfall patterns from year to year. While some regions have experienced slight increases or decreases in average rainfall, these trends are generally less pronounced than the variability associated with natural climate oscillations.

Despite the absence of a strong uniform trend in total rainfall, there is increasing evidence that the character of rainfall is changing, particularly in terms of intensity and temporal distribution. Observational analyses indicate that extreme rainfall events have become more intense in many parts of the Pacific, even where total annual rainfall has not changed significantly.²³ This reflects the influence of rising temperatures and increased atmospheric moisture capacity. Heavy rainfall events also carry social implications. Flooding and landslides disproportionately affect informal settlements and low-income households, where limited drainage and shelter options heighten risks. Women and children often face additional burdens in water collection and safe mobility during flood conditions, while persons with disabilities encounter heightened barriers to evacuation and access to emergency services.

Warmer atmospheric conditions allow for greater moisture retention, which can lead to more intense precipitation during convective events.¹⁸ In the Pacific, where rainfall is largely convective, this relationship results in a tendency toward heavier rainfall delivered over shorter periods. This shift contributes to increased variability in hydrological conditions and alters the distribution of rainfall over time.

In addition to increased intensity, there is evidence of changes in rainfall timing and variability. Some regions have experienced longer dry periods between rainfall events, suggesting a shift toward more irregular precipitation patterns.¹⁸ This pattern reflects the interaction between increased evaporation and variability in atmospheric circulation, resulting in a more uneven distribution of rainfall.

ENSO continues to dominate rainfall variability in the historical record. El Niño events are typically associated with reduced rainfall and drought conditions in parts of the western Pacific, while La Niña events tend to bring increased rainfall and wetter conditions.¹⁰ These patterns are well established and remain a central feature of Pacific climate variability. However, it is important to note that these ENSO-driven patterns now occur within a warmer climate system, which influences their magnitude and effects.

³⁰ McGree, S., Smith, G., Chandler, E., Herold, N., Begg, Z., Kuleshov, Y., Malsale, P. and Rittman, M. (2022). *Climate Change in the Pacific 2022: Historical and Recent Variability, Extremes and Change*. Climate and Oceans Support Programme in the Pacific (COSPPac), Pacific Community (SPC), Suva, Fiji. and Intergovernmental Panel on Climate Change. 2021. *Climate Change 2021: The Physical Science Basis*. Contribution of Working Group I to the Sixth Assessment Report. Cambridge University Press, Chapter 4.

Historical rainfall variability is therefore shaped by a combination of natural climate oscillations and emerging climate change signals. While ENSO remains the primary driver of variability, rising temperatures and changes in atmospheric moisture are influencing the intensity and distribution of rainfall. This indicates that the Pacific rainfall regime is already evolving, with implications for future climate conditions.

2.4.2 Projected

Climate projections indicate that rainfall patterns across the Pacific will continue to exhibit high variability under future climate conditions, with significant changes in intensity, distribution, and temporal structure. While projections of mean annual rainfall remain uncertain and vary spatially, there is strong agreement that rainfall intensity will increase under both SSP2-4.5 and SSP5-8.5 scenarios.³¹ This increase is driven primarily by rising temperatures and the associated increase in atmospheric moisture capacity.

Under SSP2-4.5, changes in mean rainfall are expected to be moderate and spatially heterogeneous. Some regions may experience slight increases in annual rainfall, while others may experience slight decreases.¹¹ However, even where total rainfall does not change significantly, the intensity of rainfall events is projected to increase. This reflects the thermodynamic relationship between temperature and moisture, which leads to more intense precipitation under warming conditions.

Under SSP5-8.5, changes in rainfall intensity are more pronounced. Extreme precipitation events are projected to increase substantially, with some projections indicating increases of approximately 10–20% or more in extreme daily rainfall by the end of the century.³¹ These increases are associated with higher atmospheric moisture content and enhanced convective processes.

A key feature of projected change is the increasing prevalence of short-duration, high-intensity rainfall events. These events are important because they influence the temporal distribution of rainfall and contribute to greater variability in water availability. Increased intensity means that rainfall is more likely to occur in concentrated bursts, which affects how water is distributed across time and space.

At the same time, projections suggest that dry periods may become longer or more pronounced in some regions, particularly under SSP5-8.5.¹¹ This reflects the combined influence of increased evaporation and variability in rainfall patterns. The result is an intensification of the hydrological cycle, with both wetter and drier extremes becoming more pronounced. Extended droughts reduce water security, with burdens falling disproportionately on women and youth responsible for household water collection, while persons with disabilities face greater barriers to accessing safe and reliable supplies, and elderly persons experience heightened health risks from dehydration and heat stress. These dynamics intensify inequities in health and education outcomes during prolonged dry periods.

ENSO is expected to remain a dominant influence on rainfall variability, although there is uncertainty regarding how its behaviour may change under climate warming.¹⁰ Regardless of changes in ENSO frequency, future ENSO events will occur within a warmer and more moisture-rich atmosphere, which is likely to amplify the magnitude of rainfall anomalies.

Projected changes in rainfall are therefore characterised by increased intensity, greater variability, and stronger interaction with other climate drivers. These changes are consistent with global climate model projections and are supported by regional datasets and country-level analyses. From a climate driver perspective, rainfall will continue to play a central role in shaping environmental conditions across PICs, acting as a key pathway through which changes in temperature and ocean processes are expressed.

2.5 Tropical Cyclones

Tropical cyclones are a key component of the Pacific climate system, representing one of the most dynamic interactions between oceanic and atmospheric processes. Tropical cyclones play a critical

³¹ Intergovernmental Panel on Climate Change. 2021. *Climate Change 2021: The Physical Science Basis*. Contribution of Working Group I to the Sixth Assessment Report. Cambridge University Press, Chapters 8 and 11.

role in redistributing heat and moisture within the climate system, while also contributing to interannual variability in rainfall, atmospheric circulation, and ocean conditions.²³ Although they are often considered primarily as hazards, within the context of climate drivers they represent an important mechanism through which energy is transferred and climatic variability is expressed, yet recovery financing and reconstruction processes are often shaped by governance structures that limit the participation of women, youth, persons with disabilities, and SOGIESC groups. Post-cyclone recovery also increases unpaid care and community labour burdens for women and girls, which are rarely recognised in formal recovery planning. Despite their active role in community mobilisation, youth are often excluded from formal disaster governance structures, reducing opportunities for leadership and innovation.

The formation and behaviour of tropical cyclones are governed by a combination of environmental conditions, including sea surface temperature, atmospheric moisture, vertical wind shear, and large-scale circulation patterns. Warm ocean waters provide the primary energy source for cyclone development, while atmospheric conditions determine the organisation and intensification of storm systems.²³ In the Pacific, where sea surface temperatures are typically high and atmospheric moisture is abundant, conditions are generally conducive to cyclone formation, particularly within defined cyclone basins.

Tropical cyclones are closely linked to large-scale climate variability, particularly the ENSO. ENSO influences the spatial distribution of cyclones across the Pacific, altering where storms are most likely to form and track.¹⁰ During El Niño phases, cyclone activity tends to shift eastward into the central Pacific, while during La Niña phases activity is more concentrated in the western Pacific. These shifts have important implications for regional climate variability and the distribution of rainfall across PICs.

Beyond their role as discrete events, tropical cyclones influence broader climate processes. They contribute to ocean mixing, which affects sea surface temperature and nutrient distribution, and they play a role in regulating atmospheric energy balance by transporting heat from the ocean to higher latitudes.³² Cyclones are also associated with significant rainfall, which can contribute to seasonal water availability and influence hydrological conditions. As such, they are embedded within the broader climate system rather than acting as isolated phenomena. Recovery and reconstruction processes following cyclone events often reflect governance structures that do not fully include women, youth, persons with disabilities, and SOGIESC groups. This limited participation can affect how resources are allocated and whose needs are prioritised. In addition, post-cyclone recovery frequently increases unpaid care and community labour burdens for women and girls, which are rarely recognised in formal planning, while youth contributions to community mobilisation are often overlooked in official disaster governance structures.

A defining characteristic of tropical cyclones as a climate driver is their sensitivity to underlying ocean and atmospheric conditions. Changes in sea surface temperature, atmospheric moisture, and circulation patterns all influence cyclone behaviour. As these drivers evolve under climate change, the characteristics of tropical cyclones are also expected to change, with implications for the overall structure of the climate system.

2.5.1 Historic

Historical records of tropical cyclone activity in the Pacific indicate strong variability in both frequency and distribution, driven primarily by large-scale climate processes. The number of cyclones occurring each year varies considerably, reflecting the influence of ENSO and other modes of variability.³³ At the basin scale, there is no clear long-term trend in total cyclone frequency over the historical record, although regional patterns vary.

³² Intergovernmental Panel on Climate Change. 2021. *Climate Change 2021: The Physical Science Basis*. Contribution of Working Group I to the Sixth Assessment Report. Cambridge University Press, Chapters 9 and 11.

³³ C. Schreck, and National Center for Atmospheric Research Staff, eds. 2022. The Climate Data Guide: IBTrACS: [Tropical cyclone best track data](#). (accessed 21 April 2026).

While total cyclone numbers have not shown a consistent increase, there is evidence of changes in cyclone characteristics, particularly in terms of intensity. Observational data suggest that the proportion of high-intensity cyclones has increased in some regions, even where overall frequency has remained relatively stable.³⁴ This shift is consistent with changes in underlying climate drivers, including increases in sea surface temperature and atmospheric moisture.

Rainfall associated with tropical cyclones has also shown evidence of intensification. Warmer atmospheric conditions increase the amount of moisture available for precipitation, leading to heavier rainfall during cyclone events.¹⁸ This reflects broader changes in the hydrological cycle and highlights the interaction between temperature, moisture, and cyclone processes. Heavy rainfall and storm surges from cyclones disproportionately affect informal settlements and poorer households. Housing fragility and lack of protective infrastructure heighten risks, while women and youth often bear the burden of evacuation logistics, caregiving, and post-disaster recovery in settings with limited shelter and services, and persons with disabilities face heightened barriers to evacuation and access to relief, while elderly populations are at greater risk of injury and health complications during displacement. ENSO remains the dominant influence on cyclone variability in the historical record. El Niño events tend to shift cyclone activity eastward, while La Niña events concentrate activity in the western Pacific.²⁵ These shifts influence not only where cyclones occur but also the climatic conditions experienced across different PICs, including rainfall distribution and seasonal variability.

In addition to changes in intensity and distribution, there is emerging evidence of changes in other cyclone characteristics, such as rainfall structure and duration. While these trends are less certain than changes in intensity, they suggest that cyclone behaviour is evolving in response to changes in the climate system.

Overall, the historical record indicates that tropical cyclones remain highly variable, but that key characteristics - particularly intensity and associated rainfall - are being influenced by underlying climate change. These changes are consistent with observed trends in temperature and sea surface temperature and provide an indication of how cyclone behaviour may evolve in the future.

2.5.2 Projected Trends

Climate projections indicate that tropical cyclone behaviour in the Pacific will continue to evolve under future climate conditions. A robust finding across climate models is that the total number of tropical cyclones is unlikely to increase significantly and may decrease slightly under both SSP2-4.5 and SSP5-8.5 scenarios.²³ However, this potential reduction in frequency is accompanied by a consistent increase in the intensity of the most severe storms.

Under SSP2-4.5, the proportion of high-intensity cyclones is projected to increase, reflecting the influence of warmer sea surface temperatures and increased atmospheric moisture. These changes result in stronger storms with higher wind speeds and more intense rainfall.²³ The increase in intensity represents a shift in the distribution of cyclone strength, with a greater share of storms reaching higher categories.

Under SSP5-8.5, these trends are more pronounced. Higher sea surface temperatures provide additional energy for cyclone development, leading to greater peak intensities and more extreme rainfall rates. The increase in the most intense cyclones under this scenario represents a significant change in the behaviour of the climate system, with implications for both atmospheric energy balance and variability. More intense cyclones heighten social and economic vulnerability. Damage to critical infrastructure, including housing, health facilities, and basic services leaves women, children, and persons with disabilities disproportionately exposed, while insecure tenure and inequitable access to recovery resources can deepen long-term vulnerability.

A key projected change is the increase in rainfall associated with tropical cyclones. As atmospheric moisture increases, cyclone-related precipitation becomes more intense, contributing to greater

³⁴ Intergovernmental Panel on Climate Change. 2021. *Climate Change 2021: The Physical Science Basis*. Contribution of Working Group I to the Sixth Assessment Report. Cambridge University Press, Chapter 11; and T.R. Knutson et al. 2019. Tropical Cyclones and Climate Change Assessment. *Bulletin of the American Meteorological Society*, 100(10).

variability in rainfall patterns.¹⁸ This effect is evident under both SSP scenarios but is substantially stronger under SSP5-8.5, where higher temperatures lead to greater moisture availability.

Projected changes may also include alterations in cyclone structure and behaviour, such as changes in storm size, translation speed, and duration. While there is uncertainty in these aspects, there is evidence that some cyclones may move more slowly, increasing the duration of associated rainfall and wind conditions.²³ Such changes would influence how cyclones interact with other climate processes, including rainfall and ocean mixing.

ENSO is expected to remain a dominant influence on cyclone variability, although its future behaviour remains uncertain. Regardless of changes in ENSO frequency or structure, future cyclone activity will occur within a warmer climate baseline, increasing the magnitude of associated anomalies.²⁵ This means that even if variability patterns remain similar, the conditions experienced during cyclone seasons are likely to become more extreme.

From a climate driver perspective, tropical cyclones are projected to become more intense manifestations of underlying ocean–atmosphere processes. The interaction between sea surface temperature, atmospheric moisture, and circulation dynamics will produce storms with greater energy and more extreme characteristics.

2.6 Sea Level Rise

Sea-level rise is a fundamental climate driver in the PICs, reflecting the combined effects of ocean warming and the addition of water from melting land-based ice. In the Pacific context, sea level is not a static boundary condition but a dynamic component of the climate system, influenced by thermal expansion, ocean circulation, atmospheric pressure patterns, and regional variability.³⁵ Changes in sea level therefore represent both a long-term trend and a variable process that interacts with other climate drivers, including sea surface temperature, atmospheric circulation, and storm systems.

The primary drivers of global mean sea-level rise are thermal expansion of seawater as it warms and the transfer of mass from glaciers and ice sheets into the ocean. Regional sea-level patterns in the Pacific are influenced by changes in atmospheric pressure, wind patterns, and ocean circulation can produce short-term fluctuations in sea level, which are superimposed on the long-term rising trend.⁹ These regional variations are particularly important for PICs, where local sea-level change can differ from global averages due to the influence of large-scale climate phenomena such as ENSO. During El Niño events, sea levels tend to fall in parts of the western Pacific and rise in the eastern Pacific, while the opposite occurs during La Niña conditions.

A defining characteristic of sea-level rise as a climate driver is the way in which long-term change interacts with variability and extremes. As mean sea level increases, the baseline upon which tides, storm surge, and wave processes operate is elevated.³⁶ This means that even without changes in storm behaviour, the frequency with which high water levels are reached increases over time. This interaction between mean change and variability is central to understanding how sea-level rise modifies the behaviour of the broader climate system.

This dynamic is particularly important due to the geographic characteristics of PICs. Many islands are low-lying and have limited elevation above mean sea level, meaning that relatively small increases in baseline sea level can alter coastal conditions. From a climate driver perspective, this represents a shift in the physical boundary conditions of the system, affecting how ocean–atmosphere processes interact with land.

2.6.1 Historic

Observed sea-level rise over the past century shows a clear and accelerating upward trend. Global mean sea level has increased at an average rate of approximately 1.5 mm per year during the early

³⁵ Intergovernmental Panel on Climate Change. 2021. *Climate Change 2021: The Physical Science Basis*. Contribution of Working Group I to the Sixth Assessment Report. Cambridge University Press. Chapter 1 and 12

³⁶ Pacific Region Infrastructure Facility. 2021. *Climate Resilient Infrastructure in the Pacific: Guidance for Practitioners*; and, World Bank. 2020. *Water Security in the Pacific: Impacts of Climate Variability and Change*. Washington, DC.

twentieth century, accelerating to around 3–4 mm per year in recent decades.³⁷ This acceleration reflects increasing ocean heat content and growing contributions from melting glaciers and ice sheets.

Across the Pacific, observed sea-level rise is broadly consistent with global trends but exhibits notable regional variability. Long-term observational records from tide gauges and satellite altimetry confirm that sea-level rise is occurring across all PICs, although the magnitude varies between locations.³⁷ The western tropical Pacific, for example, has experienced rates of rise that exceed the global average over recent decades.³⁸ These differences are driven by regional ocean circulation patterns and wind systems, which redistribute water across the basin.

In addition to long-term trends, sea levels in the Pacific exhibit significant short-term variability. Seasonal cycles and interannual variability driven by ENSO can result in fluctuations of several centimetres to tens of centimetres, temporarily amplifying or offsetting the long-term trend.²⁵ These fluctuations are an important feature of the Pacific climate system and influence the conditions experienced at any given time.

Historical sea-level rise has already altered baseline coastal conditions. Incremental increases in mean sea level have resulted in more frequent exceedance of certain water level thresholds, even in the absence of changes in storm intensity or wave conditions.³⁸ This reflects the cumulative nature of sea-level rise, where gradual changes over time lead to measurable shifts in environmental conditions. These changes are not socially neutral. Low-income households, informal settlements, and communities on low-lying atolls face disproportionate risks of inundation and land loss. Housing insecurity is compounded by loss of customary land and cultural heritage, with women and youth particularly affected when relocation disrupts tenure rights and community cohesion, and persons with disabilities facing heightened exclusion when relocation sites lack accessible infrastructure. The historical record therefore demonstrates that sea-level rise is both ongoing and accelerating, with regional variability playing a significant role in shaping local conditions. This provides a clear basis for understanding future changes and reinforces the importance of considering both long-term trends and short-term variability.

2.6.2 Projected

Climate projections indicate that sea level will continue to rise throughout the twenty-first century under all emissions scenarios, with the magnitude and rate of rise dependent on global greenhouse gas trajectories.

Under SSP2-4.5, global mean sea level is projected to rise by approximately 0.4 to 0.7 metres by 2100 relative to a late twentieth-century baseline.¹¹ Under SSP5-8.5, sea-level rise is significantly greater, with projections in the range of approximately 0.6 to 1.1 metres by the end of the century, with the possibility of higher outcomes associated with accelerated ice sheet dynamics. These projections reflect increasing ocean heat content and continued mass loss from glaciers and ice sheets.

Regional sea-level change in the Pacific is expected to differ from the global mean due to ocean circulation and wind-driven processes.¹¹ Some areas may experience higher rates of rise, particularly in parts of the western Pacific, while others may experience lower rates. Despite this variability, the overall trend of rising sea level is consistent across the region.

A key feature of projected sea-level rise is the increase in the frequency of extreme water levels. As mean sea level rises, the probability of exceeding thresholds associated with high tides and storm-driven water levels increases significantly.³⁸ This effect is non-linear, meaning that relatively small increases in mean sea level can lead to large increases in the frequency of extreme events. Frequent flooding events heighten equity concerns. Reduced mobility and limited evacuation options increase exposure for women, children, persons with disabilities, and elderly persons with chronic health conditions, while relocation from flood-prone areas can fragment social networks and weaken access to services, deepening long-term vulnerability.

³⁷ World Bank. 2023. Climate Change Knowledge Portal (CCKP): *Pacific Island Country Profiles and Climate Data*, Washington DC.

³⁸ Intergovernmental Panel on Climate Change. 2022. *Climate Change 2022, Summary for Policymakers*.

Regional infrastructure guidance emphasises the importance of considering this non-linear behaviour when selecting sea-level projections for planning and design.³⁸ Rather than relying on a single central estimate, it is recommended that a range of scenarios be considered, including upper-bound projections, to account for uncertainty and to ensure that infrastructure remains robust under future conditions. This approach is particularly relevant in the Pacific, where infrastructure is often located in coastal zones and has long design lifetimes.

Projected sea-level rise is also expected to accelerate over time, particularly under SSP5-8.5.⁹ This acceleration reflects the cumulative effects of ocean warming and ice sheet response and implies that rates of change later in the century may exceed those observed in the first half of this century. This has important implications for long-term planning, as systems designed based on current rates may not be adequate for future conditions.

Uncertainty in sea-level projections is primarily associated with the response of large ice sheets. While there is high confidence in the direction of change, the magnitude of future rise depends on complex processes that are not fully constrained.²⁵ This uncertainty reinforces the importance of scenario-based approaches that consider a range of possible outcomes.

From a climate driver perspective, sea-level rise represents a long-term and cumulative change that fundamentally alters baseline coastal conditions across the Pacific. It interacts with other drivers, including temperature and ocean processes, and plays a central role in shaping future climate dynamics.

3 Climate Hazards and Exposure

3.1 Overview

Climate hazards in the PICs arise from the interaction of changing climate drivers - outlined in Section 3 - with the physical and socio-economic characteristics of island systems. These hazards are expressed through both acute events, such as extreme rainfall and tropical cyclones, and chronic stressors, including rising temperatures and sea-level rise, which progressively alter baseline environmental conditions.³⁹ In practice, these processes are strongly interconnected, with long-term changes influencing the frequency, intensity, and consequences of extreme events.

A defining characteristic of climate risk in PICs is the prevalence of compound and cascading hazards. Individual hazards rarely occur in isolation; rather, they interact across atmospheric, oceanic, and terrestrial systems. For example, tropical cyclones combine wind, rainfall, and coastal processes, while drought conditions may be followed by high-intensity rainfall events that generate rapid runoff over degraded catchments.⁴⁰ These compound interactions are increasingly important under climate change and are reinforced by regional climate dynamics across the Pacific.

Exposure to these hazards is fundamentally shaped by geographic typology, which determines how hazards are generated, transmitted, and experienced. Consistent with the RPACA framework, three broad geographic typologies are used to structure the assessment: low-lying coral atoll systems, high volcanic and uplifted island systems, and large high-island systems. These typologies reflect differences in elevation, geomorphology, hydrology, and settlement patterns, and therefore define distinct exposure pathways across the region.

3.1.1 Low-Lying Coral Atoll Systems

Low-lying coral atoll systems - including Kiribati, Tuvalu, Republic of the Marshall Islands (RMI), and Naoero, as well as atoll areas of Federated States of Micronesia (FSM) and Palau - represent the most physically constrained and uniformly exposed environments in the Pacific.

The hazard environment in these systems is dominated by the interaction of oceanic and atmospheric processes, including sea-level rise, coastal inundation, wave overtopping, and rainfall-induced flooding. Due to the extremely low elevation - often only a few metres above mean sea level - these hazards operate across the entire landmass rather than being confined to specific zones. Regional studies highlight that even modest increases in sea level or rainfall intensity can result in widespread inundation due to limited drainage capacity and high groundwater tables.¹⁸

Exposure in atoll systems is effectively system-wide, encompassing populations, ecosystems, economic activities, and infrastructure. Human exposure is elevated due to the concentration of settlements in narrow coastal zones, combined with limited access to safe areas during hazard events. Livelihoods, particularly those dependent on fisheries and small-scale agriculture, are highly sensitive to environmental changes driven by heat, salinity, and water availability. Environmental exposure is acute, with freshwater lenses, soils, and coastal ecosystems highly sensitive to both gradual and episodic changes. Salinisation, erosion, and ecosystem degradation can occur rapidly under compound hazard conditions, with limited natural buffering capacity.

Infrastructure in these low-lying countries are heavily exposed. Transport systems - including roads, causeways, and airstrips - are typically located at low elevation and are highly susceptible to inundation and erosion. Water supply systems, often dependent on rainwater harvesting and shallow groundwater, are vulnerable to both contamination and depletion. Energy systems face exposure to both flooding and heat-related demand increases, while sanitation systems are at risk of failure under

³⁹ Intergovernmental Panel on Climate Change. 2022. *Climate Change 2022: Impacts, Adaptation and Vulnerability*. Contribution of Working Group II to the Sixth Assessment Report. Cambridge University Press.

⁴⁰ Intergovernmental Panel on Climate Change. 2022. *Climate Change 2022: Impacts, Adaptation and Vulnerability*. Contribution of Working Group II to the Sixth Assessment Report. Cambridge University Press, Chapter 15: Small Islands.

inundation conditions.⁴¹ Given the lack of spatial flexibility, exposure cannot easily be reduced through relocation, resulting in high and persistent system-wide vulnerability.

Social exposure is also acute. Women, children, and persons with disabilities face heightened risks during evacuation and relocation, while poorer households experience disproportionate housing insecurity. Loss of customary land and cultural heritage further undermines social cohesion, with relocation often disrupting tenure rights and community networks, and elderly persons experiencing heightened health risks when displacement interrupts access to medical care and support systems. Relocation and recovery processes are also shaped by governance arrangements that do not fully include women, youth, persons with disabilities, and SOGIESC groups, which can affect how tenure rights, service access, and community cohesion are maintained.

3.1.2 High Volcanic and Uplifted Island Systems

High volcanic and uplifted island systems - such as Fiji, Samoa, Tonga, Vanuatu, Solomon Islands, Cook Islands, and Niue - are characterised by more complex terrain and spatial variability in hazard processes.

Hazards in these systems are shaped by the interaction of topography and climate drivers. Orographic rainfall produces high-intensity precipitation in upland areas, generating rapid runoff through steep catchments and increasing the likelihood of flash flooding and landslides. Coastal zones remain exposed to cyclones, storm surge, and coastal erosion, while inland areas experience hazards related to riverine flooding, slope instability, and heat stress. Regional analyses indicate that increasing rainfall intensity and temperature are already affecting both catchment dynamics and coastal processes across these systems.³⁸

Exposure is spatially differentiated but highly concentrated in coastal zones, where most population and infrastructure are located. Urban areas are particularly exposed due to high population density, built environment characteristics, and limited drainage capacity. Informal settlements are often located in hazard-prone areas, increasing vulnerability to flooding and heat. Limited drainage, cooling, and protective infrastructure heighten exposure, while women and youth in these settlements often face added burdens in water collection, caregiving, and safe mobility during hazard events, and elderly persons experiencing heightened health risks when displacement interrupts access to medical care and support systems. Hazard-related disruption of transport and market systems also disproportionately affects informal vendors and small traders, particularly women and youth, whose livelihoods depend on safe and reliable access to trading spaces.

Environmental exposure includes impacts on catchment systems, soils, and vegetation, with increasing temperatures and changing rainfall patterns affecting water availability and ecosystem stability. These changes have implications for agriculture, fisheries, and broader ecosystem services.

Infrastructure exposure reflects both geographic concentration and network characteristics. Transport infrastructure - particularly coastal roads and bridges - is highly exposed to flooding, erosion, and thermal stress. Water supply systems, often dependent on surface water sources, are vulnerable to both flooding and drought-related variability. Energy systems face increasing demand due to heat, while also being exposed to physical damage from extreme events.⁴² The interaction of multiple hazards can lead to cascading impacts across infrastructure systems, particularly where redundancy is limited.

3.1.3 Large High-Island Systems

Large high-island systems, particularly Papua New Guinea and parts of Solomon Islands, exhibit the greatest complexity in hazard processes and exposure pathways.

Hazards in these systems operate across multiple spatial scales, from localised flash flooding and landslides to large-scale riverine flooding across extensive catchments. Climatic variability, including

⁴¹ PRIF. 2021. *Climate Resilient Infrastructure in the Pacific: Guidance for Practitioners*; and Asian Development Bank. 2020. *Pacific Urban Development and Infrastructure Resilience Assessment*. Manila.

⁴² Asian Development Bank. 2021. *Climate Risk and Adaptation in the Pacific: Infrastructure Sector Assessments*. Manila.

changes in rainfall patterns and temperature, interacts with large and diverse landscapes to produce heterogeneous hazard conditions. Regional assessments indicate increasing variability in rainfall and temperature, contributing to more frequent and severe hazard events across these systems.³⁸

Exposure extends across populations, ecosystems, and economic systems. Coastal and urban populations are exposed to flooding, heat, and coastal hazards, while inland populations may experience drought, landslides, and temperature variability. Economic exposure includes impacts on agriculture, forestry, and resource-based industries, which are sensitive to both climate variability and extreme events.

Environmental exposure includes impacts on large river systems, forests, and ecosystems, with changes in temperature and rainfall affecting hydrological processes and ecosystem function. These changes can have significant implications for biodiversity and ecosystem services.

Infrastructure exposure is shaped by scale and interdependence. Transport networks extend across large geographic areas and are critical for connectivity, making them highly sensitive to disruption. Flooding, landslides, and heat can damage roads, bridges, and airstrips, isolating communities and affecting access to services. Water and energy systems are similarly exposed, with impacts potentially propagating across regions due to network interconnections.⁴³ The scale of these systems increases the likelihood of cascading failures, where disruption in one sector affects multiple others. Such disruptions have equity dimensions. Isolation from services disproportionately affects rural women, youth, and persons with disabilities, compounding existing barriers to mobility, health care, and education, while elderly populations face heightened risks when prolonged isolation interrupts access to medical treatment and social support.

3.1.4 Summary

Climate hazards in the Pacific are characterised by increasing intensity, strong variability, and complex interactions between multiple drivers. Regional evidence confirms that these hazards are already intensifying and are projected to increase further under both SSP2-4.5 and SSP5-8.5 scenarios.

Exposure is shaped fundamentally by geographic typology, with atoll systems experiencing system-wide exposure, volcanic systems exhibiting spatially differentiated exposure, and large island systems experiencing multi-scale and interconnected exposure pathways. Across all typologies, exposure extends beyond infrastructure to include populations, ecosystems, and economic systems, although infrastructure remains a critical element due to its role in enabling service delivery and system resilience.

Exposure also has differentiated social impacts. Compounded risks arise when hazards interact with limited access to safe housing, services, and livelihoods, with inequities most evident in relocation pressures, service disruption, and recovery outcomes for women, youth, and persons with disabilities. Compound hazard events also intensify unpaid care and community labour demands, which fall disproportionately on women and girls and are rarely recognised in formal resilience planning.

The combination of increasing hazard intensity and high baseline exposure creates conditions in which risks are both compound and systemic, with the potential for cascading impacts across sectors. This typology-based framework provides the foundation for the detailed hazard-specific assessments that follow.

3.2 Extreme Heat

Extreme heat is an increasingly important climate hazard across the PICs, driven by rising mean air temperatures and compounded by persistently high humidity associated with ocean-dominated climates. While the Pacific region has historically experienced relatively stable thermal conditions due

⁴³ World Bank. 2020. *Enhancing the Climate Resilience of Infrastructure in the Pacific*. Washington, DC.

to maritime moderation, climate change is shifting both baseline temperatures and variability, resulting in more frequent, more intense, and longer-duration periods of heat stress.⁴⁴

In tropical Pacific environments, the severity of heat is governed by the interaction between air temperature and atmospheric moisture. High humidity reduces the effectiveness of evaporative cooling, increasing physiological stress even where absolute temperatures remain moderate by global standards.⁴⁵ Regional climate assessments confirm that warming trends in both air and sea surface temperatures are already contributing to more persistent heat stress conditions, particularly in low-lying and coastal environments where night-time cooling is limited.²⁶ Extreme heat therefore represents not only a direct hazard to human health, but also a cross-cutting stressor that influences water availability, energy demand, ecosystem function, labour productivity, and the performance of infrastructure systems.

3.2.1 Low-Lying Coral Atoll States

In low-lying coral atoll systems - including Kiribati, Tuvalu, Republic of the Marshall Islands, and Naoero, as well as atoll areas of Federated States of Micronesia and Palau - extreme heat manifests as a persistent and cumulative condition rather than a series of discrete events.

These environments are characterised by minimal diurnal and seasonal temperature variation, consistently high humidity, and limited airflow due to low elevation and narrow landforms. Elevated temperatures tend to persist over extended periods, with reduced night-time cooling driven by warm surrounding ocean conditions. Regional studies indicate that increasing sea surface temperatures are already reducing night-time cooling across atoll environments, contributing to sustained heat stress.¹⁸ Under SSP2-4.5, this results in longer periods of elevated heat and reduced recovery between events, while under SSP5-8.5, conditions may approach prolonged or near-continuous heat stress during certain seasons.

Exposure in these systems is effectively system-wide, affecting populations, ecosystems, and economic activity simultaneously. Human exposure is high due to the concentration of settlements in coastal zones and the limited availability of cooling options, particularly in informal or densely built environments where ventilation is restricted. Heat stress can reduce labour productivity, increase health risks, and exacerbate existing vulnerabilities, particularly for outdoor workers and vulnerable populations. Equity concerns are significant. Poorer households often lack cooling technologies or safe shelters, while women and youth engaged in caregiving and subsistence work face heightened exposure. Persons with disabilities are particularly at risk where evacuation and shelter facilities are not designed for accessibility, and elderly persons face heightened risks of cardiovascular and respiratory illness during prolonged heat stress. Governance of adaptation measures, such as energy subsidies, cooling infrastructure, and shelter design, often does not fully include women, youth, persons with disabilities, and SOGIESC groups, which can limit accountability and reduce the effectiveness of resilience planning.

Environmental exposure is also acute. Freshwater lenses, soils, and vegetation systems are highly sensitive to temperature increases, with higher evaporation rates reducing water availability and affecting plant health. These changes can directly impact food security and local livelihoods, particularly where subsistence agriculture is practiced.

Infrastructure exposure is a critical component of overall risk. Energy systems face sustained increases in cooling demand, placing pressure on generation capacity and distribution networks that are often limited in scale and redundancy. Water supply systems, particularly those reliant on rainwater harvesting and groundwater lenses, are stressed by increased consumption and

⁴⁴ Intergovernmental Panel on Climate Change. 2021. *Climate Change 2021: The Physical Science Basis*. Contribution of Working Group I to the Sixth Assessment Report. Cambridge University Press.

⁴⁵ Intergovernmental Panel on Climate Change. 2021. *Climate Change 2021: The Physical Science Basis*. Contribution of Working Group I to the Sixth Assessment Report. Cambridge University Press, Chapter 7; and Intergovernmental Panel on Climate Change. 2022. *Climate Change 2022: Impacts, Adaptation and Vulnerability*. Contribution of Working Group II to the Sixth Assessment Report. Cambridge University Press, Chapter 15: Small Islands.

evaporation, consistent with regional water security assessments.⁴⁶ Transport infrastructure, including roads and airstrips, is exposed to thermal degradation, while sanitation systems may be affected indirectly through increased water demand and system loading. Given the absence of spatial adaptation options, these exposures combine to create chronic and compounding system stress. These stresses also have social dimensions. Service disruptions disproportionately affect women, youth, and persons with disabilities, who rely most heavily on public infrastructure for health, water, and mobility. In atoll contexts, limited redundancy in energy and water systems means poorer households face compounding risks when cooling, water supply, and sanitation services fail simultaneously.

3.2.2 High Volcanic and Uplifted Island Systems

In high volcanic and uplifted island systems - such as Fiji, Samoa, Tonga, Vanuatu, Solomon Islands, Cook Islands, and Niue - extreme heat is more spatially variable but increasingly widespread.

Coastal zones, where most population and infrastructure are located, experience elevated temperatures combined with high humidity and limited ventilation, producing conditions similar to those in atoll environments. Inland and higher-elevation areas historically provide some degree of thermal buffering; however, regional climate projections indicate that warming trends will reduce this advantage over time, particularly under higher-emissions scenarios.¹⁸ Under SSP2-4.5, heat exposure intensifies primarily in coastal zones, while under SSP5-8.5, heat stress expands inland, increasing the spatial extent of exposure.

Exposure reflects both geographic and socio-economic patterns. Coastal populations, particularly in urban areas, are highly exposed due to density and built environment characteristics that trap heat. These conditions disproportionately affect poorer households and settlements. Women and children in informal settlements face high indoor heat accumulation, while persons with disabilities encounter barriers to accessing safe cooling spaces. Heat stress also reduces labour productivity, with gendered impacts in agriculture and fisheries. Economic exposure includes impacts on agriculture and fisheries, where heat stress affects both labour productivity and ecosystem performance. Hazard-related disruption of market activity and transport systems further affects informal vendors and small traders, particularly women and youth, whose livelihoods depend on safe and reliable access to trading spaces.

Environmental exposure includes impacts on catchment systems, vegetation, and soil moisture. Increased temperatures drive higher evapotranspiration rates, affecting water availability and ecosystem stability. These processes are consistent with regional hydrological studies indicating increased water demand and variability under warming conditions.

Infrastructure exposure is a key concern. Energy systems face increased demand for cooling, placing strain on electricity networks. Transport infrastructure - particularly roads, bridges, and port facilities located in coastal corridors - is subject to thermal stress, accelerating material degradation and increasing maintenance requirements.⁴² Water supply systems experience increased demand and evaporation losses, while treatment processes may be affected by temperature-related changes in water quality. Heat also interacts with other hazards, intensifying water stress during dry periods and affecting recovery following flooding or cyclone events, thereby increasing overall system vulnerability.

3.2.3 Large High-Island Systems

In large high-island systems, particularly Papua New Guinea and parts of Solomon Islands, extreme heat is characterised by spatial variability combined with system-scale exposure.

Coastal areas experience high humidity and heat retention, particularly in urban centres, while inland regions may experience higher daytime temperatures under conditions of reduced cloud cover or rainfall variability. Regional climate analyses indicate that warming trends are accompanied by increasing variability, resulting in more frequent periods of elevated temperature across diverse

⁴⁶ Pacific Region Infrastructure Facility. 2021. *Climate Resilient Infrastructure in the Pacific: Guidance for Practitioners*; and, World Bank. 2020. *Water Security in the Pacific: Impacts of Climate Variability and Change*. Washington, DC.

environments.¹⁸ Under SSP5-8.5, both intensity and spatial extent of heat stress increase significantly, affecting a wider range of geographic settings.

Exposure extends across populations, ecosystems, and economic systems. Urban populations experience high levels of heat stress due to density and built environment characteristics, while rural populations may be exposed during agricultural activities. Equity concerns are evident. Outdoor labourers, women farmers, and youth engaged in subsistence agriculture face heightened risks from prolonged heat exposure. In remote areas, limited access to health services compounds vulnerability, particularly for persons with disabilities who already face barriers to mobility and care. Economic exposure includes impacts on productivity and livelihoods, particularly in sectors dependent on outdoor labour and climate-sensitive resources.

Environmental exposure includes impacts on river systems, forests, and ecosystems, with increased temperatures affecting hydrological processes and ecosystem function. These changes can have implications for biodiversity and ecosystem services.

Infrastructure exposure is shaped by scale and interdependence. Energy systems face increased demand across large service areas, while transport infrastructure is subject to cumulative thermal stress affecting performance and maintenance.⁴³ Water systems are particularly sensitive, as increased temperatures drive higher demand while also increasing evaporation losses from rivers and storage systems. The interconnected nature of infrastructure networks introduces the potential for cascading impacts, where stress in one system affects the functionality of others, consistent with regional infrastructure resilience assessments.

3.2.4 Summary of Extreme Heat Exposure

Extreme heat is an increasingly significant climate hazard in the Pacific, driven by rising temperatures and amplified by high humidity. Regional studies confirm that warming trends are already affecting both air and ocean conditions, increasing the persistence and severity of heat stress across all PICs.

Exposure extends beyond infrastructure to include populations, ecosystems, and economic systems, although infrastructure remains a critical component due to its role in enabling service delivery and resilience. Across all typologies, infrastructure systems are increasingly exposed to heat-related stress, including increased energy demand, water system pressure, and material degradation. These systemic stresses also have differentiated social impacts, as service disruptions and productivity losses disproportionately affect marginalised groups with fewer adaptive options, particularly in cooling access, water security, and safe learning environments for women, youth, and persons with disabilities. Under both SSP2-4.5 and SSP5-8.5 scenarios, these pressures intensify, with higher-emissions pathways resulting in more sustained, widespread, and systemically significant impacts across all sectors.

3.3 Heavy Rainfall and Flooding

Heavy rainfall and flooding represent one of the most significant climate hazards across the PICs, reflecting the strong influence of convective rainfall processes and the intensification of the hydrological cycle under climate change. Rising temperatures increase atmospheric moisture-holding capacity, leading to more intense precipitation events, particularly in tropical environments where short-duration, high-intensity rainfall dominates.¹¹

In the Pacific context, flooding arises through multiple interconnected pathways, including pluvial (surface water) flooding, riverine flooding, and coastal flooding where intense rainfall coincides with elevated sea levels or storm conditions. These pathways frequently interact, producing compound flood events that are often more severe than any single process alone. Regional climate assessments indicate that increases in rainfall intensity are already being observed across parts of the Pacific, with projections suggesting further intensification under both SSP2-4.5 and SSP5-8.5 scenarios.⁴⁷

⁴⁷ Regional Climate Consortium for Asia and the Pacific (2021). *Climate Change in the Pacific: Scientific Assessment and New Research*; World Bank (2023). *Climate Change Knowledge Portal (CCKP): Pacific Island Country Profiles and Climate Data*. Washington, DC; and, Asian Development Bank. 2020. *Pacific Climate Risk Country Profiles*. Manila.

3.3.1 Low-Lying Coral Atoll States

In low-lying coral atoll systems - including Kiribati, Tuvalu, Republic of the Marshall Islands, and Naoero, as well as atoll areas of Federated States of Micronesia and Palau - heavy rainfall results in rapid and widespread surface flooding due to extremely limited drainage capacity.

These systems lack defined river networks, and their low elevation, shallow soils, and high groundwater tables restrict infiltration and storage. Rainfall events therefore translate quickly into surface water accumulation, often affecting entire island surfaces simultaneously. The hazard is strongly influenced by ocean conditions; high tides and elevated sea levels reduce drainage efficiency, prolonging inundation and creating compound flood conditions. Regional studies highlight that even moderate rainfall events can produce significant flooding where drainage pathways are constrained by tidal conditions.⁴⁸

Exposure in these environments is effectively system-wide, affecting populations, ecosystems, and economic systems simultaneously. Human exposure is high due to the concentration of settlements in low-lying areas, with limited access to safe or elevated locations during flood events. Flooding can disrupt daily activities, damage housing, and increase risks to health through water contamination and sanitation failures. These impacts are particularly severe for poorer households in informal settlements, where drainage and sanitation systems fail quickly. Women and children face added burdens in caregiving and water collection during prolonged inundation, while persons with disabilities encounter barriers to safe shelter and accessible evacuation routes. Flood management and relocation processes are often shaped by governance arrangements that do not fully include women, youth, persons with disabilities, and SOGIESC groups, which can affect how resources are allocated and whose needs are prioritised.

Environmental exposure is acute, particularly for freshwater lenses, soils, and vegetation. Flooding can lead to saline intrusion, soil degradation, and impacts on subsistence agriculture, with implications for food security and livelihoods. Coastal ecosystems, including reef and lagoon systems, may also be affected by sediment and pollutant transport during flood events.

Infrastructure exposure is particularly critical. Transport systems, including roads, causeways, and airstrips, are highly vulnerable to inundation and erosion, often resulting in loss of connectivity across islands. Water supply systems are exposed to contamination and disruption, particularly where rainwater harvesting and groundwater sources are affected.⁴⁹ Energy infrastructure, including generation and distribution systems, is vulnerable to both flooding and associated system failures, while sanitation systems are highly sensitive to inundation. Given the absence of alternative locations or redundancy, these impacts can affect entire national systems simultaneously.

Under SSP2-4.5, increases in rainfall intensity lead to more frequent flooding events and longer periods of inundation. Under SSP5-8.5, the combination of more intense rainfall and rising sea levels significantly increases both the frequency and duration of flooding, resulting in more persistent disruption across all systems.

3.3.2 High Volcanic and Uplifted Island Systems

In high volcanic and uplifted island systems - such as Fiji, Samoa, Tonga, Vanuatu, Solomon Islands, Cook Islands, and Niue - heavy rainfall generates complex flood dynamics driven by topography and catchment processes.

Orographic effects result in high rainfall intensities in upland areas, producing rapid runoff through steep catchments. This leads to flash flooding in downstream areas, often with short lag times between rainfall and peak flows. River systems respond quickly to intense precipitation, and sediment transport and debris flows can further exacerbate flooding conditions. In addition, intense rainfall

⁴⁸ Pacific Region Infrastructure Facility. 2021. *Climate Resilient Infrastructure in the Pacific: Guidance for Practitioners*; and Asian Development Bank. 2022. *Sea-Level Change in the Pacific Islands Region: A Review of Evidence to Inform Guidance on Selecting Projections for Climate Risk and Adaptation Assessments*. Manila.

⁴⁹ PRIF. 2021. *Water and Sanitation Infrastructure Resilience in the Pacific*.

increases the likelihood of landslides, which can block drainage channels and contribute to secondary flooding.

Exposure is spatially differentiated but highly concentrated. Coastal plains and river valleys, where most population and infrastructure are located, are particularly exposed to flooding. Urban areas face heightened risk due to high population density, impermeable surfaces, and limited drainage capacity, all of which increase runoff and reduce the ability to manage floodwaters. Informal settlements are disproportionately affected, with poorer households lacking protective infrastructure and facing higher exposure to flood-related health risks. Women and youth in these settlements often bear added burdens in caregiving and water collection during flood events, while persons with disabilities face barriers to safe evacuation and accessible shelter, and elderly persons face heightened risks of cardiovascular strain and heat-related illness in dense urban areas. Flood-related disruption of transport and market systems further affects informal vendors and small traders, particularly women and youth, whose livelihoods depend on safe and reliable access to trading spaces. Environmental exposure includes impacts on catchments, soils, and ecosystems. Increased rainfall intensity can lead to soil erosion, degradation of agricultural land, and impacts on water quality. Changes in sediment transport can affect both terrestrial and coastal ecosystems, with implications for fisheries and biodiversity.

Infrastructure exposure is a major driver of overall risk. Transport networks, often aligned along coasts and river corridors, are highly vulnerable to flooding, washouts, and erosion. Bridges and culverts are exposed to high flow velocities and debris loading, increasing the risk of structural failure.⁴² Water supply systems, particularly those reliant on river intakes, are affected by increased turbidity and damage during flood events, while energy infrastructure is exposed to both direct inundation and indirect impacts such as landslides. Service disruptions disproportionately affect poorer households, women, and persons with disabilities, who rely most heavily on public infrastructure for health, water, and mobility.

Under SSP2-4.5, increased rainfall intensity results in more frequent exceedance of drainage and river capacity thresholds, leading to more frequent flooding events. Under SSP5-8.5, higher rainfall extremes result in significantly increased flood magnitude and extent, as well as greater interaction between flooding and slope instability. These dynamics increase both direct and cascading impacts across infrastructure systems.

3.3.3 Large High-Island Systems

In large high-island systems, particularly Papua New Guinea and parts of Solomon Islands, flooding occurs across multiple spatial scales and through interconnected hydrological processes.

These systems include extensive river basins capable of generating large-scale riverine flooding during prolonged rainfall events. At the same time, localised flash flooding can occur in smaller catchments and urban areas during short-duration, high-intensity rainfall. The scale and complexity of these systems result in diverse flood pathways, with impacts often extending across large geographic areas.

Exposure extends across populations, ecosystems, and economic systems. Flooding can affect both urban and rural populations, disrupt agricultural activities, and damage natural resources. Economic exposure is significant, particularly in sectors dependent on land, water, and transport connectivity.

Environmental exposure includes impacts on river systems, floodplains, and ecosystems. Increased flooding can alter hydrological regimes, affect sediment transport, and impact biodiversity. These changes have implications for both ecosystem services and long-term environmental stability.

Infrastructure exposure is shaped by scale and interdependence. Transport networks, including roads, bridges, and airstrips, are critical for connectivity and are highly sensitive to flooding. Damage to these networks can isolate communities and disrupt economic activity across large areas.⁴³ Water and energy systems are similarly exposed, with impacts potentially propagating through interconnected networks. Flooding can damage infrastructure directly, as well as indirectly through erosion, sedimentation, and system overload. Isolation from services has equity dimensions, as rural

women, youth, and persons with disabilities often face the greatest barriers to mobility and recovery when connectivity is lost.

Under SSP2-4.5, increased rainfall intensity leads to more frequent and widespread flooding events. Under SSP5-8.5, both the magnitude and duration of flooding increase substantially, with greater spatial extent and increased potential for cascading impacts across systems. The interaction between multiple flood pathways further increases the complexity of risk in these environments. These cascading impacts disproportionately affect poorer households, women, and persons with disabilities, who face greater barriers to recovery when transport and service networks fail.

3.3.4 Summary of Flood Exposure

Heavy rainfall and flooding are central climate hazards across the Pacific, driven by intensification of the hydrological cycle and shaped by geographic typology. Atoll systems experience widespread and prolonged surface flooding driven by limited drainage and strong interaction with ocean conditions. Volcanic systems experience rapid runoff, flash flooding, and landslide-related impacts, particularly in coastal and riverine areas. Large island systems experience multi-scale flooding across extensive catchments, with significant implications for interconnected infrastructure networks.

Exposure extends across populations, ecosystems, and economic systems, with infrastructure representing a critical component due to its role in connectivity and service delivery. Regional studies confirm that rainfall intensity is increasing and is projected to continue to increase under future climate scenarios, particularly under SSP5-8.5.

Across all typologies, infrastructure systems are increasingly exposed to flooding-related stress, including damage to transport networks, disruption of water and energy systems, and cascading impacts across sectors. Flooding also has differentiated social impacts, with vulnerable groups experiencing compounded risks from housing damage, service disruption, and livelihood loss. These inequities are most evident for poorer households, women, youth, and persons with disabilities, who face fewer adaptive options and greater barriers to safe relocation, caregiving, and recovery when services fail. Prolonged flood recovery also intensifies unpaid care and community labour demands, which fall disproportionately on women and girls and are rarely recognised in formal resilience planning. These dynamics underscore the importance of integrating future climate projections into infrastructure planning, design, and management.

3.4 Drought

Drought is a critical climate hazard across the PICs, characterised by prolonged periods of below-average rainfall, increased evapotranspiration, and declining water availability. Unlike rapid-onset hazards such as flooding or cyclones, drought develops more slowly but can have extensive and persistent impacts across water systems, ecosystems, livelihoods, and infrastructure.⁴⁰

In the Pacific context, drought is closely linked to large-scale climate variability, particularly the ENSO, which strongly influences rainfall patterns across the region. El Niño phases are typically associated with reduced rainfall in many central and western Pacific island systems, increasing the likelihood of drought conditions.²⁰ Climate change is expected to modify these patterns, with rising temperatures increasing evapotranspiration and intensifying the severity of drought even where changes in rainfall are uncertain.¹¹

Drought in PICs is therefore best understood as a compound hydro-climatic hazard, driven by the interaction of rainfall variability, temperature increases, and ocean–atmosphere dynamics. Regional studies indicate that while total annual rainfall trends may be uncertain in some locations, increases in rainfall variability and temperature are likely to increase the frequency and severity of drought conditions, particularly under higher-emissions scenarios.⁵⁰

⁵⁰ Regional Climate Consortium for Asia and the Pacific. 2021. *Climate Change in the Pacific: Scientific Assessment and New Research*; and World Bank. 2023. *Climate Change Knowledge Portal (CCKP): Pacific Island Country Climate Profiles*.

3.4.1 Low-Lying Coral Atoll States

In low-lying coral atoll systems - including Kiribati, Tuvalu, Republic of the Marshall Islands, and Naoero, as well as atoll areas of Federated States of Micronesia and Palau - drought represents one of the most severe and system-wide hazards.

These environments have extremely limited natural water storage capacity. There are no significant surface water systems, and freshwater availability depends primarily on rainfall captured through rainwater harvesting systems and stored in shallow groundwater lenses. As a result, reductions in rainfall are rapidly translated into water scarcity. High temperatures further exacerbate these conditions by increasing evaporation from storage systems and soils, accelerating depletion of already limited resources. Regional analyses show that drought events associated with El Niño have historically led to severe water shortages in atoll countries, with impacts persisting long after rainfall resumes.⁴²

Exposure is effectively total across systems. Human exposure is immediate and severe, as water scarcity directly affects drinking water availability, sanitation, and hygiene. Health risks increase due to reduced water quality and quantity, while reliance on emergency water supply measures can strain limited resources and institutional capacity. Drought also disrupts WASH services, with schools and health facilities facing water shortages that reduce attendance, compromise menstrual hygiene management (MHM), and heighten risks of disease transmission among children and adolescents. These impacts disproportionately affect poorer households, women, and persons with disabilities, who face greater barriers to safe water access, caregiving, and continuity of education during prolonged drought conditions. Environmental exposure is also significant. Freshwater lenses are highly sensitive to depletion and salinisation, particularly where reduced recharge coincides with ongoing abstraction. Vegetation and agricultural systems are similarly vulnerable, with prolonged dry conditions affecting crop yields and soil quality. Food insecurity has equity dimensions, as women farmers and youth engaged in subsistence agriculture face disproportionate livelihood losses when crop yields decline. These impacts can undermine food security and increase reliance on external supply chains. Drought-related disruption of informal economies, including market vending and small trading, further affects women and youth whose livelihoods depend on reliable water and transport access.

Infrastructure exposure is a central component of drought risk. Water supply systems - particularly rainwater harvesting and storage infrastructure - are directly affected by reduced rainfall and increased evaporation. Storage capacity often becomes the limiting factor during prolonged droughts, highlighting the importance of infrastructure design and management.⁵¹ Energy systems may also be affected, particularly where water availability constrains generation or increases operational stress. Sanitation systems are highly sensitive to reduced water availability, with implications for public health. Service disruptions disproportionately affect marginalised groups, with women, youth, and persons with disabilities facing the greatest barriers to safe sanitation and reliable energy access during drought periods. The absence of alternative water sources and limited redundancy in infrastructure systems results in high systemic vulnerability to drought conditions.

Under SSP2-4.5, drought frequency and severity increase due to higher temperatures and variability in rainfall. Under SSP5-8.5, these effects are amplified, with longer and more severe drought periods driven by both reduced rainfall reliability and increased evapotranspiration.

3.4.2 High Volcanic Islands

In high volcanic and uplifted island systems - such as Fiji, Samoa, Tonga, Vanuatu, Solomon Islands, Cook Islands, and Niue - drought dynamics are more complex due to the presence of surface water systems and topographic variability.

These systems benefit from catchment-based water storage and more diverse water sources; however, they remain highly sensitive to rainfall variability. Prolonged periods of below-average rainfall reduce river flows, groundwater recharge, and reservoir levels. Increased temperatures further intensify water stress by increasing evapotranspiration from soils and vegetation. Regional climate

⁵¹ PRIF. 2021. *Water Security and Climate Resilience in the Pacific: Infrastructure Guidance*.

studies indicate that ENSO-driven drought events have historically affected these systems, reducing water availability across both rural and urban areas.¹⁸

Exposure is spatially differentiated but significant. Coastal and urban populations are particularly exposed due to high demand and dependence on centralised water supply systems. Rural communities may rely on smaller, localised water sources, which can be highly sensitive to rainfall variability. When these sources fail, WASH impacts cascade: reduced water for sanitation undermines hygiene, while schools and community facilities face interruptions that particularly affect girls' attendance during menstruation. These impacts disproportionately affect poorer households, women, and persons with disabilities, who face greater barriers to safe water access, caregiving, and continuity of education during prolonged drought conditions, while elderly persons face heightened dehydration risks and interruptions to chronic medication regimes. Limited access to credit and financial services during drought recovery can deepen inequities, as women, youth, and marginalised households often lack collateral or formal recognition in lending systems.

Environmental exposure includes impacts on catchments, soils, and ecosystems. Reduced soil moisture affects agricultural productivity, while changes in vegetation and hydrological processes can alter ecosystem function. These impacts are particularly important for subsistence farming systems, which are sensitive to both rainfall and temperature conditions. Food insecurity has equity dimensions, as women farmers and youth engaged in subsistence agriculture face disproportionate livelihood losses when crop yields decline.

Infrastructure exposure is a key determinant of overall risk. Water supply systems, including reservoirs, intakes, and distribution networks, are directly affected by reduced water availability. In some cases, infrastructure capacity may be insufficient to buffer prolonged drought conditions, leading to supply interruptions.⁵² Energy systems may also be affected, particularly where hydropower contributes to generation capacity. Increased energy demand for water pumping and treatment can further strain systems during drought periods. Service disruptions disproportionately affect marginalised groups, with women, youth, and persons with disabilities facing the greatest barriers to safe sanitation and reliable energy access during drought periods.

Drought also interacts with other hazards. Dry conditions can increase vulnerability to subsequent flooding, as hardened soils reduce infiltration and increase runoff. In addition, drought can affect recovery following cyclones by limiting water availability for reconstruction and livelihoods.

Under SSP2-4.5, increased variability in rainfall and higher temperatures lead to more frequent drought conditions. Under SSP5-8.5, these effects intensify, with greater reductions in water availability and increased stress on both natural and built systems.

3.4.3 Large High-Island Systems

In large high-island systems, particularly Papua New Guinea and parts of Solomon Islands, drought is characterised by regional variability and complex interactions between climate and hydrological systems.

These systems include extensive river basins and diverse climatic zones, resulting in uneven distribution of drought impacts. Some regions may experience significant rainfall deficits, while others remain relatively unaffected. However, prolonged dry conditions can reduce river flows, groundwater recharge, and soil moisture across large areas. Regional evidence shows that major ENSO events have resulted in widespread drought impacts in these systems, affecting both highland and lowland regions.¹⁸

Exposure extends across populations, ecosystems, and economic systems. Rural populations dependent on agriculture are particularly vulnerable, as drought reduces crop yields and affects food security. Urban populations may also be exposed where water supply systems are unable to meet demand during prolonged dry periods. Water scarcity also constrains WASH services in both rural and urban areas, with implications for school attendance, health outcomes, and gendered labour burdens

⁵² Asian Development Bank. 2020. *Pacific Water Sector and Climate Risk Assessment*. Manila.

in water collection. These burdens fall disproportionately on women and youth, who shoulder caregiving and water collection responsibilities, while persons with disabilities face heightened barriers to safe and reliable access during drought conditions.

Environmental exposure includes impacts on river systems, forests, and ecosystems. Reduced water availability can affect biodiversity, alter ecosystem processes, and increase the risk of land degradation. These impacts can have long-term implications for ecosystem services and livelihoods. Food insecurity has equity dimensions, as subsistence farmers — particularly women and youth — face disproportionate livelihood losses when agricultural productivity declines.

Infrastructure exposure is shaped by scale and system interdependence. Water supply systems, including large-scale abstraction and distribution networks, are directly affected by reduced availability. Transport systems may be indirectly affected, particularly where drought conditions impact river transport or increase the risk of land degradation.⁴³ Energy systems may also be affected, particularly where hydropower contributes to generation capacity or where increased demand places stress on supply. Service disruptions disproportionately affect marginalised groups, with poorer households, women, and persons with disabilities facing the greatest barriers to safe sanitation, energy access, and mobility when drought conditions persist.

The scale of these systems introduces the potential for cascading impacts, where water shortages affect multiple sectors simultaneously, including agriculture, energy, and public health. These impacts also increase workloads for women and youth in caregiving and water collection, while also driving livelihood losses for subsistence farmers and poorer households. Prolonged drought recovery also intensifies unpaid care and community labour demands, which are rarely recognised in formal resilience planning.

Under SSP2-4.5, drought conditions become more frequent and spatially variable. Under SSP5-8.5, increased temperatures and variability lead to more severe and widespread drought impacts, affecting larger geographic areas and increasing the likelihood of systemic disruption.

3.4.4 Summary of Drought and Water Security Exposure

Drought is a critical climate hazard in the Pacific, driven by rainfall variability, temperature increases, and large-scale climate processes such as ENSO. While its manifestation varies across geographic typologies, all PICs are exposed to increasing drought risk under future climate conditions.

Exposure extends across populations, ecosystems, and economic systems, with water availability representing the central pathway of impact. Infrastructure systems - particularly water supply - are a critical component of exposure, as they determine the ability of communities to manage and respond to drought conditions. From a social perspective, drought intensifies WASH vulnerabilities, reducing access to safe water and sanitation, disrupting education through school closures or absenteeism, and exacerbating menstrual hygiene challenges for girls. These impacts also increase workloads for women and youth in caregiving and water collection, while driving livelihood losses for subsistence farmers and poorer households. These impacts highlight the intersection of climate risk with equity and human development outcomes. Inclusive governance of drought response and adaptation financing is essential to ensure that women, youth, persons with disabilities, and SOGIESC groups are meaningfully involved in decision-making and resource allocation.

Regional studies confirm that increasing temperature and rainfall variability are likely to intensify drought conditions under both SSP2-4.5 and SSP5-8.5 scenarios, with higher-emissions pathways resulting in more severe and persistent impacts. These dynamics underscore the importance of integrated water resource management, climate-resilient infrastructure, and equity-focused adaptation strategies that reduce differentiated burdens on vulnerable groups.

3.5 Tropical Cyclones

Tropical cyclones represent one of the most significant and high-impact climate hazards affecting the PICs. These events combine multiple hazard components, including extreme winds, intense rainfall, storm surge, and coastal inundation, often occurring simultaneously and producing severe and widespread impacts.³⁴ The compound nature of tropical cyclones makes them particularly destructive,

as the interaction of these hazard drivers can amplify overall impacts across physical, ecological, and socio-economic systems.

The Pacific region is one of the most active cyclone basins globally, particularly in the South Pacific, where countries are regularly exposed to tropical cyclone activity. Cyclone behaviour is strongly influenced by ocean temperatures, atmospheric circulation patterns, and large-scale climate variability, including ENSO.⁵³ Climate change is expected to influence cyclone characteristics, with regional projections indicating an increase in the intensity of the most severe cyclones, even where total cyclone frequency may decrease or remain uncertain¹⁸. Sea-level rise further amplifies cyclone-related coastal impacts by increasing baseline water levels, thereby enhancing storm surge and coastal inundation.

3.5.1 Low-Lying Coral Atoll States

In low-lying coral atoll systems - including Kiribati, Tuvalu, Republic of the Marshall Islands, and Naoero, as well as atoll areas of Federated States of Micronesia and Palau - tropical cyclone impacts are dominated by coastal processes, particularly storm surge, wave overtopping, and inundation.

Due to their low elevation and limited landmass, these systems are highly exposed to cyclone-induced sea-level anomalies. Even relatively low-intensity cyclones or distant storm systems can generate significant wave and surge impacts, particularly when combined with high tides. Regional studies highlight that wave-driven flooding is often the primary driver of damage in atoll environments, rather than wind alone.⁴¹

Exposure in these systems is effectively total across all sectors. Human exposure is high due to the concentration of populations in coastal areas, with limited access to shelter or safe zones. Cyclone events can result in widespread displacement, damage to housing, and disruption to essential services. These impacts have equity dimensions, as women, children, and persons with disabilities often face greater challenges in accessing safe shelter, evacuation routes, and recovery assistance. Cyclones also increase unpaid workloads for women and youth in caregiving and water collection, while livelihood losses are most severe for subsistence farmers and poorer households whose assets are destroyed or whose recovery support is limited.

Environmental exposure is acute, particularly for coastal ecosystems such as coral reefs and lagoon systems, which provide natural protection but are themselves vulnerable to storm damage. Soil erosion, saltwater intrusion, and vegetation loss can have lasting impacts on agriculture and ecosystem function. These environmental impacts translate into livelihood risks, disproportionately affecting households reliant on small-scale farming and fishing.

Infrastructure exposure is particularly severe. Transport infrastructure, including airstrips, roads, and causeways, is highly vulnerable to inundation, erosion, and structural damage. Water supply systems are exposed to contamination from saltwater and debris, while energy systems are vulnerable to both wind damage and flooding.⁴³ Sanitation infrastructure is particularly sensitive, with inundation leading to system failure and public health risks. The lack of redundancy and limited spatial options for relocation mean that cyclone impacts can disrupt entire national systems. Service disruptions have equity dimensions, as poorer households, women, and persons with disabilities face the greatest barriers to safe mobility, reliable water, and sanitation access during prolonged cyclone recovery.

Under SSP2-4.5, increased cyclone intensity and sea-level rise contribute to greater storm surge impacts. Under SSP5-8.5, these effects are amplified, with higher-intensity cyclones and elevated baseline sea levels significantly increasing the extent and severity of coastal inundation.

3.5.2 High Volcanic Islands

In high volcanic and uplifted island systems - such as Fiji, Samoa, Tonga, Vanuatu, Solomon Islands, Cook Islands, and Niue - tropical cyclones generate a combination of wind, rainfall, and coastal hazards that interact with complex terrain.

⁵³ Intergovernmental Panel on Climate Change. 2021. *Climate Change 2021: The Physical Science Basis*. Cambridge University Press, Chapter 11: Weather and Climate Extreme Events.

Wind impacts are often most severe in exposed coastal areas, where infrastructure and settlements are concentrated. Intense rainfall associated with cyclones generates rapid runoff in steep catchments, leading to flash flooding and increased risk of landslides. Orographic effects can further intensify rainfall in upland areas, increasing downstream flood risk.

Exposure is multi-dimensional and spatially concentrated. Coastal populations and urban areas are highly exposed to wind damage, flooding, and storm surge, while inland communities may be affected by landslides and riverine flooding. Informal settlements are particularly vulnerable due to weaker construction and limited access to resilient infrastructure. This vulnerability disproportionately affects poorer households and marginalised groups, who are more likely to live in hazard-prone areas and lack resources for rebuilding after cyclone damage. Women and youth in these settlements often shoulder increased workloads in caregiving and water collection during recovery, while persons with disabilities face heightened barriers to evacuation, shelter access, and rebuilding support. Livelihood losses are concentrated among subsistence farmers and informal workers, who lack financial protection and face prolonged income disruption after cyclone events.

Environmental exposure includes damage to forests, coastal ecosystems, and agricultural systems. Cyclones can cause widespread vegetation loss, soil erosion, and degradation of coastal ecosystems, with implications for biodiversity and livelihoods.

Infrastructure exposure is a major driver of impact. Transport networks, including roads and bridges, are highly vulnerable to flooding, landslides, and wind damage.⁴² Ports and coastal infrastructure are exposed to storm surge and wave action, while energy systems are vulnerable to both wind damage and flooding. Water supply systems are affected by turbidity, infrastructure damage, and contamination during cyclone events.

The interaction of these hazard components often results in cascading impacts. For example, damage to transport networks can limit access to affected areas, while power outages can disrupt water supply and communication systems. Under SSP2-4.5, increased cyclone intensity leads to more frequent high-impact events. Under SSP5-8.5, further increases in intensity, combined with sea-level rise, significantly amplify impacts across all hazard pathways.

3.5.3 Large High-Island Systems

In large high-island systems, particularly Papua New Guinea and parts of Solomon Islands, tropical cyclone impacts are characterised by scale, variability, and the interaction of multiple hazard pathways.

These systems experience a combination of strong winds, intense rainfall, and widespread flooding during cyclone events. Large river basins can generate extensive flooding following prolonged rainfall, while steep terrain increases the risk of landslides. The spatial scale of these systems means that cyclone impacts can extend across large geographic areas, affecting multiple regions simultaneously.

Exposure extends across populations, ecosystems, and economic systems. Coastal and urban populations are exposed to wind and surge impacts, while inland populations may experience flooding and landslides. Economic exposure includes impacts on agriculture, forestry, and infrastructure-dependent sectors. Social exposure is also significant: rural women, youth, and persons with disabilities often face barriers to mobility and access to services during cyclone events, compounding recovery challenges. These barriers translate into heavier labour burdens for women and youth in caregiving and water collection, while livelihood losses are most severe for subsistence farmers and poorer households whose crops, housing, and informal income sources are destroyed.

Environmental exposure includes damage to forests, river systems, and ecosystems, with long-term implications for biodiversity and ecosystem services. Cyclone impacts can alter hydrological processes, increase sediment transport, and degrade natural systems.

Infrastructure exposure is shaped by scale and interdependence. Transport networks are critical for connectivity and are highly sensitive to cyclone impacts, including flooding, landslides, and structural

damage.⁵⁴ Damage to these networks can isolate communities and disrupt economic activity. Energy and water systems are similarly exposed, with impacts potentially propagating across regions due to network interconnections.

The scale of these systems increases the likelihood of cascading impacts, where disruption in one sector affects multiple others. Under SSP2-4.5, increased cyclone intensity leads to more frequent high-impact events. Under SSP5-8.5, further intensification and sea-level rise significantly increase the scale and severity of impacts.

3.5.4 Summary

Tropical cyclones are among the most significant climate hazards in the Pacific, characterised by their compound nature and potential for widespread and severe impacts. Climate change is expected to increase the intensity of the most severe cyclones, while sea-level rise amplifies coastal impacts.

Exposure varies across geographic typologies but is universally high. Atoll systems face system-wide exposure to storm surge and inundation, volcanic systems experience multi-hazard impacts across coastal and inland areas, and large island systems experience complex, large-scale impacts across multiple hazard pathways.

Exposure extends across populations, ecosystems, and economic systems, with infrastructure representing a critical component due to its role in connectivity and service delivery. Across all typologies, infrastructure systems are highly vulnerable to cyclone impacts, including wind damage, flooding, and cascading failures across interconnected networks. These differentiated impacts are most acute for poorer households, women, youth, and persons with disabilities, who face heavier labour burdens in caregiving and water collection, limited access to safe evacuation and shelter, and prolonged livelihood disruption when subsistence farming, informal work, and small-scale fisheries are damaged. This underscores the need for equity-focused adaptation strategies that reduce workload burdens and strengthen livelihood resilience alongside physical infrastructure protection. and livelihood loss disproportionately affecting marginalised groups across the Pacific.

3.6 Coastal Inundation and Sea Level Rise

Coastal inundation and sea-level rise represent some of the most critical and systemic climate hazards facing the PICs. Unlike episodic hazards, sea-level rise is a chronic, progressive process that elevates baseline water levels, thereby increasing the frequency and severity of coastal flooding, erosion, and saline intrusion.²⁸ These processes interact with other hazards, particularly storm surge and wave action during tropical cyclones, to produce compound coastal impacts.

Relative sea-level rise in the Pacific is influenced by both global mean sea-level change and regional oceanographic processes, including ocean circulation, thermal expansion, and vertical land movement. Regional assessments indicate that parts of the Pacific are already experiencing sea-level rise at or above the global average, with projections showing continued acceleration under both SSP2-4.5 and SSP5-8.5 scenarios.⁶⁴ Importantly, even small increases in mean sea level can lead to disproportionate increases in the frequency of extreme sea-level events, meaning that what are currently rare coastal flooding events may become annual or more frequent occurrences.

Coastal inundation in PICs is therefore not limited to permanent land loss but includes a spectrum of impacts, including episodic flooding, chronic tidal inundation, wave overtopping, and saline intrusion into freshwater systems.⁴⁶ These processes are strongly shaped by geographic typology and have far-reaching implications for populations, ecosystems, economic systems, and infrastructure.

3.6.1 Low-Lying Coral Atoll States

In low-lying coral atoll systems - including Kiribati, Tuvalu, Republic of the Marshall Islands, and Naoero, as well as atoll areas of Federated States of Micronesia and Palau - coastal inundation represents an existential, system-wide hazard.

⁵⁴ World Bank. 2020. *Lifelines: The Resilient Infrastructure Opportunity*. Washington, DC.

These systems are typically only one to two metres above mean sea level, with narrow landforms and strong dependence on coastal processes. As sea levels rise, the frequency of tidal inundation and wave-driven flooding increases significantly. Regional studies emphasise that wave overtopping during high tides and storm events is already a primary driver of flooding in many atoll systems, and this is expected to intensify under future scenarios.⁵²

Exposure is effectively total across all systems. Human exposure is extremely high, as settlements are located entirely within coastal zones. Even minor increases in sea level can lead to more frequent flooding of homes, displacement, and loss of habitable land. In many atoll countries, this translates into relocation pressures, with households facing loss of ancestral land, cultural identity, and social cohesion. Relocation carries risks of inequitable access to land, disruption of livelihoods, and heightened vulnerability for women, children, and persons with disabilities who often have fewer resources to adapt. These groups face specific challenges: women and youth often carry heavier caregiving and water collection burdens during displacement, while persons with disabilities encounter barriers to safe relocation, shelter access, and continuity of services. Livelihood losses are concentrated among subsistence farmers, informal workers, and small-scale fishers, who lack financial protection and face prolonged income disruption when coastal land and ecosystems are degraded.

Environmental exposure is acute, particularly for freshwater lenses, which are highly sensitive to saline intrusion. Increased inundation can contaminate groundwater resources, reduce soil fertility, and damage vegetation. Coastal ecosystems, including reefs and lagoons, may also be affected by changing wave and sediment dynamics, although they may provide some buffering capacity where healthy. Degradation of these ecosystems has equity dimensions, as poorer households and women reliant on small-scale farming and fishing face disproportionate livelihood risks when protective natural systems fail.

Infrastructure exposure is particularly critical and often represents the limiting factor for resilience. Transport infrastructure - including roads, causeways, and airstrips - is highly vulnerable to inundation, erosion, and overtopping, with direct implications for connectivity and emergency response.⁴³ Water supply systems are exposed to both contamination and depletion, particularly where groundwater resources are affected by salinity. Energy infrastructure, including generation and distribution systems, is vulnerable to flooding and corrosion, while sanitation systems are highly sensitive to inundation and can fail under repeated flooding conditions. Service disruptions disproportionately affect poorer households, women, and persons with disabilities, who rely most heavily on public infrastructure for health, water, and mobility during prolonged inundation events.

Under SSP2-4.5, increases in sea level lead to a significant rise in the frequency of coastal flooding events. Under SSP5-8.5, these processes intensify, with substantial increases in both the frequency and duration of inundation, potentially rendering some areas increasingly uninhabitable without significant adaptation measures. These dynamics underscore the importance of equity-focused relocation planning, livelihood protection, and accessible infrastructure design to reduce differentiated burdens on vulnerable groups.

3.6.2 High Volcanic and Uplifted Island Systems

In high volcanic and uplifted island systems - such as Fiji, Samoa, Tonga, Vanuatu, Solomon Islands, Cook Islands, and Niue - coastal inundation is more spatially constrained but remains a major hazard due to the concentration of assets in coastal zones.

These systems benefit from higher elevations and more complex topography, which provide some protection from widespread inundation. However, coastal plains and low-lying urban areas are highly exposed to sea-level rise, storm surge, and wave action. Regional analyses indicate that many key urban centres and infrastructure assets in these countries are located within zones that are vulnerable to coastal flooding.⁵¹

Exposure is therefore highly concentrated in coastal zones, where population density and economic activity are greatest. Human exposure includes risks to housing, livelihoods, and access to services, particularly in urban and peri-urban areas. Where relocation from coastal zones becomes necessary,

informal settlements and low-income households face particular challenges in securing safe land tenure and adequate services, increasing risks of exclusion and social tension. These challenges disproportionately affect women and youth, who often lack secure tenure and face heavier caregiving and water collection burdens during relocation, while persons with disabilities encounter barriers to accessible housing and continuity of services. Livelihood losses are concentrated among poorer households and informal workers whose income sources are tied to vulnerable coastal zones

Environmental exposure includes impacts on coastal ecosystems, including mangroves, coral reefs, and beaches. These systems play a critical role in coastal protection but are themselves vulnerable to changes in sea level, sediment dynamics, and human pressures. Degradation of these ecosystems has equity dimensions, as women and small-scale fishers reliant on coastal resources face disproportionate livelihood risks when protective natural systems fail.

Infrastructure exposure is a central concern. Ports, airports, coastal roads, and urban infrastructure are often located in low-lying areas, making them highly vulnerable to inundation and erosion.⁵⁵ Water supply systems, particularly those located near the coast, may be affected by saline intrusion, while wastewater and drainage systems are vulnerable to backflow and reduced efficiency under elevated sea levels. Service disruptions disproportionately affect poorer households, women, and persons with disabilities, who rely most heavily on public infrastructure for health, water, and mobility during prolonged inundation events

The interaction between sea-level rise and extreme events is particularly important. Storm surge and wave action during cyclones can lead to significant coastal flooding, with impacts extending inland. Under SSP2-4.5, these interactions lead to increased frequency of coastal flooding in exposed areas. Under SSP5-8.5, higher sea levels and more intense storm conditions significantly increase the magnitude and extent of coastal impacts.

3.6.3 Large High-Island Systems

In large high-island systems, particularly Papua New Guinea and parts of Solomon Islands, coastal inundation is influenced by both sea-level rise and the complexity of coastal and river systems.

These systems include extensive and diverse coastlines, with varying levels of exposure depending on local topography, coastal morphology, and settlement patterns. While higher elevations reduce the extent of direct inundation compared to atoll systems, many key population centres and infrastructure assets are located in low-lying coastal areas and deltas, which are highly vulnerable.

Exposure extends across populations, ecosystems, and economic systems. Coastal communities are exposed to flooding, erosion, and saline intrusion, while economic activities such as agriculture, fisheries, and ports are highly sensitive to coastal changes. In delta regions, relocation from flood-prone areas can fragment communities and disrupt access to services, with rural women and youth disproportionately affected when social networks and support systems are weakened. These groups face heavier caregiving and water collection burdens during displacement, while livelihood losses are concentrated among subsistence farmers, informal workers, and small-scale fishers whose assets and income sources are most exposed to coastal degradation. Persons with disabilities face heightened barriers to relocation and continuity of services.

Environmental exposure includes impacts on coastal and deltaic ecosystems, including mangroves, wetlands, and river systems. Changes in sea level can alter sediment transport, increase erosion, and affect ecosystem function. Loss of these ecosystems has equity dimensions, as poorer households and women reliant on subsistence farming and fishing face disproportionate livelihood risks when protective natural systems fail.

Infrastructure exposure is shaped by scale and interdependence. Coastal transport infrastructure, including ports and road networks, is critical for connectivity and is highly vulnerable to inundation and erosion⁵⁴. Water and energy systems located in coastal zones are exposed to flooding and saline intrusion, while inland systems may be indirectly affected through disruption of coastal infrastructure.

⁵⁵ Asian Development Bank. 2021. *Pacific Urban Development and Infrastructure Resilience Assessment*. Manila.

Service disruptions disproportionately affect marginalised groups, with poorer households, women, and persons with disabilities facing the greatest barriers to safe mobility, reliable water, and energy access when coastal infrastructure fails.

The scale of these systems increases the potential for cascading impacts, where coastal flooding disrupts transport and supply chains, affecting broader economic and social systems. Under SSP2-4.5, increases in sea level lead to more frequent coastal flooding in exposed areas. Under SSP5-8.5, these impacts become more widespread and severe, particularly in low-lying coastal and delta regions.

3.6.4 Summary

Coastal inundation and sea-level rise represent a fundamental and escalating risk across the Pacific, driven by rising baseline sea levels and amplified by storm surge and wave processes. Regional evidence indicates that even modest increases in sea level can lead to large increases in the frequency of coastal flooding events.

Exposure varies by geographic typology but is universally significant. Atoll systems face system-wide exposure with limited adaptive capacity, volcanic systems experience concentrated exposure in coastal zones, and large island systems experience complex and spatially variable exposure across extensive coastlines.

Exposure extends across populations, ecosystems, and economic systems, with infrastructure representing a critical component due to its role in enabling connectivity and service delivery. Across all typologies, infrastructure systems are highly vulnerable to coastal inundation, including transport, water, energy, and sanitation systems. Beyond infrastructure, relocation linked to sea-level rise introduces long-term social risks: loss of land-rights, cultural heritage, and community cohesion. These impacts underscore that adaptation must address not only physical exposure but also the equity dimensions of displacement and resettlement. These equity dimensions include heavier caregiving and water collection burdens for women and youth during relocation, heightened barriers for persons with disabilities in accessing safe housing and services, and livelihood losses concentrated among subsistence farmers, informal workers, and small-scale fishers whose income sources are tied to vulnerable coastal zones.

Under both SSP2-4.5 and SSP5-8.5 scenarios, coastal risks increase substantially, with higher-emissions pathways leading to more frequent, severe, and persistent impacts. These dynamics highlight the importance of integrating sea-level rise projections into long-term planning and infrastructure design. These dynamics highlight the importance of integrating sea-level rise projections into long-term planning and infrastructure design, alongside equity-focused relocation strategies and livelihood protection measures that reduce differentiated burdens on vulnerable groups

3.7 Cross-Hazard Interactions and Compound Risk

Climate hazards in the PICs do not occur in isolation. Instead, they interact across temporal and spatial scales to produce compound and cascading risks that amplify overall impacts. These interactions occur when multiple hazards occur simultaneously or sequentially, or when one hazard alters the conditions under which another hazard operates.³⁹ In small island contexts, where physical systems are tightly coupled and infrastructure networks are highly interdependent, these interactions are particularly significant.

Compound risk in the Pacific is driven by the convergence of atmospheric, oceanic, and terrestrial processes. For example, tropical cyclones combine extreme winds, intense rainfall, and storm surge, while sea-level rise increases the baseline upon which these events occur, amplifying coastal inundation. Similarly, drought conditions can reduce soil moisture and vegetation cover, increasing runoff and flood risk when rainfall returns.²² Climate change is expected to intensify these interactions by increasing the magnitude and frequency of individual hazards and by altering baseline environmental conditions.

Exposure to compound hazards extends across populations, ecosystems, economic systems, and infrastructure. However, infrastructure systems play a particularly critical role, as they both experience

direct impacts and act as pathways for cascading failures. Disruption in one system - such as transport or energy - can propagate across other systems, amplifying overall risk.

3.7.1 Low-Lying Coral Atoll Systems

In low-lying coral atoll systems - including Kiribati, Tuvalu, Republic of the Marshall Islands, and Naoero, as well as atoll areas of Federated States of Micronesia and Palau - compound risk is dominated by the interaction of ocean-driven and hydrological processes.

Sea-level rise elevates baseline water levels, increasing the frequency of tidal inundation and reducing drainage capacity. When combined with heavy rainfall, this leads to prolonged flooding, as water cannot effectively drain from island surfaces. During tropical cyclones, storm surge and wave overtopping further amplify these effects, resulting in widespread and persistent inundation.⁵⁶ These processes can occur simultaneously, creating compound flood conditions that are significantly more severe than individual hazards alone.

Sequential hazards also play an important role. Drought conditions can deplete freshwater lenses, reducing water availability and increasing dependence on stored water. Subsequent flooding can contaminate these limited resources, creating a combined water scarcity and water quality crisis. Heat further exacerbates these conditions by increasing water demand and evaporation.

Exposure in these systems is fully systemic. Human populations are affected simultaneously across entire islands, with limited capacity for relocation or shelter. Where relocation becomes unavoidable, households face loss of land rights, cultural heritage, and community cohesion. Relocation processes carry risks of inequitable access to land and services, with women, children, and persons with disabilities often experiencing the greatest disruption to education, livelihoods, and social support networks. Compound hazards intensify unpaid caregiving and community labour demands, which fall disproportionately on women and youth and are rarely recognised in formal resilience planning. Compound hazards also strain governance and institutional capacity, as emergency response systems must manage overlapping crises with limited resources. These pressures often result in uneven recovery support, with poorer households and marginalised groups receiving delayed or inadequate assistance compared to better-resourced communities.

Environmental systems, including freshwater lenses and soils, are highly sensitive to both drought and saline intrusion. Economic activities, particularly subsistence agriculture and fisheries, are affected by changes in water availability and ecosystem health. When hazards occur sequentially, livelihood recovery windows shrink, leaving women farmers, youth, and informal workers particularly exposed to prolonged income disruption.

Infrastructure plays a central role in both exposure and risk propagation. Water systems are highly vulnerable to both drought and flooding, with limited redundancy and storage capacity. Energy systems are affected by both physical damage and increased demand during extreme conditions. Transport infrastructure is exposed to repeated inundation, affecting connectivity and access to services.⁴³ The tight coupling of these systems means that failure in one component can rapidly propagate across others, resulting in system-wide disruption. These cascading failures highlight institutional equity challenges, as service restoration often prioritises urban centres, leaving rural and marginalised populations with longer recovery times and reduced access to essential services.

Under SSP2-4.5, compound interactions become more frequent, particularly through the interaction of rainfall and sea-level rise. Under SSP5-8.5, these interactions intensify significantly, with higher sea levels, more intense rainfall, and increased heat leading to persistent multi-hazard conditions.

3.7.2 High Volcanic and Uplifted Island Systems

In high volcanic and uplifted island systems - such as Fiji, Samoa, Tonga, Vanuatu, Solomon Islands, Cook Islands, and Niue - compound risk arises from the interaction of multiple hazard pathways across complex terrain.

⁵⁶ PRIF. 2021. *Climate Resilient Infrastructure in the Pacific: Guidance for Practitioners*.

Tropical cyclones generate concurrent wind, rainfall, and coastal hazards, with intense rainfall producing rapid runoff in steep catchments and increasing flood risk in downstream areas. Landslides triggered by saturated soils can block river channels, exacerbating flooding and creating secondary hazards. At the same time, sea-level rise increases the extent of coastal flooding during storm surge events, extending impacts further inland.

Sequential interactions are also important. Drought conditions can reduce soil moisture and vegetation cover, increasing susceptibility to erosion and landslides during subsequent rainfall events. Heat can exacerbate water stress during drought and increase demand for energy and water, placing additional strain on infrastructure systems.

Exposure is multi-dimensional and spatially concentrated. Coastal populations and infrastructure are exposed to multiple hazards simultaneously, while inland areas experience interactions between rainfall, flooding, and slope instability. In some cases, relocation from hazard-prone slopes or floodplains is necessary, but social risks arise when informal settlements are moved without secure tenure or adequate services, creating long-term vulnerability and potential social tension. These relocation processes often exclude women, youth, and persons with disabilities from decision-making, increasing inequities in tenure security and access to services. Environmental systems, including catchments and coastal ecosystems, are affected by changes in hydrological and sediment processes.

Infrastructure exposure is particularly important in shaping overall risk. Transport networks, often aligned along coasts and river valleys, are vulnerable to flooding, landslides, and erosion. Water systems are exposed to both drought and flood-related impacts, affecting both availability and quality. Energy systems are affected by both physical damage and increased demand during extreme conditions.⁴³ The interdependence of these systems creates the potential for cascading impacts, where disruption in one sector affects multiple others.

Under SSP2-4.5, these compound interactions become more frequent and more intense. Under SSP5-8.5, increased hazard intensity and reduced buffering capacity significantly amplify compound risk, particularly in coastal and urban areas.

3.7.3 Large High-Island Systems

In large high-island systems, particularly Papua New Guinea and parts of Solomon Islands, compound risk is characterised by scale, spatial variability, and system interconnection.

These systems experience interactions between large-scale hydrological processes, climatic variability, and complex terrain. Prolonged rainfall can generate widespread riverine flooding across multiple catchments, while localised intense rainfall can produce flash flooding and landslides. Coastal flooding may occur simultaneously, particularly during cyclone events, creating multi-hazard conditions across large geographic areas.

Sequential hazards are also significant. Drought conditions can reduce water availability and affect agricultural productivity, while subsequent extreme rainfall events can lead to flooding and erosion. Heat interacts with both drought and flooding, increasing stress on populations and infrastructure systems.

Exposure extends across populations, ecosystems, and economic systems. Rural populations dependent on agriculture are particularly vulnerable to combined drought and flood impacts, while urban populations may experience compounded impacts from flooding, heat, and infrastructure disruption. Relocation from flood-prone river valleys or coastal deltas can fragment communities and disrupt access to services, with rural women and youth disproportionately affected when social networks and support systems are weakened. These disruptions translate into heavier caregiving and water collection burdens for women and youth, while livelihood losses are concentrated among subsistence farmers and informal workers whose crops, housing, and income sources are repeatedly exposed to sequential hazards. Persons with disabilities face heightened barriers to relocation and continuity of services during multi-hazard events. Sequential hazards shorten recovery windows,

leaving women farmers, youth, and informal workers particularly exposed to prolonged income disruption and inequitable access to recovery support.

Infrastructure exposure is shaped by scale and network interdependence. Transport systems are critical for connectivity and are highly vulnerable to disruption from flooding and landslides. Water and energy systems are similarly exposed, with impacts potentially propagating across regions.⁵⁴ The scale of these systems increases the likelihood of cascading impacts, where disruption in one area affects multiple regions and sectors. Cascading failures often result in inequitable recovery, as service restoration prioritises urban centres, leaving rural and marginalised populations with longer recovery times and reduced access to essential services. Institutional accountability is critical to ensure that recovery resources are distributed fairly and that vulnerable groups are not excluded from service restoration.

Under SSP2-4.5, compound hazards become more frequent and widespread. Under SSP5-8.5, increased hazard intensity and variability significantly amplify compound risk, leading to more complex and persistent multi-hazard conditions.

3.7.4 Summary

Cross-hazard interactions and compound risk are defining characteristics of climate risk in the Pacific. Hazards interact across physical systems and over time, producing impacts that are greater than the sum of individual hazards.

Exposure extends across populations, ecosystems, and economic systems, with infrastructure playing a central role both as an exposed system and as a pathway for cascading impacts. Across all geographic typologies, infrastructure systems - including transport, water, and energy - are critical to resilience but are also highly vulnerable to compound hazard conditions. From a social perspective, compound risks intensify displacement pressures and can disrupt access to essential services, with vulnerable groups facing greater challenges in recovery and adaptation. Sequential hazards shorten recovery windows, leaving subsistence farmers, informal workers, and small-scale fishers particularly exposed to prolonged livelihood disruption. Women and youth often face heavier caregiving and water collection burdens during recovery, while persons with disabilities encounter persistent barriers to evacuation, relocation, and continuity of services. Institutional accountability is essential, as uneven recovery support and exclusion from decision-making processes can deepen inequities for poorer households, women, youth, people with disabilities, and other groups that are vulnerable and underrepresented.

Regional and global evidence indicates that climate change will intensify both individual hazards and their interactions, particularly under higher-emissions scenarios. This will increase the frequency, magnitude, and complexity of compound events, with significant implications for planning, design, and risk management. These dynamics underscore the need for adaptation strategies that strengthen institutional capacity, ensure equitable recovery support, and integrate compound risk into long-term planning frameworks, with explicit attention to differentiated workloads, livelihood protection, and service access for vulnerable groups.

4 Impacts and Vulnerabilities

4.1 Overall Vulnerability

Climate change impacts across the Pacific Island Countries (PICs) are determined not only by the magnitude and frequency of hazards, as outlined in Section 4, but also by the underlying vulnerability of exposed systems. Vulnerability in the Pacific context is systemic and multi-layered, reflecting the interaction between biophysical constraints, socio-economic structures, infrastructure limitations, and institutional capacity.³⁹ These characteristics are widely recognised in both global and regional assessments as defining features of small island developing states, where exposure and vulnerability are closely coupled.⁵⁷

A defining feature of vulnerability in PICs is the coincidence of high exposure and constrained adaptive capacity, which results in disproportionate impacts from climate hazards relative to global averages.³⁸ Many countries are characterised by small land areas, dispersed populations, and limited natural resource bases, which restrict opportunities for risk avoidance, diversification, and relocation. These constraints are further compounded by economic structures that are highly dependent on climate-sensitive sectors, including agriculture, fisheries, and tourism, and by reliance on imported goods and external financial flows.⁴³ These systemic constraints translate into differentiated impacts: women and youth concentrated in subsistence farming and informal work face heightened livelihood insecurity, while persons with disabilities encounter persistent barriers to relocation, service continuity, and participation in adaptation planning.

The influence of climate change on vulnerability is further shaped by the progressive intensification of climate drivers under different emission scenarios. Under SSP2-4.5, increases in temperature, rainfall variability, and sea level contribute to a gradual intensification of existing risks. Under SSP5-8.5, these changes are more pronounced, resulting in non-linear increases in hazard intensity and frequency, and in some cases, the emergence of conditions beyond historical experience.¹¹ Regional assessments indicate that such threshold effects are particularly relevant in small island systems, where environmental and infrastructure limits may be reached rapidly.¹⁸ Threshold effects also exacerbate inequities, as poorer households, women, and marginalised groups have fewer buffers and resources to absorb shocks, accelerating vulnerability beyond historical baselines. These inequities are compounded when adaptation financing and relocation governance fail to include women, youth, and persons with disabilities in decision-making.

4.2 Drivers of Vulnerability

Vulnerability across PICs is driven by a combination of interrelated factors that operate across economic, social, environmental, infrastructural, and institutional domains. These drivers influence both the degree of impact experienced during climate events and the capacity of systems to anticipate, absorb, and recover from those impacts.

Economic vulnerability is a central driver. Many PIC economies are small, undiversified, and highly exposed to external shocks. Key sectors - including subsistence and commercial agriculture, fisheries, and tourism - are directly sensitive to climate variability and extreme events, meaning that disruptions can rapidly translate into economy-wide impacts.⁵⁵ Fiscal constraints further exacerbate vulnerability, with high public debt levels and limited domestic revenue reducing the ability of governments to invest in climate-resilient infrastructure and recovery measures.⁵⁸ High transport costs and geographic isolation increase the cost of imports, including food, fuel, and construction materials, further constraining adaptive capacity.⁵⁹ These costs fall most heavily on poorer households and women-headed households, who have fewer resources to absorb price shocks and limited access to

⁵⁷ World Bank. 2017. *Pacific Possible: Long-Term Economic Opportunities and Challenges for Pacific Island Countries*. Washington, DC.

⁵⁸ Asian Development Bank. 2021. *Pacific Economic Monitor*. Manila.

⁵⁹ Footnote 10, Chapter 15. Intergovernmental Panel on Climate Change. 2022. *Climate Change 2022: Impacts, Adaptation and Vulnerability*. Contribution of Working Group II to the Sixth Assessment Report. Cambridge University Press, Chapter 15: Small Islands.

financial protection mechanisms. Youth and informal workers are similarly excluded from formal credit and insurance systems, leaving them disproportionately exposed to prolonged livelihood disruption.

Social vulnerability reflects patterns of settlement, access to services, and demographic characteristics. Populations are often concentrated in coastal zones, where exposure to hazards such as flooding, cyclones, and sea-level rise is highest.⁴³ At the same time, rural and outer island communities may experience limited access to essential services, including healthcare, education, and infrastructure, reducing their ability to respond to climate shocks. Informal settlements, particularly in rapidly urbanising areas, are frequently located in hazard-prone locations and are characterised by limited access to resilient housing and basic services.⁶⁰ Gender dimensions of vulnerability are also significant, with women and marginalised groups often facing disproportionate impacts due to differences in access to resources, livelihoods, and decision-making processes.⁶¹ Intersectional factors compound these risks: women and youth carry heavier caregiving and water collection burdens during climate shocks, persons with disabilities face barriers to evacuation and safe shelter, and marginalised groups are often excluded from formal recovery and adaptation decision-making.

Environmental vulnerability is closely linked to the limited natural resource base of many PICs. Freshwater availability is constrained, particularly in atoll systems where water resources depend on rainfall and shallow groundwater lenses. Changes in temperature and rainfall patterns affect evapotranspiration, soil moisture, and hydrological processes, with implications for agriculture and water security.⁵⁴ Coastal ecosystems, including coral reefs and mangroves, provide critical protective and productive functions but are themselves vulnerable to climate change and other stressors.⁶² Degradation of these systems reduces their capacity to buffer hazards, increasing overall vulnerability. This degradation disproportionately affects subsistence farmers, women reliant on small-scale agriculture, and fishers whose livelihoods depend directly on fragile ecosystems. Youth and informal workers dependent on coastal and marine resources also face heightened livelihood insecurity when ecosystems collapse.

Infrastructure vulnerability is a key determinant of climate risk. Infrastructure systems in PICs are often characterised by high exposure to hazards, limited redundancy, and constraints in design, construction, and maintenance. Transport infrastructure is frequently located in coastal zones and is highly exposed to flooding, erosion, and storm damage. Water supply systems are sensitive to both drought and contamination, while energy systems face increasing demand under rising temperatures and are vulnerable to physical damage from extreme events.⁵⁶ The interdependence of infrastructure systems means that failures can propagate across sectors, resulting in cascading impacts that amplify overall risk.⁵⁴ Service disruptions have equity dimensions: poorer households, women, and persons with disabilities face the greatest barriers to safe mobility, reliable water, and energy access during prolonged recovery periods. Youth and informal workers reliant on transport and energy systems for income generation are also disproportionately affected when cascading failures disrupt informal economies.

Institutional vulnerability further shapes the ability of countries to manage climate risks. While many PICs have established policy frameworks for climate adaptation and disaster risk management, implementation is often constrained by limited technical, financial, and human resources. Coordination across sectors and levels of government can be challenging, particularly in the context of complex, multi-hazard risks.⁶³ At the same time, traditional governance systems and community networks provide important sources of resilience, although these may be under increasing pressure as climate risks intensify.⁴³ Institutional gaps often result in uneven recovery support, with women, youth, and marginalised groups receiving delayed or inadequate assistance compared to

⁶⁰ Asian Development Bank. 2020. *Pacific Urban Development and Climate Risk Assessment*. Manila

⁶¹ United Nations Development Programme (UNDP). 2021. *Gender, Climate Change and Disaster Risk in the Pacific*.

⁶² Secretariat of the Pacific Regional Environment Programme (SPREP). 2019. *State of the Environment and Conservation in the Pacific Islands Region*.

⁶³ United Nations Office for Disaster Risk Reduction. 2022. *Global Assessment Report on Disaster Risk Reduction*.

better-resourced communities. Persons with disabilities are frequently excluded from consultation processes, limiting accountability and reducing the inclusiveness of adaptation planning. Strengthening inclusive governance and ensuring women's participation in decision-making are critical to reducing systemic vulnerability, alongside explicit mechanisms to include youth and persons with disabilities. Strengthening inclusive governance and ensuring women's participation in decision-making are critical to reducing systemic vulnerability.

4.3 Vulnerability by Geographic Typology

The vulnerability of PICs to climate change is strongly structured by geographic typology, which shapes the interaction between hazard exposure, system sensitivity, and adaptive capacity. As established in Sections 3 and 4, the three dominant typologies - low-lying coral atoll systems, high volcanic and uplifted island systems, and large high-island systems - exhibit fundamentally different vulnerability pathways. These pathways are defined not only by physical characteristics, but also by patterns of settlement, infrastructure configuration, economic structure, and institutional capacity.

Importantly, vulnerability within each typology is not static but evolves under changing climate conditions. Under SSP2-4.5, vulnerability increases progressively as hazard intensity and variability rise. Under SSP5-8.5, these dynamics are amplified, with the potential for threshold exceedance in environmental and infrastructure systems, leading to non-linear and potentially irreversible impacts.³⁹ These dynamics underscore the importance of equity-focused adaptation strategies tailored to each typology, ensuring that relocation, livelihood protection, and service continuity measures explicitly address the differentiated burdens faced by women, youth, and persons with disabilities.

4.3.1 Low-Lying Coral Atoll Systems

In low-lying coral atoll systems - including Kiribati, Tuvalu, Republic of the Marshall Islands, and Naoero - vulnerability is characterised by the convergence of extreme exposure, high system sensitivity, and severely constrained adaptive capacity.

At the core of vulnerability in these systems is the hydro-geophysical constraint of freshwater availability. Freshwater lenses, which depend on rainfall recharge, are highly sensitive to both drought and saline intrusion from sea-level rise and coastal inundation.⁵¹ Under drought conditions, reduced recharge and increased evapotranspiration lead to rapid depletion of water reserves. Subsequent flooding or wave overtopping events can contaminate these limited resources with saline water, resulting in compound water security crises. This creates a critical vulnerability pathway linking climate variability directly to public health, food security, and economic stability. These crises have intersectional impacts: women and girls face heightened burdens in water collection and caregiving, while persons with disabilities encounter barriers to safe access and continuity of health services. Youth also face disrupted education and livelihood pathways when water insecurity forces school closures or reduces opportunities in subsistence farming and fisheries.

Land constraints further intensify vulnerability. With land elevations often less than two metres above mean sea level, there is minimal capacity for spatial adaptation or retreat. Sea-level rise increases the frequency of tidal inundation and wave-driven flooding, progressively reducing habitable land area and damaging infrastructure.⁶⁴ Under SSP5-8.5, regional projections indicate that extreme sea-level events may become annual occurrences, significantly increasing the likelihood of chronic inundation. Forced migration and relocation carry risks of inequitable land access, loss of cultural identity, and exclusion of women, youth, and marginalised groups from resettlement planning and decision-making. Institutional accountability is critical to ensure relocation processes include persons with disabilities and do not reinforce existing inequities.

Economic vulnerability is amplified by limited diversification and strong dependence on climate-sensitive sectors. Fisheries and subsistence agriculture are directly affected by changes in ocean conditions, temperature, and water availability. External dependence on imported food and fuel further increases sensitivity to disruptions in transport systems, which may be affected by climate hazards. Livelihood insecurity is most acute for women, youth, and informal workers concentrated in

⁶⁴ Asian Development Bank 2022. *Sea-Level Change in the Pacific Islands Region: A Review of Evidence to Inform Guidance on Selecting Sea-Level Projections for Climate Risk and Adaptation Assessments*. Manila.

subsistence farming and small-scale fisheries, who lack financial protection and face prolonged income disruption.

Infrastructure systems represent both a point of vulnerability and a constraint on adaptation. Water supply infrastructure is highly sensitive to both drought and contamination, with limited storage capacity often acting as a bottleneck during prolonged dry periods.⁴³ Transport infrastructure, including airstrips and causeways, is frequently located at low elevations and is highly exposed to flooding and erosion, affecting connectivity and access to essential services. Energy systems are similarly vulnerable, with exposure to both physical damage and increased demand under heat stress conditions. Service disruptions disproportionately affect poorer households, women, and persons with disabilities, who rely most heavily on public infrastructure for mobility, water, and energy access during recovery.

Social vulnerability is compounded by high population densities in limited areas, limited access to alternative livelihoods, and constraints on mobility. Gender and social inequalities may further exacerbate vulnerability, particularly in relation to access to water, health services, and decision-making processes.⁶¹ Intersectional inequities mean that women and girls face intensified caregiving and health burdens, youth experience disrupted education and livelihood pathways, and persons with disabilities are often excluded from evacuation, shelter, and adaptation planning.

The interaction of these factors results in a highly constrained adaptation space, where options are limited and often costly. Under higher-emissions scenarios, the combination of increasing hazard intensity and structural constraints may lead to transformational impacts, including loss of habitable land and forced migration. Ensuring inclusive adaptation planning, women's empowerment, and equitable relocation strategies is critical to reducing systemic vulnerability in atoll contexts.

4.3.2 High Volcanic and Uplifted Island Systems

In high volcanic and uplifted island systems - such as Fiji, Samoa, Tonga, Vanuatu, Solomon Islands, Cook Islands, and Niue - vulnerability is characterised by spatial concentration of exposure combined with multi-hazard sensitivity.

A defining feature of these systems is the coastal concentration of population and infrastructure, which creates a strong linkage between hazard exposure and economic and social vulnerability. Coastal zones are exposed to multiple hazards, including flooding, storm surge, cyclones, and heat, while inland areas may experience landslides and hydrological variability.¹⁸ This results in overlapping exposure pathways, where multiple hazards affect the same assets and populations. Social vulnerability is intensified in these zones, as poorer households, women, and youth are more likely to reside in informal settlements with weaker construction, limited drainage, and restricted access to resilient infrastructure. Persons with disabilities face heightened barriers to evacuation and safe shelter in hazard-prone areas.

Hydrological processes play a key role in shaping vulnerability. Intense rainfall events generate rapid runoff in steep catchments, leading to flash flooding in downstream areas. At the same time, variability in rainfall and increasing temperatures affect water availability, creating a dual vulnerability to both flooding and drought.⁶⁵ This variability places significant stress on water supply systems, which must operate under both high-flow and low-flow conditions. These stresses have equity dimensions, as women and girls often carry heavier burdens in water collection and caregiving during both drought and flood conditions. Persons with disabilities face heightened risks when water and sanitation systems fail, as accessible alternatives are rarely prioritised in emergency planning.

Urbanisation is a critical driver of vulnerability. Rapid population growth in urban areas, often accompanied by informal settlement development, increases exposure to hazards while placing additional pressure on infrastructure systems. Informal settlements are frequently located in flood-prone areas or on unstable slopes, increasing sensitivity to both flooding and landslides.⁵⁵ Livelihood insecurity is concentrated among women, youth, and informal workers in these settlements, who lack financial protection and face prolonged disruption when housing and income sources are repeatedly

⁶⁵ Intergovernmental Panel on Climate Change (2021). *Climate Change 2021: The Physical Science Basis*.

damaged. Exclusion from formal recovery financing mechanisms further deepens inequities, leaving poorer households reliant on informal coping strategies.

Infrastructure systems are central to vulnerability dynamics. Transport networks, which often follow coastal corridors and river valleys, are highly exposed to flooding, erosion, and landslides. Damage to these networks can disrupt connectivity and access to services, with cascading impacts on economic activity and emergency response. Water supply systems are vulnerable to both variability in source availability and damage during extreme events, while energy systems are exposed to both physical damage and increasing demand. Service disruptions disproportionately affect marginalised groups, with poorer households, women, and persons with disabilities experiencing reduced access to safe mobility, reliable water, and energy during recovery.

Environmental systems also play a critical role. Degradation of catchments and coastal ecosystems reduces natural buffering capacity, increasing exposure to flooding and erosion. Changes in sediment transport and hydrological processes can further alter hazard dynamics, creating feedback loops that increase vulnerability over time.⁵⁴ Loss of ecosystem services has intersectional impacts, as subsistence farmers, women reliant on small-scale agriculture, and fishers dependent on coastal resources face disproportionate livelihood risks when natural buffers fail.

Under SSP2-4.5, increasing hazard variability leads to more frequent stress on systems, requiring incremental adaptation. Under SSP5-8.5, higher hazard intensity and reduced buffering capacity significantly increase the likelihood of system failure, particularly in densely populated coastal areas. Inclusive adaptation planning, women's empowerment, and equitable access to resilient infrastructure are critical to reducing systemic vulnerability in these contexts.

4.3.3 Large High-Island Systems

In large high-island systems, particularly Papua New Guinea and parts of Solomon Islands, vulnerability is shaped by scale, diversity, and systemic inequality in access to infrastructure and services. These inequalities have clear social dimensions, as rural women, youth, and persons with disabilities face the greatest barriers to mobility, service access, and participation in adaptation planning.

These systems exhibit significant geographic and climatic variability, resulting in uneven distribution of both hazards and vulnerability. While some areas may have relatively low exposure, others - particularly coastal zones, river floodplains, and steep upland areas - are highly exposed to flooding, landslides, and climate variability.⁵⁵ Intersectional vulnerability is evident, as poorer households, women, and informal workers are disproportionately concentrated in hazard-prone zones with limited resilience capacity.

A key driver of vulnerability is the limited reach and uneven distribution of infrastructure systems. Many rural and remote communities have limited access to transport, water, and energy infrastructure, reducing their capacity to respond to and recover from climate impacts.¹⁸ Where infrastructure exists, it is often exposed to multiple hazards and may lack resilience to extreme events. Service disruptions disproportionately affect marginalised groups, with women and persons with disabilities experiencing reduced access to health, education, and safe mobility during recovery. Youth and informal workers also face prolonged livelihood disruption when transport and energy failures isolate rural economies.

Economic vulnerability is closely linked to reliance on subsistence agriculture and natural resources. Climate variability affects crop yields, water availability, and ecosystem services, with direct implications for food security and livelihoods. Market access is often limited by infrastructure constraints, increasing sensitivity to disruptions. Livelihood insecurity is most acute for women, youth, and small-scale farmers, who lack financial protection and face prolonged income disruption when crops and natural resources are damaged.

Hydrological systems play a central role in vulnerability. Large river basins are susceptible to both flooding and drought, with impacts extending across large geographic areas. Changes in rainfall patterns and temperature affect river flows, soil moisture, and water availability, creating complex and

interacting vulnerability pathways. These pathways have equity dimensions, as rural women and girls often carry heavier burdens in water collection and caregiving during both drought and flood conditions.

Infrastructure interdependence further amplifies vulnerability. Transport disruptions can limit access to markets, health services, and emergency response, while energy and water system failures can affect multiple sectors simultaneously.⁵⁴ The scale of these systems increases the potential for cascading impacts, where localised disruptions propagate across regions. Cascading failures often result in uneven recovery, with urban centres prioritised while rural and marginalised populations face longer delays in service restoration.

Institutional capacity is a critical factor in managing vulnerability. The scale and complexity of these systems require coordinated, multi-level governance, which can be challenging given resource constraints. Under higher-emissions scenarios, increasing hazard intensity and variability place additional strain on already limited capacity, increasing the risk of systemic impacts. Institutional gaps often translate into inequitable recovery support, with women, youth, and persons with disabilities excluded from decision-making processes and receiving delayed assistance compared to better-resourced groups. Strengthening inclusive governance and women's empowerment is essential to reduce systemic vulnerability.

4.3.4 Summary

Vulnerability across the Pacific is structured by geographic typology but is fundamentally shaped by the interaction of environmental constraints, socio-economic conditions, infrastructure systems, and institutional capacity. Each typology exhibits distinct vulnerability pathways, but all are characterised by high exposure, sensitivity to climate variability, and constraints on adaptive capacity. Intersectional inequities further intensify these pathways: women, youth, and persons with disabilities face differentiated burdens in caregiving, livelihood insecurity, and access to services, while marginalised groups are often excluded from adaptation decision-making. Institutional accountability and equitable access to adaptation financing are essential to ensure that relocation, infrastructure investment, and livelihood protection measures reduce rather than reinforce systemic inequities.

Under both SSP2-4.5 and SSP5-8.5 scenarios, vulnerability increases, with higher-emissions pathways leading to more severe, widespread, and potentially transformative impacts. Infrastructure systems play a central role in shaping vulnerability, both as exposed assets and as critical enablers of resilience, with their performance determining the extent to which climate hazards translate into impacts across sectors. Equitable access to resilient infrastructure, inclusive governance, and women's empowerment are therefore critical determinants of whether adaptation reduces or reinforces systemic vulnerability.

4.4 Sectoral Impacts

4.4.1 Urban Development

Urban areas across the PICs represent critical nodes of population, economic activity, infrastructure, and governance, and are therefore central to understanding climate vulnerability and impacts. Rapid urbanisation, combined with constrained land availability and infrastructure limitations, has resulted in increasing concentrations of people and assets in hazard-prone areas, particularly coastal zones.⁵⁷ As a result, climate hazards translate into highly concentrated and often systemic urban impacts, with implications for service delivery, economic productivity, and human well-being. These impacts are not evenly distributed: women, youth, and persons with disabilities in informal settlements face disproportionate risks due to insecure tenure, weaker housing, and limited access to essential services. Exclusion from formal urban planning processes also means these groups rarely influence decisions on resilient infrastructure, relocation, or service provision, reinforcing systemic inequities.

Urban vulnerability in PICs is shaped by the interaction of climate hazards - including extreme heat, heavy rainfall, flooding, tropical cyclones, drought, and coastal inundation - with underlying structural constraints such as informal settlement growth, limited infrastructure capacity, and governance challenges.⁵⁵ These interactions create multiple and overlapping pathways through which climate change affects urban systems. Intersectional inequities amplify these pathways, as marginalised

groups often lack representation in urban planning and decision-making, reducing their access to resilient infrastructure and adaptation resources.

4.4.1.1 Hazard–System Interaction Pathways

A defining feature of urban vulnerability in the Pacific is the convergence of multiple hazards within constrained urban environments, leading to compound and cascading impacts.

Extreme rainfall events generate rapid runoff in urban areas where impermeable surfaces and limited drainage capacity reduce infiltration. This leads to pluvial flooding, which is often exacerbated by inadequate stormwater systems and the occupation of natural drainage pathways by informal settlements.⁵⁹ Where heavy rainfall coincides with high tides or storm surge, drainage systems can become ineffective, resulting in prolonged inundation. Flooding disproportionately affects poorer households and women-headed households, who face higher caregiving burdens and limited access to safe relocation options. Youth and informal workers also experience prolonged livelihood disruption when flooding damages small businesses and informal markets.

Tropical cyclones introduce compound hazards, including high winds, intense rainfall, and coastal flooding. Wind damage to buildings and infrastructure is often accompanied by flooding and landslides, particularly in areas with steep terrain. Coastal urban areas are further exposed to storm surge and wave action, which can damage infrastructure and disrupt economic activity. Recovery is often inequitable, with marginalised groups receiving delayed assistance and limited access to rebuilding resources. Persons with disabilities frequently encounter barriers to accessible shelter and rebuilding support, leaving them dependent on overstretched community networks.

Extreme heat represents an emerging urban hazard, particularly in dense settlements where built surfaces retain heat and reduce ventilation. Increasing temperatures and humidity contribute to heat stress, with implications for public health, labour productivity, and energy demand.⁶⁶ Heat stress has gendered and social dimensions: women, outdoor workers, and persons with disabilities are more vulnerable due to caregiving roles, occupational exposure, and limited access to cooling infrastructure. Children and youth in informal settlements also face disrupted education when schools close or lack cooling facilities,

Drought affects urban water supply systems, particularly where cities rely on limited surface or groundwater resources. Reduced water availability can lead to supply restrictions, increased reliance on alternative sources, and increased costs for households and service providers.⁵¹ These costs disproportionately burden poorer households and women, who are often responsible for water collection and household management.

Sea-level rise acts as a chronic stressor, increasing the frequency of coastal flooding and reducing the effectiveness of drainage systems. Over time, this leads to progressive degradation of infrastructure and increased maintenance requirements. Chronic inundation compounds social inequities, as informal settlements in low-lying areas face repeated displacement, loss of tenure security, and exclusion from formal adaptation planning.

4.4.1.2 Low-Lying Coral Atoll Urban Systems

In atoll countries such as Kiribati and Tuvalu, urban development is highly constrained by limited land availability, resulting in extremely high population densities in narrow coastal zones.

Urban vulnerability in these systems is characterised by system-wide exposure and limited adaptive capacity. Flooding from rainfall, storm surge, and tidal inundation affects entire urban areas simultaneously, with limited opportunities for spatial differentiation of risk.⁵¹ Informal housing and high-density settlements exacerbate exposure, with limited ventilation increasing heat stress and poor drainage increasing flood risk. Women, youth, and persons with disabilities in these settlements face disproportionate risks due to insecure tenure, caregiving burdens, and barriers to safe relocation. Institutional accountability is critical to ensure relocation planning includes these groups and does not reinforce existing inequities.

⁶⁶ World Health Organization (WHO). 2021. *Heat and Health in Small Island Developing States*.

Water supply represents a critical vulnerability pathway. Urban populations depend on rainwater harvesting and shallow groundwater, both of which are highly sensitive to drought and contamination. Flooding events can contaminate water sources, while drought reduces availability, creating compound risks for public health and sanitation.⁴³ These risks are most acute for women and girls responsible for water collection and household management.

Infrastructure systems are highly exposed and constrained. Roads, airstrips, and utility networks are located at low elevations and are vulnerable to inundation and erosion. Energy systems face increasing demand due to heat while also being exposed to flooding and storm damage.⁴³ The lack of redundancy in infrastructure systems means that failures can have system-wide consequences.

Under SSP2-4.5, urban vulnerability increases through more frequent flooding and water stress. Under SSP5-8.5, these pressures intensify, with increasing likelihood of chronic inundation and infrastructure degradation.

4.4.1.3 High Volcanic and Uplifted Island Urban Systems

In countries such as Fiji, Samoa, and Vanuatu, urban vulnerability is shaped by coastal concentration and multi-hazard exposure.

Urban areas are typically located on coastal plains or along river valleys, where exposure to flooding, cyclones, and coastal hazards is highest. Rapid urban growth has led to expansion into flood-prone areas and informal settlements with limited infrastructure provision.³⁹ These settlements concentrate vulnerability among women, youth, and informal workers, who lack financial protection and face prolonged disruption when housing and income sources are damaged. Exclusion from recovery financing mechanisms further deepens inequities, leaving poorer households reliant on informal coping strategies.

Flooding represents a major urban risk, driven by both rainfall and riverine processes. Inadequate drainage systems and encroachment on floodplains increase exposure, while sedimentation and waste accumulation can further reduce drainage capacity.⁵¹ Cyclones introduce additional risks through wind damage and storm surge, affecting both buildings and infrastructure. Recovery support is often uneven, with marginalised groups receiving delayed assistance and limited access to rebuilding resources.

Heat stress is increasing in urban areas due to the urban heat island effect, with implications for health and energy demand.⁴⁴ Heat stress has gendered and social dimensions: outdoor workers, women, and persons with disabilities are more vulnerable due to occupational exposure, caregiving roles, and limited access to cooling infrastructure.

Water supply systems are vulnerable to both drought and contamination during flood events, creating a dual exposure pathway. These pressures disproportionately burden poorer households and women, who manage household water needs.

Infrastructure systems are critical but vulnerable. Transport networks are essential for connectivity but are exposed to flooding and landslides. Water and energy systems are similarly exposed, with impacts potentially cascading across sectors.⁶¹ Urban infrastructure often operates close to capacity, reducing resilience to extreme events. Cascading failures amplify inequities, as service restoration tends to prioritise formal urban centres over informal settlements.

Under SSP2-4.5, increased hazard variability places growing pressure on urban systems. Under SSP5-8.5, higher hazard intensity and rapid urbanisation significantly increase vulnerability, particularly in informal settlements.

4.4.1.4 Large High-Island Urban Systems

In larger countries such as Papua New Guinea and Solomon Islands, urban vulnerability is shaped by scale, inequality, and infrastructure gaps.

Urban areas in these systems often experience rapid and unplanned growth, resulting in expansion into hazard-prone areas and limited provision of basic services.⁶³ Informal settlements are particularly

vulnerable due to poor housing quality, limited access to water and sanitation, and exposure to flooding and landslides. Women, youth, and persons with disabilities in these settlements face compounded risks from insecure tenure, disrupted education, and exclusion from formal adaptation planning.

Flooding is a major hazard, driven by both rainfall and riverine processes. In some cases, urban areas are located in floodplains or delta regions, increasing exposure to large-scale flooding. Cyclones and coastal hazards also affect urban areas, particularly in coastal cities. Livelihood insecurity is concentrated among subsistence farmers and informal workers, with women and youth most affected by prolonged income disruption.

Water supply and sanitation systems are often underdeveloped, increasing vulnerability to both drought and flooding. Limited infrastructure coverage and maintenance challenges further increase exposure.⁴³ Service gaps disproportionately affect poorer households and women, who carry heavier caregiving and household management burdens. Persons with disabilities face heightened risks when water and sanitation systems fail, as accessible alternatives are rarely prioritised in emergency planning.

Infrastructure interdependence is a key factor in vulnerability. Transport disruptions can isolate urban areas and limit access to services, while failures in energy and water systems can affect multiple sectors simultaneously.⁵⁴ The scale of these systems increases the potential for cascading impacts, particularly during extreme events. Cascading failures often result in inequitable recovery, with rural and marginalised populations facing longer delays in service restoration.

Under SSP2-4.5, urban vulnerability increases through gradual intensification of hazards and continued urban growth. Under SSP5-8.5, higher hazard intensity and infrastructure constraints significantly increase the risk of systemic urban impacts. Inclusive governance and women's empowerment are critical to ensuring adaptation reduces rather than reinforces systemic urban inequities.

4.4.1.5 Summary

Urban areas in the Pacific represent focal points of climate vulnerability due to the concentration of population, infrastructure, and economic activity in hazard-prone locations. The interaction of multiple hazards with structural vulnerabilities - particularly informal settlement growth and infrastructure constraints - creates complex and often systemic risk pathways. These pathways have equity dimensions, as women, youth, and persons with disabilities in informal settlements face disproportionate risks from insecure tenure, caregiving burdens, and exclusion from formal adaptation planning.

Across all typologies, infrastructure systems are central to both vulnerability and resilience. Failures in transport, water, or energy systems can propagate across sectors, amplifying impacts and slowing recovery. Cascading failures often result in uneven recovery, with poorer households and marginalised groups experiencing longer delays in service restoration and reduced access to essential services

Regional evidence indicates that without significant investment in climate-resilient urban infrastructure and planning, urban vulnerability will continue to increase under both SSP2-4.5 and SSP5-8.5 scenarios. Ensuring inclusive governance, equitable service provision, and women's empowerment is critical to reducing systemic urban vulnerability and strengthening resilience.

4.4.2 Water Supply and Sanitation

Water supply and sanitation systems across the PICs are among the most climate-sensitive sectors, with vulnerability arising from the direct dependence of water resources on climatic conditions and the high exposure of infrastructure systems to multiple hazards. Climate change affects water systems through a combination of hydrological variability, temperature increases, and coastal processes, resulting in both availability and quality risks.³⁹

In the Pacific context, water systems are characterised by limited storage capacity, high variability in supply, and strong dependence on natural systems, particularly rainfall and groundwater.⁵¹ As a result,

climate hazards such as drought, extreme rainfall, flooding, and sea-level rise directly translate into operational and systemic risks for water supply and sanitation services. These risks have equity dimensions, as women and girls often carry heavier burdens in water collection and caregiving, while persons with disabilities face barriers to safe access and continuity of services. Exclusion from emergency water distribution points and inaccessible sanitation facilities further deepen inequities, leaving persons with disabilities and poorer households dependent on unsafe alternatives.

Sanitation systems are similarly vulnerable, particularly where infrastructure is limited or dependent on water availability. Flooding and inundation can lead to system failure, contamination, and public health risks, while drought conditions can reduce functionality and increase reliance on unsafe alternatives.⁶⁷ Public health impacts are disproportionately felt by poorer households and marginalised groups, who have less access to safe sanitation and healthcare.

4.4.2.1 Hazard–System Interaction Pathways

Water supply and sanitation systems are affected by multiple climate hazards, often simultaneously or sequentially, creating complex vulnerability pathways.

Drought represents a primary driver of water scarcity. Reduced rainfall and increased evapotranspiration decrease surface water availability, reduce groundwater recharge, and increase demand for water. In systems with limited storage capacity, this results in rapid depletion of available resources and increased reliance on emergency measures.⁵⁵ Women and youth are particularly affected, as household water collection responsibilities intensify during scarcity.

Extreme rainfall and flooding introduce both physical and operational risks. High-intensity rainfall increases runoff, leading to flooding that can damage infrastructure, disrupt supply systems, and contaminate water sources. Sedimentation and increased turbidity can affect treatment processes, reducing system efficiency and increasing operational costs.⁴⁴ Flood-related contamination disproportionately impacts informal settlements, where poorer households lack access to resilient infrastructure and safe alternatives.

Sea-level rise and coastal inundation affect groundwater quality through saline intrusion, particularly in low-lying coastal and atoll systems. This process reduces the availability of potable water and can render existing sources unusable without treatment.⁶⁴ Saline intrusion has intersectional impacts, as subsistence farmers, women reliant on small-scale agriculture, and persons with disabilities dependent on community water points face heightened risks of exclusion from safe supply.

Extreme heat increases water demand while also increasing evaporation from storage systems and distribution networks. This creates additional stress on already constrained systems and can exacerbate drought conditions. Heat-driven demand spikes often translate into higher costs, disproportionately burdening poorer households and women-headed households.

Sanitation systems are particularly sensitive to flooding and water availability. Flooding can lead to overflow of wastewater systems, contamination of water sources, and increased disease risk. Drought can reduce system functionality, particularly where water is required for operation. Disease outbreaks linked to sanitation failures disproportionately affect children, women caregivers, and marginalised groups with limited healthcare access.

4.4.2.2 Low-Lying Coral Atoll Systems

In atoll countries such as Kiribati, Tuvalu, and Republic of the Marshall Islands, water supply and sanitation systems are among the most vulnerable globally.

Water supply is almost entirely dependent on rainwater harvesting and shallow groundwater lenses, both of which are highly sensitive to climate variability. Drought conditions rapidly reduce water availability, while high temperatures increase evaporation from storage systems.⁵⁵ The limited storage capacity of rainwater systems means that even short periods of reduced rainfall can lead to water shortages. Women and girls face intensified burdens in water collection and caregiving during scarcity, while persons with disabilities encounter barriers to safe and reliable access. Accessible

⁶⁷ WHO. 2020. *Sanitation and Health in the Pacific*.

design of water points and sanitation facilities is not always prioritised, leaving persons with disabilities at heightened risk during both drought and flooding.

Sea-level rise and coastal inundation represent critical risks to groundwater systems. Saline intrusion into freshwater lenses reduces water quality and availability, with impacts that may persist over extended periods.⁵⁴ Wave overtopping and flooding during storms can further contaminate water sources, creating compound water quality risks. These risks disproportionately affect subsistence farmers, women reliant on small-scale agriculture, and marginalised households with limited alternatives.

Sanitation systems are highly vulnerable to flooding and water scarcity. Many systems rely on on-site sanitation, which can fail under inundation conditions, leading to contamination of groundwater and surface water.⁶² Limited infrastructure and high population densities in urban areas exacerbate these risks. Disease outbreaks linked to sanitation failures disproportionately impact children and women caregivers, who shoulder the burden of health management in households.

Infrastructure constraints are a defining feature of vulnerability. Water storage capacity is often insufficient to buffer prolonged drought conditions, while distribution systems may be limited or absent. Energy constraints can further affect water supply, particularly where pumping is required.⁴³ Service disruptions amplify inequities, as poorer households and informal settlements face longer delays in restoration and reduced access to safe water and sanitation.

Under SSP2-4.5, increasing rainfall variability and sea-level rise lead to more frequent water shortages and contamination events. Under SSP5-8.5, these processes intensify, with increasing likelihood of chronic water stress and degradation of groundwater resources.

4.4.2.3 High Volcanic and Uplifted Island Systems

In countries such as Fiji, Samoa, and Vanuatu, water systems are more diverse but remain highly vulnerable to climate variability.

These systems rely on a combination of surface water, groundwater, and rainfall, providing greater flexibility but also exposing systems to multiple hazard pathways. Drought reduces river flows and groundwater recharge, while extreme rainfall increases flooding and sediment loads, affecting water quality and treatment processes.⁴⁴ These dynamics disproportionately affect rural women and youth, whose livelihoods and household responsibilities depend directly on reliable water access.

Catchment dynamics are critical to water system performance. Land degradation, deforestation, and changes in rainfall patterns affect runoff, infiltration, and water quality, increasing vulnerability to both drought and flooding.⁶⁸ Loss of ecosystem services has intersectional impacts, as subsistence farmers, women reliant on small-scale agriculture, and fishers dependent on catchments face heightened livelihood risks.

Urban water systems are particularly vulnerable due to high demand and infrastructure constraints. Supply systems may operate close to capacity, reducing resilience to variability. Informal settlements may have limited access to reliable water and sanitation services, increasing vulnerability. Marginalised groups in these settlements face exclusion from formal service provision, reinforcing inequities in health and resilience.

Sanitation systems are exposed to both flooding and water scarcity. Flooding can overwhelm wastewater systems, while drought reduces functionality and increases reliance on alternative, often unsafe, solutions.⁶² These failures disproportionately affect poorer households and women caregivers, who manage sanitation and health risks at the household level.

Infrastructure systems are central to vulnerability. Water treatment plants, distribution networks, and storage facilities are exposed to flooding, landslides, and cyclones. Energy supply is critical for system operation, and disruptions can affect water availability. Cascading failures often result in

⁶⁸ SPC. 2021. *Pacific Water and Climate Resilience Programme Reports*.

inequitable recovery, with rural and marginalised populations experiencing longer delays in service restoration.

Under SSP2-4.5, increasing variability places growing pressure on water systems, requiring improved management and infrastructure investment. Under SSP5-8.5, higher variability and extreme events significantly increase the risk of system failure and service disruption.

4.4.2.4 Large High-Island Systems

In large systems such as Papua New Guinea and Solomon Islands, water supply and sanitation vulnerability is shaped by scale, infrastructure gaps, and uneven service provision.

Water resources may be relatively abundant at the national scale but are often unevenly distributed, with many communities lacking reliable access to safe water.⁵⁵ Infrastructure coverage is limited, particularly in rural areas, increasing reliance on untreated or poorly managed water sources.

Flooding and extreme rainfall affect water quality through increased sediment loads and contamination, while drought affects availability in areas dependent on rainfall or small catchments.⁴⁴ The combination of these hazards creates highly variable water conditions. Household burdens are intensified for women and girls, who manage water collection and caregiving during both scarcity and contamination events.

Sanitation systems are often underdeveloped, increasing vulnerability to both flooding and water scarcity. Limited wastewater treatment capacity increases the risk of contamination and disease during flood events.⁶² Disease outbreaks disproportionately impact children and caregivers in poorer households, where healthcare access is limited.

Infrastructure interdependence is a key factor. Water systems depend on transport for maintenance and supply chains, and on energy for pumping and treatment. Disruptions in these systems can affect water availability across large areas.⁵⁴ Cascading failures amplify inequities, as rural and marginalised populations generally face longer delays in service restoration compared to urban centres.

Under SSP2-4.5, increasing variability in water availability requires improved management and infrastructure expansion. Under SSP5-8.5, higher hazard intensity and infrastructure constraints significantly increase the risk of widespread service disruption.

4.4.2.5 Summary

Water supply and sanitation systems in the Pacific are highly vulnerable to climate change due to their dependence on climate-sensitive resources, limited infrastructure capacity, and exposure to multiple hazards. Climate change affects both water availability and quality, creating complex and interacting risks. Intersectional inequities intensify these risks, as women, youth, and persons with disabilities face differentiated burdens in water collection, caregiving, and access to safe services.

Across all typologies, infrastructure systems are central to vulnerability, determining the capacity of communities to manage and respond to climate impacts. The interaction of drought, flooding, sea-level rise, and heat creates compound risks that can overwhelm existing systems. Equitable investment in resilient infrastructure, inclusive governance, and women's empowerment is critical to reducing systemic vulnerability.

Regional evidence indicates that without significant investment in climate-resilient water infrastructure and integrated water resource management, vulnerability will continue to increase under both SSP2-4.5 and SSP5-8.5 scenarios, with implications for public health, economic development, and social stability.

4.4.3 Transport

Transport systems in the Pacific Island Countries (PICs) are critical enablers of economic activity, service delivery, and regional connectivity, but are also among the most climate-exposed infrastructure sectors. The geographic characteristics of PICs - small land areas, dispersed

populations, and reliance on maritime and air transport - mean that transport networks are both highly concentrated and highly sensitive to disruption.⁴³

Transport infrastructure includes roads, bridges, ports, airports, and inter-island shipping systems, many of which are located in coastal zones or along river corridors. These assets are directly exposed to a range of climate hazards, including flooding, coastal inundation, tropical cyclones, landslides, and extreme heat.⁴⁹ As a result, climate change introduces both direct physical risks to assets and system-level risks to connectivity and economic function. Disruptions have equity dimensions because poorer households, women, and persons with disabilities rely more heavily on transport for access to markets, health care, and education, yet face systemic barriers to alternatives. Limited financial resources constrain their ability to absorb higher costs or secure private transport, caregiving responsibilities increase dependence on reliable mobility, and physical accessibility gaps restrict safe evacuation and service continuity.

A defining characteristic of transport vulnerability in PICs is the lack of redundancy. In many cases, single roads, ports, or airstrips provide the only connection between communities and essential services. Damage or disruption to these assets can therefore result in immediate and widespread impacts, including isolation of communities, disruption of supply chains, and constraints on emergency response.⁵⁴ Isolation has intersectional consequences: women traders lose market access, youth face disrupted education, and persons with disabilities are excluded from emergency logistics when transport corridors fail. Gendered livelihood patterns also heighten exposure, as women and youth are concentrated in informal trade and tourism sectors that depend directly on reliable transport links.

4.4.3.1 Hazard–System Interaction Pathways

Transport systems are affected by climate hazards through multiple pathways that influence both physical infrastructure and service delivery.

Heavy rainfall and flooding are primary drivers of damage to road networks. High-intensity rainfall increases runoff, leading to erosion, washouts, and failure of road surfaces and embankments. Inadequate drainage systems can result in water accumulation and prolonged inundation, accelerating pavement degradation and reducing serviceability.⁶⁹ Bridges and culverts are particularly vulnerable to high flows and debris loading, which can lead to structural failure.

Tropical cyclones introduce compound hazards, including extreme winds, rainfall, and storm surge. Wind damage can affect port and airport infrastructure, while storm surge and wave action can damage coastal roads, ports, and airstrips. Flooding and landslides during cyclone events can disrupt inland transport networks, compounding impacts.⁵¹

Coastal inundation and sea-level rise represent chronic stressors for transport infrastructure located in low-lying coastal areas. Rising sea levels increase the frequency of flooding and wave overtopping, leading to progressive degradation of assets and increasing maintenance requirements.⁶⁴

Extreme heat affects transport systems through thermal expansion of materials, softening of asphalt surfaces, and increased wear and tear. These effects can reduce the lifespan of infrastructure and increase maintenance costs.

Landslides, particularly in steep terrain, represent a significant hazard for road networks. Intense rainfall can trigger slope instability, leading to blockages, damage, and safety risks.

4.4.3.2 Low-Lying Coral Atoll Systems

In atoll countries such as Kiribati, Tuvalu, and Republic of the Marshall Islands, transport systems are highly constrained and extremely vulnerable.

Road networks are typically limited in extent and located at very low elevations, often running parallel to coastlines. These roads are highly exposed to flooding, erosion, and wave overtopping, with even moderate storm events capable of causing damage.³⁹ Causeways connecting different parts of

⁶⁹ Asian Development Bank.2021. *Climate Risk and Adaptation in the Pacific: Transport Sector*.

islands are particularly vulnerable, as they are frequently overtopped by waves and subject to structural stress.

Air transport is critical for connectivity in atoll systems, with airstrips often located at low elevations and exposed to flooding and storm surge. Disruption of air transport can isolate entire countries, affecting access to goods, services, and emergency support.

Maritime transport is similarly critical but vulnerable to changing ocean conditions, including increased wave heights and storm activity. Port infrastructure may be limited and exposed to damage from storm surge and wave action.

The lack of alternative routes or infrastructure creates a single-point-of-failure dynamic, where disruption of one asset can have system-wide impacts.⁶⁴ Maintenance is also challenging due to limited resources and exposure to ongoing environmental stress.

Under SSP2-4.5, increasing frequency of coastal flooding and storm events leads to more frequent disruption and higher maintenance costs. Under SSP5-8.5, these impacts intensify, with increasing risk of chronic disruption and reduced service reliability.

4.4.3.3 High Volcanic and Uplifted Island Systems

In countries such as Fiji, Samoa, Vanuatu, and Tonga, transport systems are more extensive but remain highly vulnerable due to coastal concentration and terrain complexity.

Road networks often follow coastal corridors and river valleys, exposing them to flooding, erosion, and storm surge. In mountainous areas, roads are also exposed to landslides and slope instability, particularly during heavy rainfall events.⁵⁴

Bridges and culverts are critical components of transport networks but are often undersized or inadequately designed for extreme flows, increasing vulnerability to failure during flood events. Sedimentation and debris can further exacerbate these risks.

Ports and airports are essential for international and domestic connectivity but are typically located in coastal areas, making them highly exposed to storm surge and sea-level rise. Damage to these assets can disrupt trade, tourism, and supply chains.

Urban transport systems are particularly vulnerable due to high traffic volumes and limited redundancy. Flooding can disrupt mobility and access to services, while damage to key routes can have cascading economic impacts.

Infrastructure maintenance and design standards are key factors in vulnerability. Many systems are not designed for future climate conditions, increasing the likelihood of failure under extreme events ⁵⁴.

Under SSP2-4.5, increasing hazard variability leads to more frequent disruptions and higher maintenance requirements. Under SSP5-8.5, higher hazard intensity and sea-level rise significantly increase the risk of asset failure and network disruption.

4.4.3.4 Large High-Island Systems

In larger countries such as Papua New Guinea and Solomon Islands, transport vulnerability is shaped by scale, network gaps, and dependence on critical corridors.

Transport networks in these systems often consist of a limited number of key corridors that connect major population centres and economic hubs. These corridors are highly vulnerable to flooding, landslides, and erosion, with disruption affecting large geographic areas.⁵⁴

River crossings are a particular point of vulnerability, with bridges exposed to high flows, debris loading, and structural stress during flood events. In some cases, alternative routes are not available, increasing the impact of disruptions.

Rural and remote areas often have limited or no formal transport infrastructure, increasing reliance on informal or seasonal access routes. These routes are highly sensitive to climate variability, particularly rainfall.

Ports and airports are critical for connectivity but may be limited in capacity and exposed to coastal hazards. Disruption of these assets can affect national and regional supply chains.

Infrastructure interdependence amplifies vulnerability. Transport systems support the operation of water, energy, and health services, meaning that disruptions can have cascading impacts across sectors.⁵⁴

Under SSP2-4.5, increasing hazard variability leads to more frequent disruption of transport networks. Under SSP5-8.5, higher hazard intensity and infrastructure constraints significantly increase the risk of widespread and prolonged disruption.

4.4.3.5 Summary

Transport systems in the Pacific are highly vulnerable to climate change due to their exposure to multiple hazards, limited redundancy, and critical role in connectivity and economic activity. Climate hazards affect both the physical integrity of transport infrastructure and the ability of systems to provide reliable services. Disruptions carry equity dimensions: poorer households, women, and persons with disabilities depend more heavily on public transport for market access, health care, and education, yet face systemic barriers to alternatives. Limited financial resources constrain their ability to absorb higher costs, caregiving responsibilities heighten reliance on reliable mobility, and accessibility gaps restrict safe evacuation and continuity of services.

Across all typologies, transport infrastructure is subject to increasing stress from flooding, cyclones, sea-level rise, and heat. The lack of redundancy and the concentration of assets in hazard-prone areas amplify vulnerability and increase the potential for cascading impacts. When networks fail, isolation has intersectional consequences: women traders lose market access, youth face disrupted education, and persons with disabilities are excluded from emergency logistics and recovery.

Regional evidence indicates that without significant investment in climate-resilient transport infrastructure, improved design standards, and enhanced maintenance capacity, transport vulnerability will continue to increase under both SSP2-4.5 and SSP5-8.5 scenarios, with implications for economic development, service delivery, and resilience. Inclusive planning and women's empowerment in transport governance are critical to ensuring that adaptation reduces systemic vulnerability rather than reinforcing existing inequities.

4.4.4 Energy

Energy systems in the PICs are critical enablers of economic activity, service delivery, and climate resilience, but are highly vulnerable to climate change due to their exposure to multiple hazards, dependence on imported fuels, and limited system redundancy.⁴³ Energy infrastructure - including generation, transmission, and distribution systems - is frequently located in coastal areas or along critical corridors, increasing exposure to flooding, cyclones, and sea-level rise.³⁹ High electricity costs disproportionately burden poorer households, who spend a larger share of income on energy and often face difficult trade-offs between power, food, and education expenses. Women-headed households and informal workers are particularly exposed, as limited income buffers mean they cannot afford backup systems or alternative fuels.

Energy vulnerability in the Pacific is characterised by the interaction of physical exposure, operational sensitivity, and system interdependence. Climate hazards affect both the physical integrity of energy infrastructure and the ability of systems to meet demand, particularly under conditions of stress such as extreme heat or post-disaster recovery.⁷⁰ Outages have direct social impacts: women's workloads increase when household energy is unavailable for cooking, water pumping, or caregiving; school performance suffers when children lose access to lighting and digital learning; and persons with disabilities face heightened risks when medical equipment and mobility support systems fail.

A defining feature of energy systems in PICs is their central role in enabling other sectors, including water supply, transport, health, and communications. As a result, disruptions to energy systems can propagate rapidly across sectors, creating cascading impacts that amplify overall vulnerability.⁵⁴

⁷⁰ Asian Development Bank. 2021. *Climate Risk and Adaptation in the Pacific: Energy Sector*.

These cascading failures deepen inequities, as marginalised groups are least able to afford backup systems or alternative energy sources, prolonging exclusion from essential services.

4.4.4.1 Hazard–System Interaction Pathways

Energy systems are affected by climate hazards through multiple pathways that influence both infrastructure and service delivery.

Tropical cyclones represent a primary hazard, with high winds capable of damaging generation facilities, transmission lines, and distribution networks. Wind damage to poles, lines, and substations can result in widespread outages, particularly in systems with overhead distribution networks. Flooding associated with cyclones can further damage infrastructure, particularly where assets are located in low-lying areas.⁶⁴

Flooding and extreme rainfall affect energy systems through both direct and indirect mechanisms. Floodwaters can damage generation facilities, substations, and underground infrastructure, while sedimentation and debris can affect operations. In addition, flooding can disrupt access for maintenance and repair, prolonging outages.⁴³

Sea-level rise and coastal inundation introduce chronic risks, particularly for coastal generation facilities and substations. Rising sea levels increase the frequency of flooding and corrosion, reducing the lifespan of infrastructure and increasing maintenance requirements.⁶⁴

Extreme heat affects both supply and demand. Higher temperatures increase electricity demand for cooling, placing additional stress on generation and distribution systems. At the same time, heat can reduce the efficiency of generation equipment and increase losses in transmission and distribution systems.⁷¹ This creates inequities in access to cooling, as poorer households and persons with disabilities reliant on assistive technologies are least able to afford higher tariffs or alternative energy sources.

Drought affects energy systems where hydropower contributes to generation capacity, reducing output and increasing reliance on alternative sources, often diesel-based.⁷² In addition, drought can affect cooling water availability for certain types of generation.

4.4.4.2 Low-Lying Coral Atoll Systems

In atoll countries such as Kiribati, Tuvalu, and Republic of the Marshall Islands, energy systems are highly constrained and extremely vulnerable.

Generation systems are typically small-scale and heavily dependent on imported diesel fuel, with increasing integration of solar photovoltaic systems. These systems are often located in coastal areas and are highly exposed to flooding, storm surge, and sea-level rise.⁵⁴ Even minor inundation events can disrupt generation and distribution systems.

Distribution networks are typically limited in extent but highly exposed, with overhead lines vulnerable to wind damage and corrosion. Maintenance is challenging due to resource constraints and environmental exposure.

Energy demand is increasing, particularly in urban areas, driven by population growth and rising temperatures. Extreme heat increases demand for cooling, placing additional stress on already constrained systems.⁴³

The lack of redundancy and limited generation capacity creates a high risk of system-wide outages, with significant implications for water supply, health services, and communications.⁶¹ Energy disruptions can therefore amplify impacts across multiple sectors.

⁷¹ International Energy Agency. 2021. *Climate Impacts on Energy Systems in Small Island Developing States*.

⁷² Secretariat of the Pacific Community (SPC). 2021. *Pacific Energy and Climate Change Reports*.

Under SSP2-4.5, increasing hazard frequency leads to more frequent disruptions and higher operational costs. Under SSP5-8.5, higher sea levels and more intense storms significantly increase the risk of chronic disruption and infrastructure degradation.

4.4.4.3 High Volcanic and Uplifted Island Systems

In countries such as Fiji, Samoa, Vanuatu, and Tonga, energy systems are more extensive but remain highly vulnerable due to multi-hazard exposure and infrastructure concentration.

Generation systems may include a mix of diesel, hydropower, and renewable energy sources. Hydropower systems are particularly sensitive to rainfall variability, with drought reducing generation capacity and increasing reliance on alternative sources.³⁹

Transmission and distribution networks are often extensive and exposed to multiple hazards, including flooding, landslides, and cyclones. Overhead lines are particularly vulnerable to wind damage, while substations located in low-lying areas are exposed to flooding.

Urban energy systems are under increasing pressure due to rising demand and infrastructure constraints. Extreme heat increases demand for cooling, while rapid urbanisation increases overall consumption.

Infrastructure interdependence is a key factor. Energy systems support water supply, transport, and communications, meaning that disruptions can have cascading impacts across sectors.⁶⁸

Under SSP2-4.5, increasing hazard variability leads to more frequent disruptions and higher maintenance requirements. Under SSP5-8.5, higher hazard intensity and demand pressures significantly increase the risk of system failure and cascading impacts.

4.4.4.4 Large High-Island Systems

In larger countries such as Papua New Guinea and Solomon Islands, energy vulnerability is shaped by scale, infrastructure gaps, and uneven access.

Energy systems in these countries often have limited coverage, with many rural areas lacking reliable access to electricity. Where systems exist, they are often exposed to multiple hazards and may lack resilience to extreme events.⁶⁷

Hydropower plays a significant role in some systems, increasing sensitivity to rainfall variability and drought. Flooding can also affect generation facilities and transmission infrastructure.

Transmission networks are often limited and concentrated along key corridors, making them vulnerable to disruption from flooding and landslides. Damage to these networks can affect large areas and disrupt multiple sectors.

Energy access is a critical issue, with limited infrastructure coverage increasing vulnerability to climate impacts. Disruptions to energy systems can affect water supply, health services, and economic activity, particularly in remote areas.⁶⁸

Under SSP2-4.5, increasing variability in climate conditions places growing pressure on energy systems. Under SSP5-8.5, higher hazard intensity and infrastructure constraints significantly increase the risk of widespread and prolonged outages.

4.4.4.5 Summary

Energy systems in the Pacific are highly vulnerable to climate change due to their exposure to multiple hazards, limited redundancy, and critical role in supporting other sectors. Climate hazards affect both the physical integrity of infrastructure and the ability of systems to meet demand. High electricity costs absorb a disproportionate share of income for poorer households, forcing trade-offs with food, health, and education. Outages intensify women's workloads in caregiving and household management, reduce school performance when children lose access to lighting and digital learning, and heighten risks for persons with disabilities reliant on medical equipment and assistive technologies. Livelihood losses are concentrated among women traders, youth, and informal workers when energy disruptions halt refrigeration, small enterprise activity, and digital connectivity.

Across all typologies, energy systems are subject to increasing stress from cyclones, flooding, sea-level rise, heat, and drought. The interdependence of energy systems with other sectors amplifies vulnerability, creating cascading impacts that extend beyond the energy sector. Diesel dependence and fuel price volatility deepen inequities, as low-income households lack access to alternatives such as solar or backup systems. Women and youth engaged in informal trade and small enterprises are particularly vulnerable when energy disruptions halt production or market access.

Regional evidence indicates that without significant investment in climate-resilient energy infrastructure, diversification of energy sources, and improved system management, energy vulnerability will continue to increase under both SSP2-4.5 and SSP5-8.5 scenarios. Embedding gender equality and social inclusion in energy governance, from tariff design to renewable access programs is essential to ensure resilience measures reduce systemic inequities rather than entrench them.

4.4.5 Coastal Management

Coastal systems in the PICs are central to settlement, economic activity, and infrastructure, and are therefore among the most critical and vulnerable sectors to climate change. The majority of population centres, transport infrastructure, energy systems, and economic assets are located in coastal zones, reflecting both geographic constraints and historical development patterns.⁴³ As a result, coastal hazards - including sea-level rise, coastal inundation, erosion, and storm surge - translate directly into systemic national-level risks. Social vulnerability is acute in these zones: poorer households, women, and persons with disabilities are disproportionately concentrated in low-lying settlements, with limited capacity to relocate or invest in protective measures. Women engaged in near-shore gleaning and small-scale fish processing, along with market vendors reliant on coastal access, face immediate livelihood disruption when erosion damages landing sites or market spaces. Persons with disabilities are often excluded from evacuation logistics when coastal corridors fail, leaving them stranded during hazard events.

Coastal vulnerability in PICs is driven by the interaction of progressive sea-level rise, extreme events (particularly tropical cyclones), and local geomorphological and ecological conditions.²⁸ These drivers affect both natural coastal systems (e.g., reefs, mangroves, beaches) and built infrastructure, creating complex and interdependent vulnerability pathways. Importantly, sea-level rise acts as a baseline modifier, increasing the frequency and severity of coastal flooding and erosion, even in the absence of extreme events.⁶⁴ Loss of protective ecosystems such as mangroves and reefs also has gendered livelihood impacts, reducing access to fisheries and coastal resources that women and youth depend on for subsistence and income.

4.4.5.1 Hazard–System Interaction Pathways

Coastal management systems are affected by climate change through a combination of chronic and acute processes.

Sea-level rise leads to progressive coastal inundation, increased frequency of extreme sea-level events, and long-term shoreline retreat. Even small increases in mean sea level can result in large increases in the frequency of coastal flooding events, particularly when combined with tides and wave action.⁶⁴

Wave dynamics play a critical role in Pacific coastal systems, particularly in atoll environments. Wave overtopping during high tides and storms can lead to flooding, erosion, and infrastructure damage. These processes are influenced by reef health and coastal morphology, linking ecological and physical vulnerability.⁵⁶

Tropical cyclones introduce acute coastal hazards, including storm surge and extreme wave conditions. These events can cause rapid and severe coastal erosion, infrastructure damage, and sediment redistribution, with impacts that may persist long after the event. Recovery financing and rebuilding often prioritise commercial assets such as ports and hotels, while informal settlements and subsistence households remain exposed to unsafe coastal conditions for extended periods.

Sediment dynamics are also affected by climate change. Changes in wave patterns, sea level, and river sediment supply can alter coastal processes, leading to erosion or accretion in different areas. Human activities, such as coastal development and sand mining, can further exacerbate these dynamics.

Saline intrusion affects both groundwater and soils, reducing water availability and agricultural productivity. This process is particularly important in low-lying and deltaic systems.

4.4.5.2 Low-Lying Coral Atoll Systems

In atoll countries such as Kiribati, Tuvalu, and Republic of the Marshall Islands, coastal vulnerability is systemic and existential, reflecting the dominance of coastal processes across entire land areas.

Sea-level rise and wave-driven flooding represent the primary drivers of impact. Land elevations are typically only one to two metres above mean sea level, meaning that even modest increases in sea level significantly increase the frequency of inundation.⁶⁴ Wave overtopping during high tides and storm events can result in widespread flooding, often affecting entire islands simultaneously.

Coastal erosion is a major concern, particularly where sediment supply is limited or disrupted. Changes in wave patterns and sea level can alter shoreline dynamics, leading to land loss and damage to infrastructure.⁵⁶

Natural coastal systems play a critical role in buffering hazards. Coral reefs reduce wave energy, while vegetation stabilises shorelines. However, these systems are themselves vulnerable to climate change, including ocean warming and acidification, which can reduce their effectiveness.⁶²

Infrastructure systems are highly exposed and constrained. Coastal roads, airstrips, and utilities are often located at low elevations and are vulnerable to inundation and erosion. Ports and landing areas are critical for connectivity but are exposed to wave and surge impacts.⁷³

The interaction between coastal processes and water systems is a key vulnerability pathway. Saline intrusion into freshwater lenses reduces water availability, while flooding can contaminate water sources. These interactions create compound risks affecting both water security and public health.

Under SSP2-4.5, increasing sea levels and wave impacts lead to more frequent flooding and gradual land loss. Under SSP5-8.5, these processes intensify significantly, with potential for chronic inundation and loss of critical infrastructure.

4.4.5.3 High Volcanic and Uplifted Island Systems

In countries such as Fiji, Samoa, Vanuatu, and Tonga, coastal vulnerability is spatially concentrated but economically and socially significant.

Coastal zones in these systems host major urban centres, ports, and infrastructure, making them critical to national economies. Exposure to sea-level rise, storm surge, and erosion is therefore highly consequential.

Coastal flooding is driven by the interaction of sea-level rise, storm surge, and rainfall. Urban drainage systems may be affected by backflow during high sea levels, reducing their effectiveness and increasing flood risk.⁶⁴

Erosion processes are influenced by both natural and human factors. Coastal development can disrupt sediment transport, increasing vulnerability to erosion. In some areas, protective ecosystems such as mangroves have been degraded, reducing natural buffering capacity.⁴³

Ports and coastal infrastructure are particularly vulnerable. Damage to these assets can disrupt trade, tourism, and supply chains, with significant economic impacts. Transport networks located along coasts are also exposed to flooding and erosion.³⁹ Small-scale women traders and coastal food vendors are disproportionately affected when port closures halt passenger flows and market access, undermining household income security.

⁷³ Asian Development Bank. 2021. *Climate Risk and Adaptation in the Pacific: Coastal and Transport Sectors*.

Infrastructure design and planning are critical factors in vulnerability. Many assets were not designed for future sea-level conditions, increasing the likelihood of failure under extreme events.⁷⁴

Under SSP2-4.5, increasing sea levels and hazard interactions lead to more frequent coastal impacts. Under SSP5-8.5, higher sea levels and more intense storms significantly increase the scale and severity of impacts, particularly in urban and economic centres.

4.4.5.4 Large High-Island Systems

In larger countries such as Papua New Guinea and Solomon Islands, coastal vulnerability is shaped by diverse coastal environments, delta systems, and infrastructure concentration in key locations.

These systems include extensive coastlines with varying levels of exposure. Low-lying coastal plains and delta regions are particularly vulnerable to flooding, erosion, and saline intrusion⁶⁴.

River–coastal interactions are a key feature of vulnerability. Flooding in river systems can coincide with high sea levels, creating compound flood conditions in coastal areas. Sediment transport processes are also influenced by both river and coastal dynamics.

Ports and coastal transport infrastructure are critical for connectivity and economic activity but are highly exposed to coastal hazards. Damage to these assets can affect national and regional supply chains.³⁹

Coastal ecosystems, including mangroves and wetlands, provide important protective functions but are under pressure from both climate change and human activities. Degradation of these systems increases vulnerability to coastal hazards.⁴³ Loss of mangroves and wetlands erodes subsistence safety nets, particularly for women who depend on them for fuelwood collection and near-shore food harvesting.

Infrastructure interdependence amplifies vulnerability. Coastal transport systems support energy, water, and economic systems, meaning that disruptions can have cascading impacts across sectors.⁵⁴

Under SSP2-4.5, coastal vulnerability increases through gradual changes in sea level and hazard interactions. Under SSP5-8.5, higher sea levels and increased hazard intensity significantly increase the risk of widespread and severe impacts.

4.4.5.5 Summary

Coastal management is a critical sector in the Pacific, with vulnerability driven by the interaction of sea-level rise, extreme events, and local coastal processes. The concentration of population, infrastructure, and economic activity in coastal zones amplifies vulnerability and increases the potential for systemic impacts. Households in low-lying settlements, particularly poorer families, women, and persons with disabilities, face disproportionate exposure due to limited relocation options, insecure tenure, and reduced access to protective infrastructure. Coastal food insecurity is intensified when reef and mangrove degradation reduces access to protein sources, disproportionately affecting women responsible for household nutrition.

Across all typologies, coastal systems are subject to increasing stress from both chronic and acute hazards. Natural ecosystems play a critical role in buffering impacts but are themselves vulnerable to climate change. Degradation of reefs and mangroves undermines subsistence fisheries and coastal food security, with gendered consequences for women and youth who depend on these resources for nutrition and livelihoods.

Infrastructure systems are central to vulnerability, particularly transport, energy, and water systems located in coastal zones. The interaction of these systems with coastal hazards creates complex and often cascading impacts. When coastal infrastructure fails, equity dimensions emerge: women traders lose market access, youth experience disrupted schooling, and persons with disabilities encounter

⁷⁴ World Bank. 2021. *Coastal Resilience in Pacific Island Countries*.

barriers to evacuation and recovery. Saline intrusion into water systems increases caregiving burdens and undermines household health, disproportionately affecting women and children.

Regional evidence indicates that without integrated coastal management, climate-resilient infrastructure design, and ecosystem-based approaches, coastal vulnerability will continue to increase under both SSP2-4.5 and SSP5-8.5 scenarios. Inclusive governance, from relocation planning to ecosystem restoration, is essential to ensure resilience measures address differentiated risks and reduce inequities rather than reinforce them.

4.4.6 Agriculture and the Water–Food–Energy Nexus

Agriculture and associated food systems in the PICs are highly vulnerable to climate change due to their dependence on climate-sensitive resources, including rainfall, temperature, soils, and ecosystems. In many PICs, agriculture is closely linked to subsistence livelihoods, rural economies, and food security, meaning that climate impacts on agricultural systems translate directly into household-level vulnerability and national development outcomes.⁷⁵ Equity dimensions are pronounced: women farmers, youth, and poorer households are disproportionately reliant on small-scale, rain-fed production, with limited access to irrigation, resilient seed varieties, or financial buffers. Limited land tenure rights constrain women's ability to adopt resilient practices or access adaptation financing, while persons with disabilities are often excluded from agricultural extension and decision-making processes.

The agricultural sector is also closely interconnected with water and energy systems, forming a water–food–energy nexus in which changes in one system propagate across others. Water availability influences crop production and livestock systems, while energy is required for water supply, processing, and transport. Climate change therefore affects agricultural systems through both direct biophysical impacts and indirect system interactions.³⁹ Disruptions cascade into gendered impacts: women's workloads increase when water scarcity affects food preparation and caregiving; youth face reduced nutrition and learning outcomes when food insecurity rises; and persons with disabilities are disproportionately affected when household resilience is eroded. Adaptive technologies and agricultural extension services rarely reach persons with disabilities, reinforcing exclusion from climate-resilient livelihoods.

A defining characteristic of agricultural vulnerability in the Pacific is the limited buffering capacity of production systems, which are often small-scale, rain-fed, and dependent on fragile soils and ecosystems. As a result, climate variability and extreme events can lead to rapid declines in productivity and food availability. Food insecurity has differentiated consequences: women and children experience higher health risks from malnutrition, while poorer households are forced into negative coping strategies such as reduced meals or selling assets. Loss of crop diversity intensifies nutrition insecurity, with women bearing responsibility for household diets and children's health outcomes.

4.4.6.1 Hazard–System Interaction Pathways

Agricultural systems are affected by climate hazards through multiple interacting pathways.

Drought is a primary driver of agricultural vulnerability. Reduced rainfall and increased evapotranspiration decrease soil moisture, reduce crop yields, and affect pasture availability for livestock. In rain-fed systems, even short periods of drought can lead to crop failure and reduced food availability.⁴⁴

Extreme rainfall and flooding affect agriculture through soil erosion, waterlogging, and damage to crops and infrastructure. High-intensity rainfall can wash away topsoil, reduce soil fertility, and disrupt planting and harvesting cycles. Flooding can damage crops and reduce access to agricultural land.

⁷⁵ Food and Agriculture Organization. 2021. *Climate Change and Food Security in Small Island Developing States*.

Extreme heat affects crop growth, reduces yields, and increases stress on livestock. Heat stress can reduce labour productivity, affecting agricultural operations.⁷⁶

Sea-level rise and coastal inundation affect agricultural systems through saline intrusion into soils and groundwater. Increased salinity reduces crop productivity and can render land unsuitable for agriculture.⁶⁴

Tropical cyclones introduce compound impacts, including wind damage to crops, flooding, and soil erosion. These events can result in widespread agricultural losses and long-term impacts on soil quality and productivity.

4.4.6.2 Low-Lying Coral Atoll Systems

In atoll countries such as Kiribati, Tuvalu, and Republic of the Marshall Islands, agricultural systems are highly constrained and extremely vulnerable.

Agricultural production is limited by poor soils, limited freshwater availability, and high exposure to coastal processes. Crops are typically restricted to salt-tolerant species, and production is often supplemented by imported food.

Drought represents a critical risk, reducing water availability for crops and increasing reliance on limited freshwater resources. High temperatures further exacerbate these conditions by increasing evapotranspiration.⁶⁸

Sea-level rise and saline intrusion represent major constraints on agricultural productivity. Salinity affects both soils and groundwater, reducing crop yields and limiting the range of viable crops.²⁸

Flooding and wave overtopping during storms can damage crops and contaminate soils, creating compound impacts that affect both production and water quality.

Agricultural systems are closely linked to water and energy systems. Water scarcity affects both crop production and household consumption, while energy is required for water supply and food storage.⁷⁷ Women responsible for household food preparation face heightened burdens when imported staples become unaffordable, while persons with disabilities encounter barriers to accessing emergency food distribution.

Under SSP2-4.5, increasing variability in rainfall and sea-level rise lead to gradual declines in agricultural productivity. Under SSP5-8.5, these impacts intensify, with increasing likelihood of crop failure and reduced viability of local food production systems.

4.4.6.3 High Volcanic and Uplifted Island Systems

In countries such as Fiji, Samoa, Vanuatu, and Tonga, agricultural systems are more diverse but remain highly vulnerable to climate variability.

Agricultural production in these systems includes both subsistence and commercial activities, with crops grown in coastal plains and upland areas. Water availability is a key determinant of productivity, with rainfall variability affecting soil moisture and crop growth.

Drought reduces crop yields and affects livestock systems, while extreme rainfall can lead to flooding, erosion, and landslides that damage agricultural land.

Soil degradation is a key issue, particularly in areas with steep slopes or intensive land use. Climate change can exacerbate these processes through increased rainfall intensity and variability.⁷⁸

Coastal agriculture is particularly vulnerable to saline intrusion and flooding, affecting both crop production and soil quality.²⁸

⁷⁶ WHO 2021. *Climate Change and Health in the Pacific*.

⁷⁷ PRIF. 2021. *Water–Energy Nexus in the Pacific*.

⁷⁸ SPC. 2021. *Pacific Agriculture and Climate Change Reports*.

Energy and transport systems play a critical role in agricultural value chains, including processing, storage, and distribution. Disruptions to these systems can affect market access and increase post-harvest losses.⁶⁴ Women vendors and small traders are disproportionately affected when transport disruptions cut off access to markets, while men in commercial agriculture are more likely to access formal recovery support.

Under SSP2-4.5, increasing variability in climate conditions leads to greater uncertainty in agricultural production. Under SSP5-8.5, higher temperatures and more extreme events significantly reduce productivity and increase the risk of food insecurity.

4.4.6.4 Large High-Island Systems

In larger countries such as Papua New Guinea and Solomon Islands, agricultural vulnerability is shaped by scale, diversity, and reliance on subsistence systems.

Agriculture in these systems is often the primary livelihood for rural populations, making climate impacts particularly significant. Variability in rainfall and temperature affects crop yields, water availability, and soil conditions.

Drought affects soil moisture and crop growth, while extreme rainfall can lead to flooding and erosion, affecting both crops and infrastructure.⁶⁸ Agricultural systems are closely linked to transport networks, which are required for market access and distribution. Disruptions to transport systems can limit access to markets and increase food insecurity.⁴³

Water and energy systems are also critical, particularly for irrigation, processing, and storage. Infrastructure limitations increase vulnerability to climate impacts.

Environmental degradation, including deforestation and soil erosion, can exacerbate climate impacts, reducing the resilience of agricultural systems.⁵⁶ Youth face barriers to accessing agricultural financing and innovation programs, limiting their ability to adopt resilient practices or diversify livelihoods.

Under SSP2-4.5, increasing variability in climate conditions affects agricultural productivity and livelihoods. Under SSP5-8.5, higher temperatures and more extreme events significantly increase the risk of widespread agricultural impacts and food insecurity.

4.4.6.5 Summary

Agriculture and the water–food–energy nexus in the Pacific are highly vulnerable to climate change due to the dependence of production systems on climate-sensitive resources and the limited buffering capacity of natural and infrastructure systems. Climate shocks translate quickly into differentiated social impacts: poorer households face income and food trade-offs, women absorb additional caregiving and labour burdens when water and food supplies are disrupted, and children's health and learning outcomes decline under malnutrition. Nutrition insecurity is intensified when crop diversity declines, with women responsible for balancing scarce food resources in household diets. Persons with disabilities are often excluded from agricultural extension and adaptive technology programs, reinforcing inequities in climate-resilient livelihoods.

Climate hazards affect agricultural systems through multiple pathways, including water availability, soil conditions, temperature, and coastal processes. These impacts are amplified by interactions with water and energy systems, creating complex and cascading risks. Disruptions to transport and storage systems compound inequities, as informal traders, often women, lose market access and income security. Persons with disabilities are disproportionately affected when household resilience erodes, limiting their access to food and essential services.

Across all typologies, agricultural vulnerability has direct implications for food security, livelihoods, and economic stability. Regional evidence indicates that without investment in climate-resilient agricultural practices, water management, and supporting infrastructure, vulnerability will continue to increase under both SSP2-4.5 and SSP5-8.5 scenarios. Embedding gender equality and social inclusion in agricultural governance, from resource allocation to market access, is essential to ensure resilience measures reduce systemic inequities rather than entrench them.

4.4.7 Disaster Risk Management

Disaster risk management (DRM) systems across the PICs are both directly exposed to climate hazards and central to the capacity of countries to manage escalating climate risks. In the Pacific context, DRM is not a stand-alone sector but a cross-cutting institutional and operational system that links hazard monitoring, preparedness, emergency response, early warning, evacuation, relief logistics, post-disaster recovery, and risk-informed planning.⁷⁹ Equity dimensions are critical: women, youth, persons with disabilities, and poorer households often face barriers to accessing early warning information, evacuation transport, and relief distribution. Gender-based violence and protection risks also increase during displacement and sheltering, requiring DRM systems to integrate safeguarding measures. Exclusion from decision-making bodies means that women and persons with disabilities are not systematically engaged in shaping evacuation planning or shelter design, reinforcing systemic gaps in accessibility and protection.

As climate hazards intensify under both SSP2-4.5 and SSP5-8.5, DRM systems face increasing pressure, not only because the frequency and severity of events rise, but because compound, cascading, and chronic climate stresses increasingly exceed the design assumptions and operational capacities of existing arrangements.⁷⁹ These pressures are not evenly distributed, marginalized groups are more likely to live in hazard-prone areas, have fewer assets to recover, and experience slower access to relief and recovery services. Informal settlements often fall outside formal DRM mapping and resource allocation, leaving poorer households without designated evacuation routes or shelter capacity.

A defining feature of DRM vulnerability in PICs is that response systems are often expected to operate under precisely the same hazard conditions that disrupt the infrastructure, communications, transport, water, and energy systems upon which they depend. In other words, DRM systems are highly exposed to the very hazards they are intended to manage.⁵⁴ This creates a critical systemic challenge: when transport networks are cut, power fails, telecommunications are disrupted, and water systems are compromised, the capacity to coordinate evacuation, deliver relief supplies, communicate warnings, and restore essential services may be significantly reduced. Climate change therefore affects DRM not only by increasing hazard loads, but by increasing the probability of multi-system failure during response and recovery periods.⁴³ For women and persons with disabilities, these failures translate into heightened risks of exclusion from evacuation, delayed access to health care, and increased exposure to protection concerns. Community volunteers engaged in emergency logistics often lack formal training and protective equipment, increasing their vulnerability during multi-system failures.

In addition, climate change is altering the temporal character of disaster risk. Historically, DRM systems in many PICs have been oriented primarily toward acute hazards, particularly tropical cyclones and associated flooding. However, climate change is increasing the significance of slow-onset and compounding hazards, including drought, heat stress, sea-level rise, prolonged coastal inundation, and repeated events occurring in close succession.⁸⁰ These shifts require DRM systems to move beyond episodic emergency management toward more integrated risk governance that can address chronic stress, recovery overlap, and long-duration disruptions. Embedding GEDSI into this transition is essential, inclusive governance ensures that preparedness, response, and recovery strategies account for differentiated vulnerabilities and strengthen resilience across all social groups. Without sex-disaggregated monitoring and disability-inclusive data, chronic hazard impacts remain invisible in planning, perpetuating inequities in resource allocation.

4.4.7.1 Hazard–System Interaction Pathways

DRM systems are affected by climate change through a series of interrelated hazard–system pathways.

⁷⁹ Intergovernmental Panel on Climate Change. 2021. *Climate Change 2021: The Physical Science Basis*. Cambridge University Press, Chapters 11 and 12.

⁸⁰ United Nations Office for Disaster Risk Reduction (UNDRR). 2022. *Global Assessment Report on Disaster Risk Reduction 2022: Our World at Risk*. Geneva.

Tropical cyclones remain the most obvious and severe acute challenge for DRM systems, generating simultaneous wind, rainfall, coastal flooding, communications failures, and transport disruption. Under more intense cyclone conditions, emergency shelters, evacuation routes, response depots, and command centres may themselves be exposed to damage or loss of functionality.⁴²

Heavy rainfall and flooding affect DRM systems by disrupting road access, damaging communications infrastructure, isolating settlements, and reducing the ability of emergency services to reach affected populations. In steep volcanic and high-island settings, landslides triggered by extreme rainfall can sever transport corridors and isolate communities for extended periods.⁵⁵

Drought affects DRM in different but equally important ways. Prolonged water shortages increase pressure on emergency water supply systems, health services, and relief logistics. In some contexts, drought may not trigger the same immediate mobilisation as cyclones, but it can produce severe cumulative impacts on food security, health, and social stability.⁸¹

Extreme heat affects both populations and response systems. Heat stress can reduce the effectiveness and safety of emergency personnel, increase health-related demand, and raise cooling and water requirements in shelters and health facilities.⁶⁶

Sea-level rise and coastal inundation affect the long-term viability of emergency infrastructure located in coastal zones, including airports, ports, warehouses, and coordination centres. Rising baseline risk also increases the frequency with which emergency systems are activated, potentially straining limited institutional and financial resources.⁶⁴

These hazards increasingly interact. For example, a cyclone may be followed by prolonged water stress due to damaged supply systems, or repeated flood events may occur before recovery from a prior event is complete. These interactions are central to DRM vulnerability and are expected to intensify under higher-emissions scenarios.

4.4.7.2 Low-Lying Coral Atoll Systems

In low-lying coral atoll systems - including Kiribati, Tuvalu, the Republic of the Marshall Islands, and Naoero, as well as atoll areas of the Federated States of Micronesia and Palau - DRM vulnerability is shaped by extreme geographic constraint, very high exposure, and limited operational flexibility.

In these systems, hazard exposure is often national in extent rather than localised. Storm surge, wave overtopping, rainfall flooding, drought, and heat stress can affect entire islands or island groups simultaneously, leaving few safe zones and limited capacity for internal relocation.¹⁸ This creates a fundamental DRM constraint: emergency planning cannot rely on unaffected nearby areas for shelter, logistics, or service continuity in the same way that larger landmasses can.

The hazard burden in atoll systems is strongly shaped by compound coastal processes. Cyclones or distant storm systems may generate wave-driven flooding that damages housing, contaminates water supplies, and disrupts transport at the same time. Drought can then prolong the emergency by constraining drinking water availability and reducing sanitation functionality. In these settings, emergency conditions can persist long after the triggering event has passed, shifting DRM from immediate response into prolonged support operations.⁵¹

Exposure extends across populations, public services, natural systems, and economic activity. Human exposure is particularly high because settlements are concentrated in narrow coastal strips, often with limited formal shelter capacity and restricted access to resilient housing. Health risks increase when water and sanitation systems fail under inundation or drought conditions. Social vulnerability can be especially acute for outer island communities, where supply chains are fragile and access to services is limited. Outer island women and persons with disabilities can be last to receive relief supplies due to logistical prioritisation of central hubs, reinforcing inequities in emergency support.

Infrastructure exposure is central to DRM vulnerability. Airstrips and ports are often the primary lifelines for emergency response, yet they are themselves highly exposed to flooding, erosion, and

⁸¹ WHO 2020. *Climate Change, Water and Health in Small Island Settings*. Geneva.

overtopping.⁵⁶ Road and causeway networks may be sparse but critical, meaning that failure of even short sections can disconnect communities and hinder movement of relief supplies. Water storage, desalination units where present, emergency generators, fuel storage, telecommunications towers, and health facilities all face high exposure to both chronic coastal processes and acute events. Limited redundancy means that failure of a single critical asset can have disproportionate system-wide consequences.

Institutional and logistical vulnerability is also high. DRM systems in atoll countries often depend heavily on external support for surge response, technical assistance, and emergency relief. Where multiple islands are affected at once, logistics become more complex and expensive. Under SSP2-4.5, activation frequency and operational strain are expected to increase steadily. Under SSP5-8.5, rising sea levels, stronger extremes, and worsening water stress substantially increase the likelihood that DRM systems will face repeated, prolonged, and overlapping emergencies that challenge existing response models.

4.4.7.3 High Volcanic and Uplifted Island Systems

In high volcanic and uplifted island systems - such as Fiji, Samoa, Tonga, Vanuatu, Solomon Islands, Cook Islands, and Niue - DRM vulnerability is shaped by multi-hazard exposure across complex terrain, combined with strong concentration of population and infrastructure in coastal and riverine zones.

These systems are exposed to tropical cyclones, extreme rainfall, flash flooding, river flooding, landslides, coastal flooding, drought, and increasing heat stress. The key DRM challenge is therefore not simply event severity, but hazard interaction across landscapes. Intense rainfall in upland catchments can generate downstream flooding in urban areas at the same time that landslides cut off road access and coastal surge affects ports and airports.⁸² This creates operational environments in which response must be coordinated across multiple, concurrent hazard zones.

Exposure is strongly differentiated but remains highly concentrated in the areas most important for service delivery and governance. Coastal cities and towns often contain key government buildings, hospitals, emergency coordination centres, communications hubs, and transport nodes. As a result, the places from which response is coordinated are often themselves exposed to the most severe hazards. Informal settlements on floodplains, unstable slopes, or poorly drained coastal margins are particularly vulnerable, increasing emergency shelter demand and post-event health risks.

Environmental conditions further shape DRM vulnerability. Catchment degradation, deforestation, and poor slope management can amplify flood and landslide risk, increasing the scale of emergency response required. Coastal ecosystem degradation, including reef and mangrove loss, reduces natural buffering and increases the magnitude of surge and wave impacts on populated areas.⁶²

Infrastructure exposure is extensive and often determines the success or failure of DRM operations. Coastal roads, bridges, and port facilities are critical for evacuation and relief logistics but are vulnerable to flooding, erosion, storm surge, and wind damage. Inland road corridors are vulnerable to landslides and washouts. Airports are essential for inter-island and international response but may be disrupted by flooding, debris, or coastal impacts. Energy and communications systems are equally critical and can fail under extreme wind and flood conditions, undermining coordination and public warning systems.⁸³ Water supply and sanitation infrastructure in shelters and health facilities are also crucial and may be stressed by both drought and flood conditions.

Institutional capacity in these systems is often stronger than in atoll states, but operational demand is also more complex because events can affect multiple hazard zones simultaneously and across multiple islands. Under SSP2-4.5, increased hazard intensity is likely to result in more frequent high-pressure response operations, particularly for flood and cyclone events. Under SSP5-8.5, the combination of stronger extremes, repeated disruptions, and growing urban exposure significantly increases the risk that DRM systems will be stretched beyond planned response thresholds,

⁸² SPC.2021. *Pacific Resilience and Disaster Risk Management Programme Reports*.

⁸³ World Bank. 2020. *Resilient Communications for Emergency Management in Pacific Island Countries*. Washington, DC.

especially where infrastructure resilience and inter-agency coordination do not keep pace with climate risk.

4.4.7.4 Large High-Island Systems

In larger high-island systems, particularly Papua New Guinea and parts of Solomon Islands, DRM vulnerability is shaped by scale, geographic dispersion, uneven service coverage, and major differences in access and capacity between regions.

These systems face complex hazard environments that include large-scale river flooding, flash flooding, landslides, coastal flooding, cyclones in exposed areas, drought in some regions, and increasing heat stress. The principal DRM challenge is the management of large-area, multi-regional emergencies in contexts where transport and communications networks may already be limited.⁸⁴ In contrast to smaller islands, hazards may not affect the whole national territory at once, but the sheer scale of response requirements can exceed available capacity.

Exposure extends across highly diverse populations and livelihoods. Rural populations reliant on agriculture and local water sources are vulnerable to drought, flooding, and access disruptions. Urban populations face flood and infrastructure risks, particularly in low-lying or poorly serviced settlements. Economic exposure is also significant, as disruptions to major transport corridors, ports, and urban centres can affect supply chains and access to markets over large areas.

Environmental exposure includes river basins, forests, catchments, wetlands, and coastal systems that influence the scale and persistence of disasters. Deforestation, catchment degradation, and land-use pressures can increase runoff, erosion, and slope instability, thereby amplifying flood and landslide risk.⁸⁵ These environmental conditions are therefore integral to DRM effectiveness, not merely background factors.

Infrastructure exposure is shaped by network scale, corridor dependence, and service inequality. Major roads, bridges, airstrips, and ports are essential for emergency logistics, but many are highly exposed to flooding, landslides, erosion, and coastal damage.⁸⁶ In some areas, the absence of alternative routes means that disruption can isolate entire regions. Energy and telecommunications networks may be sparse and fragile, limiting early warning dissemination and response coordination. Water and health infrastructure in remote areas may also be limited, reducing the ability to maintain essential services during prolonged emergencies.

The principal system vulnerability in these contexts is that DRM operations depend on infrastructure networks that are incomplete before disasters and frequently degraded during them. This produces a dual challenge: climate hazards both create humanitarian needs and reduce the means of meeting those needs. Under SSP2-4.5, increasing hazard variability and event intensity will place growing pressure on already stretched systems. Under SSP5-8.5, more severe extremes and repeated events are likely to increase the frequency of large, multi-regional emergencies, with greater potential for prolonged displacement, logistical bottlenecks, and cascading failures across sectors.

4.4.7.5 Summary

Disaster risk management systems in the Pacific are critical to resilience but are increasingly vulnerable to the same climate hazards they are designed to manage. Climate change affects DRM not only by increasing the severity of individual hazards, but by increasing the frequency of compound events, the duration of response and recovery periods, and the probability of cascading failures across essential systems. These pressures translate into differentiated social impacts: poorer households, women, youth, and persons with disabilities often face barriers to accessing early warnings, evacuation transport, and relief distribution, while protection risks such as gender-based violence rise during displacement and sheltering. Exclusion from DRM governance structures means

⁸⁴ World Bank. (2021). *Disaster Risk Management in Papua New Guinea: Strategic Challenges and Opportunities*. Washington, DC.

⁸⁵ Food and Agriculture Organization. 2021. *Forests, Catchments and Resilience in Pacific Island Countries*. Rome.

⁸⁶ Asian Development Bank. 2021. *Transport Resilience and Connectivity in the Pacific*. Manila.

that the voices of women and persons with disabilities are rarely integrated into preparedness planning, perpetuating inequities in evacuation, relief, and recovery.

Across all geographic typologies, exposure extends beyond emergency agencies and assets to include populations, ecosystems, livelihoods, and the infrastructure systems that enable preparedness, warning, evacuation, response, and recovery. Infrastructure is particularly important because it acts both as an exposed asset and as a functional backbone for DRM operations. When transport, energy, communications, water, and health infrastructure fail, disaster impacts deepen and recovery slows. For marginalized groups, these failures mean exclusion from evacuation routes, delayed access to health care, disrupted education, and prolonged recovery periods. Informal settlements and outer island communities are especially vulnerable when lifeline infrastructure collapses.

Regional and global evidence indicates that, under both SSP2-4.5 and SSP5-8.5, DRM systems in PICs will face increasing operational strain, with higher-emissions pathways producing more severe, more frequent, and more overlapping emergencies. Strengthening DRM therefore requires not only institutional capacity building but also major investment in resilient lifeline infrastructure, climate-informed early warning systems, distributed logistics capacity, and integrated planning for compound and cascading risks. Embedding GEDSI into DRM through disability-inclusive evacuation, safeguarding in shelters, equitable access to relief, and sex-disaggregated monitoring is essential to ensure resilience measures reduce systemic inequities rather than entrench them. Box 2

Box 2: Observed Impacts of Climate Hazards in the Pacific Region

PICs are already experiencing significant and increasing adverse impacts from coastal climate hazards, including tropical cyclones, storm surge, coastal inundation, erosion, and saline intrusion. These impacts occur in the context of high baseline exposure, where infrastructure, populations, and economic activity are heavily concentrated in low-lying coastal zones. The table below provides quantitative evidence of the extent to which coastal hazards are already generating loss and damage across the region.

Evidence Category	Quantitative Evidence	RPACA Climate Rationale
Exposure of built infrastructure	57% of built infrastructure across 12 PICs within 500 m of coastline; US\$21.9 billion replacement value ^a	High structural exposure means coastal hazards directly translate into infrastructure damage
Recent disaster losses (2020–2024)	US\$4.3 billion total losses; cyclones 55% of impacts ^b	Confirms increasing loss trends and cyclone dominance
Population and housing impacts	1.7 million people affected; 76,000 houses damaged/destroyed (2020–2024) (footnote a)	Demonstrates large-scale impacts on communities
Cyclone frequency and impacts	42 cyclones in ~5 years affecting 1 million people; ~US\$2 billion losses (footnote a)	Highlights high recurrence of damaging coastal hazards
Long-term disaster impacts	9.2 million people affected, 9,800 deaths, US\$3.2 billion damage since 1950 ^c	Confirms cumulative vulnerability
Macroeconomic shock events	Cyclone Winston (Fiji): US\$1.38bn (31% GDP), 62% population affected ^d	Demonstrates economy-wide disruption
Other major cyclone impacts	Cyclone Pam (Vanuatu): >60% GDP damage; Cyclone Gita (Tonga): 38% GDP (footnote b)	Recurrent macro-critical shocks
Fiscal and growth impacts	Disasters reduce GDP growth and strain fiscal buffers ^e	Demonstrates long-term economic impacts
Infrastructure disruption	Repeated damage to transport, energy, water systems ^f	Direct linkage to RPACA sectors
Ecosystem degradation	Increasing loss and damage linked to stronger storms and sea-level rise ^g	Ecosystem decline amplifies vulnerability

GDP= gross domestic product, PICS = Pacific Island Countries, and RPACA= Regional Programmatic Approach on Climate Change

Note: Figures are the latest approximations available and rounded.

^a L. Kumar and S. Taylor, S. 2015. Exposure of coastal built assets in the South Pacific to climate risks. *Nature Climate Change*, 5, 992–996.

^b Pacific Community Pacific Community. 2025. *Hazardous Events and Their Impacts in the Pacific (2020–2025)*.

^c Global Facility for Disaster Reduction and Recovery and World Bank. 2014. *Pacific Catastrophe Risk Assessment and Financing Initiative (PCRAFI): Catastrophe Risk Assessment Methodology*.

^d World Bank Government of Fiji and World Bank. 2016. *Fiji Post-Disaster Needs Assessment: Tropical Cyclone Winston*.

^e International Monetary Fund. 2026. *Climate Finance and Adaptation Needs in Pacific Island Countries*.

^f World Bank World Bank. 2026. *Pacific Climate Resilient Transport Programme*.

^g United Nations Office for Disaster Risk Reduction. 2025. *Addressing Loss and Damage in the Pacific*.

^h Asian Development Bank. 2021. *Transport Resilience and Connectivity in the Pacific*. Manila.

Source: Asian Development Bank.

The evidence demonstrates clear and escalating climate impacts, where high exposure and increasing hazard intensity result in systemic losses across infrastructure systems, economies, and communities. Recent impacts alone total approximately US\$4.3 billion over five years, with cyclones as the dominant driver (footnote a). Individual events generate severe macroeconomic shocks, with damages exceeding 30–60% of GDP in some cases (footnotes b and c).

These impacts are exacerbated by the concentration of infrastructure in coastal zones, where more than half of assets are located within 500 metres of the coastline.^h This results in direct damage to critical infrastructure systems, including transport, energy, and water supply, and cascading impacts on service delivery and economic activity (footnote e). At the same time, degradation of coastal ecosystems reduces natural protection, further increasing exposure (footnote f).

4.4.8 Cross-Sector Cascading Risk and Critical Systems Failure

Climate risks in the PICs are increasingly characterised not by isolated sectoral impacts, but by interconnected, cascading failures across infrastructure systems, services, and socio-economic

structures. The analysis in Sections 3, 4, and 5 demonstrates that hazards such as tropical cyclones, extreme rainfall, drought, heat, and sea-level rise interact with highly exposed and interdependent systems, creating the conditions for system-wide disruption rather than discrete sectoral impacts.⁵⁴ When these systemic shocks occur, the burden falls unevenly: households with limited assets, women traders, subsistence farmers, youth, and persons with disabilities experience deeper disruption because they rely most heavily on fragile service networks and have fewer alternatives when systems collapse.

Cascading risk arises when an initial hazard triggers failures in one system that propagate to others through physical, operational, or institutional linkages. In the Pacific context, these linkages are particularly strong due to the central role of infrastructure systems - including transport, energy, water, and communications - in enabling all other sectors.⁵⁴ Where these systems lack redundancy, are spatially concentrated, or operate close to capacity, the likelihood of cascading failure increases significantly. For vulnerable groups, this means that a single point of failure — such as a damaged port or broken communications tower — can sever access to markets, health care, education, and relief, compounding exclusion and slowing recovery. Without sex-disaggregated and disability-inclusive data, these differentiated impacts remain invisible in planning, perpetuating inequities in system design and recovery prioritisation.

Under both SSP2-4.5 and SSP5-8.5 scenarios, the frequency, intensity, and complexity of climate hazards are projected to increase, resulting in a corresponding increase in the likelihood of cascading and systemic impacts.⁴⁴ Higher-emissions pathways further increase the probability of compound events and overlapping recovery periods, where systems are unable to fully recover before being exposed to subsequent shocks. Inclusive resilience planning that integrates gender equality, disability inclusion, and social protection into system design and governance is essential to ensure that responses to cascading risk strengthen equity and reduce differentiated vulnerability rather than entrench it. Market disruption often hits women vendors hardest because they lack access to formal recovery financing or cold-storage facilities, translating into immediate livelihood insecurity when supply chains fail.

4.4.8.1 Cascading Risk Pathways Across Sectors

Cascading risks in PICs typically originate from a limited set of critical failure points, most commonly within lifeline infrastructure systems, and propagate across sectors through established dependencies. When these systems fail, differentiated impacts emerge: poorer households, women traders, and persons with disabilities are often the first to lose access to essential services and markets, as they rely most heavily on fragile supply chains and have fewer alternatives.

A common pathway begins with transport system disruption. Flooding, landslides, or coastal damage to roads, bridges, ports, or airports can isolate communities and disrupt supply chains. This immediately affects the delivery of fuel, food, water treatment chemicals, and medical supplies, while also limiting access for emergency response and repair crews.⁴³ Isolation disproportionately affects outer island communities and informal market actors, where women and youth traders face income loss and delayed relief. As a result, impacts extend rapidly into water supply, energy, health services, and economic activity.

Energy system failure represents another critical cascade trigger. Damage to generation or distribution infrastructure during cyclones or flooding can lead to widespread outages. These outages affect water supply systems that rely on pumping and treatment, disrupt communications and early warning systems, and reduce the functionality of health facilities and emergency shelters.⁷¹ In urban areas, energy failure can also affect wastewater systems, increasing contamination risks. For households without backup power, outages prolong exclusion from health services and communications, with women and caregivers bearing increased burdens in maintaining household safety and care.

Water system failure creates direct and indirect cascading impacts. Loss of potable water supply during drought or contamination during flooding affects public health, reduces sanitation functionality, and increases pressure on health services. In agricultural systems, reduced water availability affects food production, with implications for livelihoods and food security.⁵¹ These failures deepen inequities:

women and children face heightened health risks from unsafe water, while subsistence farmers and poorer households experience immediate food insecurity. Asset-stripping as a coping strategy, like selling tools, livestock, or fishing gear, disproportionately undermines poorer households' long-term resilience and women's capacity to sustain food security.

Coastal system degradation acts as a slow-onset cascade driver. Progressive sea-level rise and erosion increase the exposure of infrastructure systems to flooding and damage. Over time, this leads to increased maintenance requirements, reduced asset lifespan, and eventual loss of functionality in critical systems such as transport corridors, ports, and energy facilities.⁶⁴ Communities with insecure tenure or limited relocation option, often poorer households and persons with disabilities are most exposed to long-term displacement and livelihood disruption. These cascading pathways are rarely linear. Instead, they often involve feedback loops, where failures in one system exacerbate stress in others. For example, transport disruption delays repair of energy systems, prolonging outages, which in turn affect water supply and health services. Such feedback loops extend recovery timelines and compound inequities, leaving marginalized groups with the longest periods of exclusion from essential services

4.4.9 Compound Events and System Overload

In addition to cascading pathways, PICs are increasingly exposed to compound events, where multiple hazards occur simultaneously or in close succession. These events significantly increase the likelihood of system failure by placing multiple, overlapping demands on infrastructure and institutional capacity.

A typical compound event scenario involves a tropical cyclone generating wind damage, heavy rainfall, flooding, and storm surge. Coastal infrastructure may be damaged by surge and wave action, while inland areas experience flooding and landslides. At the same time, energy and communications systems may fail, reducing the ability to coordinate response.⁴²

Following the initial event, secondary impacts may emerge. Water supply systems may be compromised due to contamination or lack of power, while food supply chains may be disrupted due to transport damage. If a subsequent hazard - such as another storm or a period of drought - occurs before recovery is complete, systems may be pushed beyond their capacity to cope. For households with limited assets, this overlap forces negative coping strategies such as reducing meals or selling productive resources, deepening vulnerability.

Drought–flood sequences represent another important compound pathway. Prolonged drought reduces water availability and weakens agricultural systems, while subsequent heavy rainfall events can cause flooding and contamination, compounding impacts on water and food systems.⁸⁷

Under SSP5-8.5, compound events are expected to become more frequent and more intense, increasing the likelihood of system overload, where multiple sectors experience simultaneous stress that exceeds design and operational thresholds.

4.4.10 Critical Infrastructure and Single Points of Failure

A defining feature of vulnerability in PICs is the presence of critical infrastructure nodes and corridors that act as single points of failure within broader systems.

In many countries, a single port or airport provides the primary connection to international and regional supply chains. Similarly, key road corridors connect population centres to essential services and economic hubs. Energy systems may rely on a small number of generation facilities and limited distribution networks.⁶² When these nodes fail, exclusion risks are highest for poorer households, women traders, and persons with disabilities, who depend most directly on these limited lifelines for market access, health care, and relief. Without sex-disaggregated and disability-inclusive monitoring, the differentiated exclusion of these groups remains invisible in system design, perpetuating inequities in recovery prioritisation.

⁸⁷ World Bank (2021). *Disaster Risk Management in Papua New Guinea: Strategic Challenges and Opportunities*. Washington, DC.

The failure of these critical nodes can result in disproportionate impacts, as alternative routes or systems may not exist. This is particularly evident in atoll systems, where infrastructure networks are inherently limited, but is also relevant in larger systems where geographic constraints limit redundancy.

The exposure of critical infrastructure to coastal hazards is a major concern. Ports, airports, and coastal roads are often located in low-lying areas, making them highly vulnerable to sea-level rise, storm surge, and erosion.⁶² As sea levels rise, the frequency of disruption increases, potentially leading to chronic reliability issues.

Infrastructure design standards and maintenance practices are key determinants of vulnerability. Many assets were designed based on historical climate conditions and may not be resilient to future hazard levels.⁵⁶ Without adaptation, the risk of failure increases over time.

4.4.11 Typology-Specific Systemic Risk Profiles

While cascading risks are present across all PICs, their manifestation varies by geographic typology.

In low-lying coral atoll systems, cascading risk is system-wide and immediate. Hazards such as flooding and drought affect entire national systems simultaneously, leaving limited scope for internal redistribution of resources. Infrastructure networks are minimal, and failure of key assets - such as airstrips or water systems - can result in complete system disruption.¹⁸ In these contexts, exclusion risks are acute for outer island communities, women, and persons with disabilities, who have the least access to alternative transport or water systems when national networks fail.

In high volcanic and uplifted island systems, cascading risk is spatially concentrated but multi-hazard driven. Coastal urban centres act as hubs for infrastructure and services, meaning that disruption in these areas can have national-level impacts. At the same time, inland hazards such as flooding and landslides can disrupt transport and supply chains, creating multi-directional cascades.

In large high-island systems, cascading risk is shaped by scale and network dependency. Critical corridors connect dispersed populations, and failure of these corridors can isolate large regions. Infrastructure gaps and uneven service provision increase vulnerability, particularly in rural areas where access to alternative systems is limited.⁸⁴

4.4.12 Implications for System Resilience and Adaptation

The analysis of cascading risk highlights several critical implications for climate resilience in the Pacific.

First, sectoral approaches to risk management are insufficient. Because impacts propagate across sectors, resilience must be addressed through integrated, cross-sectoral strategies that consider system interdependencies.⁶⁴

Second, infrastructure systems are the primary leverage point for reducing systemic risk. Strengthening the resilience of transport, energy, water, and communications systems can reduce the likelihood and severity of cascading failures. Equity considerations are critical here: when lifeline systems fail, poorer households, women traders, and persons with disabilities are disproportionately excluded from services, so resilience investments must explicitly address differentiated access.

Third, redundancy and diversification are critical but often lacking. Investment in alternative routes, distributed systems, and decentralised infrastructure can reduce dependence on single points of failure.

Fourth, climate change is pushing systems toward critical thresholds. Under higher-emissions scenarios, the combination of increasing hazard intensity, compound events, and infrastructure constraints significantly increases the risk of systemic failure, particularly in atoll systems and rapidly urbanising areas.

Finally, DRM systems must evolve to address compound and cascading risks. This includes strengthening early warning systems, improving coordination across sectors, and integrating climate risk into planning and investment decisions.⁸⁰

4.4.13 Summary

Cascading and systemic risks are defining features of climate vulnerability in the Pacific. Hazards interact with highly exposed and interdependent systems, creating pathways through which impacts propagate across sectors and spatial scales.

Infrastructure systems play a central role in these dynamics, acting both as exposed assets and as enabling systems for all other sectors. Where these systems fail, impacts extend rapidly across water, energy, transport, health, and economic systems. These failures also translate into differentiated exclusion, with poorer households, women traders, and persons with disabilities facing the longest disruptions due to limited alternatives and reliance on fragile service networks. Asset-stripping and prolonged livelihood disruption reinforce systemic inequities, as poorer households and women vendors are least able to recover when cascading failures persist. Table 3 summarises the vulnerabilities and impacts across the sectors.

Under both SSP2-4.5 and SSP5-8.5 scenarios, the likelihood of cascading and systemic impacts is expected to increase, with higher-emissions pathways leading to more frequent compound events and greater risk of system overload.

Addressing these risks requires integrated, cross-sectoral approaches that strengthen infrastructure resilience, reduce system dependencies, and enhance the capacity of DRM systems to manage complex and evolving climate risks.

Table 3: Summarizing Climate Vulnerabilities in Pacific Island Countries and the Interaction of Island Typology, Hazard Exposure, and Socio-Economic Systems

Socio-Economic System	Hazard-System Interaction Pathways	Island Typology		
		Low-Lying Coral Atolls	High Volcanic and Uplifted Islands	Large High-Island Systems
Urban development systems	Extreme rainfall events generate rapid runoff and flooding. Tropical cyclones introduce compound hazards, including high winds, intense rainfall, and coastal flooding. Extreme heat is an emerging hazard in dense areas. Drought affects water supply. Sea-level rise increases the frequency of coastal flooding and undermines drainage. Informal settlements can leave women and PWD at risk of exclusion from resilient housing and evacuation.	Development is highly constrained by limited land in narrow coastal zones. Infrastructure systems are highly exposed and constrained, whilst facing increasing demands (in part due to climate change). ^a Lack of redundancy mean failures have system-wide consequences.	Vulnerability is shaped by coastal concentration and multi-hazard exposure . Infrastructure systems are critical but vulnerable. Impacts on water and energy systems cascade across sectors. ^b Infrastructure operates close to capacity, reducing resilience.	Vulnerability is shaped by scale, inequality, and infrastructure gaps . Infrastructure interdependence is also a key factor in vulnerability. Transport disruptions can isolate urban areas and limit access to services, while failures in energy and water systems affect multiple sectors. ^c
Water supply and sanitation systems	Drought reduces availability and increases demand. Extreme rainfall and flooding damage infrastructure and contaminate sources.	Near-total dependence on rainwater and shallow groundwater creates extreme sensitivity to drought and saline intrusion.	More diverse sources (surface water, groundwater, rainwater) but exposed to both drought and	Abundant resources at scale but uneven access and limited coverage. Flooding degrades water quality; drought affects rain-fed systems. Infrastructure gaps and

	Sea-level rise causes saline intrusion into groundwater. Heat increases demand and evaporation. Sanitation systems fail under flooding or water scarcity, heightening disease risk. Unsafe water greatly heightens health risks for women and children; PWD may face barriers to emergency distribution.	Flooding contaminates water sources; limited storage and energy constraints compound risk. System-wide failures are likely.	flooding. Catchment degradation and urban demand amplify vulnerability. Sanitation systems stressed by floods and water shortages.	interdependence increase risk of widespread service disruption.
Transport and connectivity	Heavy rainfall and flooding cause erosion, washouts, and bridge failure. Cyclones damage roads, ports, and airports via wind, flooding, and surge. Sea-level rise causes chronic inundation and asset degradation. Heat accelerates material fatigue; landslides disrupt inland corridors. Corridor failures isolate outer islands; women vendors can lose market access first; evacuation routes pose mobility barriers for PWD.	Highly constrained networks at very low elevations. Roads, causeways, airstrips, and ports exposed to overtopping and erosion. Lack of redundancy creates single-point-of-failure risks with national-scale impacts.	Extensive but coastal- and corridor-focused networks exposed to flooding, surge, and landslides. Bridges often undersized. Urban congestion and limited redundancy create cascading economic and service disruptions.	Dependence on a small number of critical corridors across large areas. Flooding and landslides can isolate regions. Limited alternatives and maintenance constraints increase duration and scale of disruption.
Energy	Cyclones damage generation, transmission, and distribution. Flooding affects substations and access for repairs. Sea-level rise increases chronic flooding and corrosion. Heat raises demand while reducing efficiency. Drought reduces hydropower output. Outages undermine health services; women absorb extra labor and caregiving burdens;	Small, diesel-dependent systems with growing solar exposure. Coastal siting and limited redundancy create high outage risk. Heat-driven demand increases stress; failures cascade to water, health, and communications.	Mixed generation (diesel, hydro, renewables) exposed to rainfall variability, flooding, landslides, and cyclones. Rising urban demand and infrastructure concentration increase cascading risk.	Limited coverage and uneven access. Hydropower sensitivity to rainfall and corridor-dependent transmission amplify vulnerability. Disruptions affect large areas and multiple sectors simultaneously.
Coastal management	Sea-level rise increases flood frequency and shoreline retreat. Wave overtopping and storm surge cause inundation and erosion. Changes in sediment dynamics	Systemic and existential risk. Entire land areas exposed to wave-driven flooding and erosion. Infrastructure, water lenses, and ecosystems highly	Impacts spatially concentrated but economically critical. Urban drainage affected by backflow; ports, coastal roads, and cities exposed.	Diverse coastal types including deltas and plains. River-coastal interaction creates compound flooding. Ports and corridors are critical vulnerabilities; ecosystem degradation

	alter shorelines. Saline intrusion degrades soils and groundwater. Ecosystem degradation reduces buffering capacity. Loss of reefs/mangroves erode subsistence safety nets, disproportionately affecting women.	sensitive; failures occur at island scale with few adaptation buffers.	Development and ecosystem degradation increase erosion and flood risk.	amplifies impacts across regions.
Agriculture and the water-food-energy nexus	Drought reduces soil moisture and yields. Extreme rainfall causes erosion, flooding, and crop damage. Heat stresses crops, livestock, and labour. Sea-level rise causes soil and groundwater salinity. Cyclones cause compound crop and soil losses. Crop diversity loss intensifies nutrition insecurity for women; poorer households often resort to asset-stripping.	Highly constrained production with poor soils and freshwater limits. Salinity and drought sharply limit yields. Strong dependence on water and energy systems; climate shocks rapidly undermine food security.	More diverse production systems but exposed to rainfall variability, erosion, and salinity in coastal areas. Transport and energy disruptions affect value chains and post-harvest losses.	Subsistence-dominated systems highly sensitive to climate variability. Linkages to transport, water, and energy are critical; infrastructure gaps amplify food insecurity and livelihood impacts.
Disaster risk management	DRM systems are exposed to the same hazards they manage. Cyclones, floods, landslides, drought, heat, and sea-level rise disrupt transport, energy, water, and communications needed for response. Increasing compound and overlapping events strain capacity. Exclusion from DRM governance can leave women and PWD outside evacuation and shelter planning; informal settlements often fall outside formal mapping.	National-scale exposure with few safe zones. Coastal flooding, drought, and heat frequently co-occur. Lifeline infrastructure (ports, airstrips, water, power) highly exposed; external assistance often required.	Multi-hazard landscapes require simultaneous response across coastal, riverine, and upland zones. Critical governance and logistics hubs are themselves exposed; infrastructure resilience determines response effectiveness.	Large, dispersed emergencies exceed capacity despite partial unaffected areas. Limited networks and pre-existing service gaps mean hazards both create needs and disable response mechanisms. Cascading failures across sectors are likely.

DRM = disaster risk management, PWD = persons with disability

^a World Bank. 2020. *Enhancing the Climate Resilience of Infrastructure in the Pacific*.

^b World Bank. 2019. *Lifelines: The Resilient Infrastructure Opportunity*.

^c Intergovernmental Panel on Climate Change. 2022. *Climate Change 2022: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report*. Cambridge University Press.

Source: Asian Development Bank

5 Climate Rationale and Justification for Intervention

Climate change presents a systemic and escalating threat to the PICs, with impacts that extend beyond individual sectors to affect the fundamental functioning of economic, social, and infrastructure systems. As demonstrated in Sections 3–5, the region is already experiencing significant changes in temperature, rainfall variability, extreme events, and sea-level rise, with projected increases under both SSP2-4.5 and SSP5-8.5 scenarios.³⁹ These changes are occurring in a context of high exposure, structural vulnerability, and limited adaptive capacity, resulting in disproportionate climate risk relative to global averages.⁸⁸

The climate rationale for intervention is therefore grounded not only in the presence of climate hazards, but in the interaction between intensifying hazards and vulnerable, interdependent systems, which together create the conditions for cascading and systemic impacts.⁸⁰ Critically, these systemic risks translate into unequal burdens: poorer households, women traders, and persons with disabilities face the steepest barriers to recovery when infrastructure and services fail, underscoring the need for equity-focused resilience measures. Without targeted and sustained intervention, these dynamics are expected to undermine development gains, increase fiscal pressure on governments, and reduce the resilience of critical infrastructure and services.

5.1 Climate Risk Context and Development Implications

Climate risks in the Pacific are characterised by high exposure across multiple hazard types, including tropical cyclones, flooding, drought, heat stress, and coastal hazards. These risks are not isolated but interact across sectors and spatial scales, creating complex and evolving impact pathways.

The development implications of these risks are significant. Infrastructure systems that underpin economic activity and service delivery are highly exposed and often operate close to capacity, meaning that climate impacts can result in disruptions to essential services, reduced economic productivity, and increased recovery costs.⁴² In many PICs, damage to infrastructure from a single extreme event can represent a substantial proportion of GDP, highlighting the scale of risk relative to national economies.

Climate change also affects human development outcomes, including health, food security, and access to water and sanitation. Drought and flooding affect water availability and quality, increasing health risks and placing pressure on already constrained systems. Agricultural impacts affect food security and livelihoods, particularly in rural areas. Heat stress and extreme events further increase vulnerability, particularly for marginalised populations.⁵⁶ These differentiated impacts highlight that resilience gaps are not only technical but social, with poorer households, women, and persons with disabilities facing the steepest barriers to recovery when health, food, and water systems are disrupted.

Importantly, climate risks are cumulative and compounding. Repeated events can erode resilience over time, reducing the capacity of systems to recover and increasing vulnerability to future shocks. This dynamic is particularly evident in atoll systems and rapidly urbanising areas, where environmental and infrastructure thresholds may be approached or exceeded under higher-emissions scenarios.⁶⁴

5.2 Infrastructure as a Critical Risk Multiplier

Infrastructure systems are central to the climate rationale for intervention because they act as both exposed assets and enablers of resilience. As shown in Section 5, transport, energy, water, and coastal infrastructure systems are highly vulnerable to climate hazards and are also critical for the functioning of all other sectors.

The vulnerability of infrastructure systems creates a risk multiplier effect, where damage to one system propagates across others. For example, disruption to transport networks can affect supply chains, emergency response, and access to services. Energy system failures can affect water supply, communications, and health services. Water system failures can affect public health, sanitation, and

⁸⁸ UNDP. 2021. *National Adaptation Planning in the Pacific*.

agricultural production.⁷⁶ Because these multiplier effects compound fastest at the household level, women traders, subsistence farmers, and persons with disabilities experience disproportionate livelihood and service disruption when infrastructure nodes fail, especially where limited redundancy or informal market dependence heightens exclusion risks.

These interdependencies mean that infrastructure failure can result in cascading impacts that extend far beyond the initial hazard event, affecting economic activity, social stability, and governance. In the absence of resilient infrastructure, the capacity to manage climate risks is significantly reduced.

A key challenge is that much of the existing infrastructure in PICs was designed based on historical climate conditions and does not account for future climate risks. As hazard intensity and frequency increase, the likelihood of infrastructure failure also increases, leading to higher maintenance costs, reduced service reliability, and increased risk of system failure,⁴³ with exclusion risks compounding fastest for poorer households, women traders, and PWD where infrastructure thresholds are exceeded.

5.3 Critical Nature of Coastal Resilience Interventions

Coastal zones across PICs underpin national economies, service delivery, and connectivity, concentrating populations and critical infrastructure such as ports, airports, tourism assets, and coastal transport networks. These areas are inherently exposed to climate hazards, including sea-level rise, coastal inundation, erosion, saline intrusion, and cyclone-driven storm surge. The scale and pace of risk escalation in the coastal sector mean that future outcomes are increasingly determined not only by climate change itself, but by how infrastructure in coastal zones is planned, financed, and managed.⁸⁹

The current Business-as-Usual (BAU) conditions in PICs reflect established patterns of infrastructure development shaped by fiscal constraints, institutional fragmentation, and capacity limitations. Coastal infrastructure planning is typically undertaken within short investment cycles and remains largely based on historical climate conditions or simplified allowances, with limited use of probabilistic, forward-looking projections. While climate change is widely acknowledged in policy frameworks, its translation into enforceable design standards, spatial planning controls, and asset management practices remain inconsistent.⁵⁴ As a result, infrastructure is often located in highly exposed coastal zones, with limited application of dynamic hazard zoning or setback regulations, leaving poorer households, women traders, and PWD more exposed where informal settlements cluster along shorelines. In practice, existing coastal protection measures such as seawalls and revetments are commonly designed for present-day conditions and are not adequately sized for future sea-level rise or compound extreme events. Maintenance regimes are frequently under-resourced, leading to declining asset performance over time. A defining feature of the current BAU is its reactive nature: infrastructure damaged by cyclones or coastal flooding is typically rebuilt to similar standards and in the same locations, perpetuating exposure and reinforcing a cycle of damage and repair.⁵⁴ This approach results in increasing fiscal burdens, reduced infrastructure reliability, and growing disruption to critical services, including transport connectivity, trade logistics, and water supply systems, with livelihood disruption compounding fastest for women vendors and PWD reliant on accessible transport and service nodes.

The impacts of this BAU trajectory are already evident. Coastal roads are regularly overtopped and eroded, port operations are periodically disrupted, and freshwater systems are increasingly affected by saline intrusion, particularly in atoll environments. At the same time, the degradation of natural coastal buffers such as mangroves and coral reefs reduces shoreline resilience, amplifying exposure to wave energy and erosion.⁹⁰ Social impacts are also intensifying, with vulnerable communities facing increasing displacement pressures, loss of livelihoods, and limited access to resilient infrastructure, especially where relocation planning does not adequately account for gendered

⁸⁹ Intergovernmental Panel on Climate Change. 2021. *Climate Change 2021: The Physical Science Basis*; and, Intergovernmental Panel on Climate Change. 2022. *Climate Change 2022: Impacts, Adaptation and Vulnerability*.

⁹⁰ Asian Development Bank. *Key Indicators*, and SPREP

livelihood roles or accessibility needs of PWD. Collectively, these dynamics represent a pathway of escalating risk, rising costs, and diminishing adaptive capacity.

In contrast, an adaptation pathways approach provides a structured and forward-looking framework for managing coastal risks under uncertainty. This approach emphasizes flexibility, sequencing, and the identification of decision points that enable adjustments over time as climate conditions evolve. It integrates multiple climate scenarios, including long-term sea-level rise projections, into planning and design processes, and aligns infrastructure investment with dynamic coastal hazard assessments and long-term development objectives.⁹¹

Under adaptation pathways, infrastructure design shifts toward flexible and future-proofed solutions. Critical assets are designed with allowances for elevation, reinforcement, or relocation, and investment is sequenced to enable incremental upgrades as risk thresholds are approached. Nature-based solutions play a central role, with the restoration and protection of mangroves, coral reefs, and coastal vegetation providing cost-effective and adaptive forms of shoreline protection. Hybrid approaches that combine engineered and ecosystem-based measures further enhance system resilience while delivering environmental and social co-benefits.⁴⁴

Importantly, adaptation pathways also incorporate transformative responses where required, including managed retreat and strategic relocation of infrastructure and communities from highly exposed areas. These measures are supported by improved spatial planning, stakeholder engagement, and financing mechanisms that facilitate long-term transition. Complementary investments in early warning systems, coastal monitoring, hybrid approaches, and risk financing strengthen preparedness and reduce residual risk.⁹² Hybrid approaches that combine engineered and ecosystem-based measures further enhance system resilience while delivering environmental and social co-benefits.⁴⁴

The climate rationale draws from the divergence between BAU and adaptation pathways. Under BAU, risks accumulate and become increasingly difficult and costly to manage, with infrastructure systems progressively losing functionality and resilience. Under adaptation pathways, risks are anticipated and managed proactively, resulting in improved asset performance, reduced lifecycle costs, and greater economic and social stability. Environmental outcomes are also enhanced, as ecosystems are recognized and managed as integral components of coastal protection.

This underscores the need for a shift from reactive, project-based interventions toward programmatic approaches that embed long-term climate risk management into infrastructure planning and delivery. This includes strengthening institutional capacity, standardizing climate-resilient design practices, integrating spatial planning and coastal risk management, and mobilizing financing mechanisms that support upfront investment in resilience.

5.4 Increasing Frequency of Compound and Systemic Events

Climate change is increasing not only the intensity of individual hazards but also the likelihood of compound and cascading events, where multiple hazards occur simultaneously or in sequence. This represents a fundamental shift in risk dynamics, with important implications for adaptation and resilience.

Compound events - such as cyclones combined with storm surge and flooding, or drought followed by extreme rainfall - place multiple stresses on systems at the same time, increasing the likelihood of failure. Cascading impacts occur when these failures propagate across sectors, creating system-wide disruption.⁵⁴

Under SSP2-4.5, these dynamics are expected to intensify gradually, requiring incremental adaptation and system strengthening. Under SSP5-8.5, the combination of higher hazard intensity, more frequent events, and reduced recovery time significantly increases the risk of system overload, where multiple

⁹¹ Intergovernmental Panel on Climate Change (2021). *Climate Change 2021: The Physical Science Basis*; and Intergovernmental Panel on Climate Change (2022). *Climate Change 2022: Impacts, Adaptation and Vulnerability*.

⁹² World Health Organization (2021). *Climate Change and Health in the Pacific*; and Asian Development Bank (2022). *Sea-Level Change in the Pacific Islands Region*.

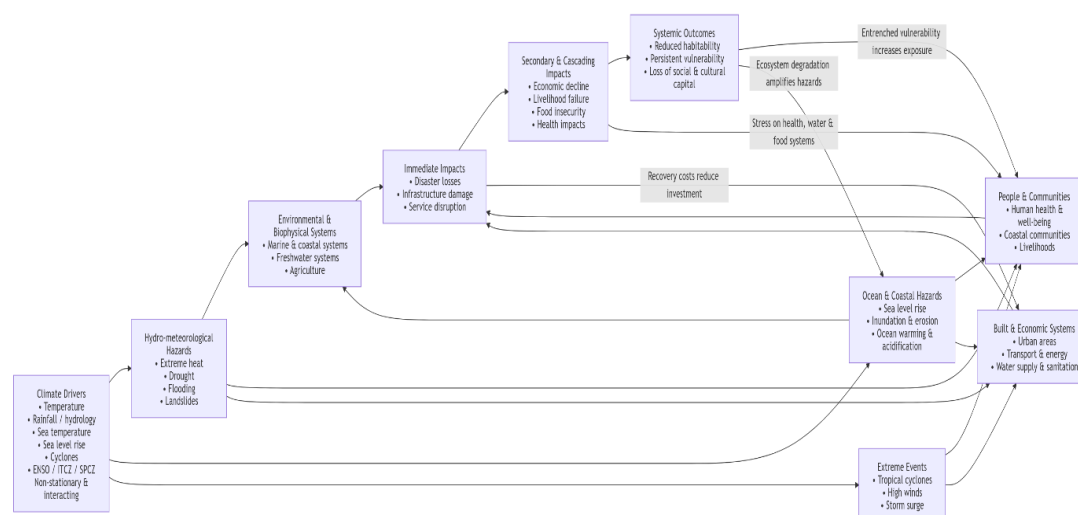
sectors are unable to cope simultaneously. For households with limited assets, overlapping shocks accelerate livelihood loss and service exclusion, with women traders and persons with disabilities least able to recover before the next event, especially where informal market dependence or accessibility barriers compound recovery delays.

This shift from isolated events to systemic risk is a key element of the climate rationale for intervention, as it highlights the limitations of traditional, sector-specific approaches to risk management and the need for integrated, cross-sectoral solutions (Box 3).

Box 3: Why Systemic Approaches are Necessary

Across the Pacific, multiple climate drivers produce multiple hazards simultaneously, rather than one-to-one cause–effect relationships. These diverse climate hazards interact - across land, ocean, and atmosphere – and converge on and impact the same systems and sectors. Then, these impacts cascade: with notably infrastructure damage and service disruption triggering economic, social, and health consequences. Negative feedback loops lock in vulnerability, as recovery costs, ecosystem degradation, and reduced investment further increase exposure and sensitivity. The most important societal outcomes (e.g. reduced habitability, e.g. persistent vulnerability) consequently emerge over time, not from single events, with poorer households and women facing disproportionate cumulative impacts where recovery windows are shortened.

Such dynamic, non-linear, multi-dimensional challenges requires system level responses or the fundamentals won't change or may even change for the worse. Note the centrality of infrastructure, the vulnerability of infrastructure systems creates a risk multiplier effect, where damage to one system propagates and cascades beyond the initial hazard event, affecting recovery, economic activity, social stability, even governance.



Source: Asian Development Bank

5.5 Constraints to Adaptation Without External Support

Despite strong policy frameworks and increasing awareness of climate risks, PICs face significant constraints in their ability to adapt without external support.

Financial constraints are a major barrier. High levels of public debt, limited domestic revenue, and competing development priorities restrict the ability of governments to invest in climate-resilient infrastructure and systems.⁴³ The cost of adaptation is high relative to national budgets, particularly for large-scale infrastructure investments, with poorer households and women traders disproportionately affected when fiscal limits delay service restoration or stall inclusive infrastructure upgrades.

Technical and institutional capacity constraints also limit adaptation. While many PICs have developed national adaptation plans and strategies, implementation is often constrained by limited technical expertise, data availability, and institutional coordination capacity.³⁹ These institutional gaps also weaken the integration of GESI priorities, underscoring the need for alignment with regional and global commitments — including the 2050 Strategy for the Blue Pacific Continent, the Pacific Leaders

Gender Equality Declaration, and the UNFCCC Gender Action Plan (Belém GAP). Without such alignment, adaptation measures risk entrenching existing exclusions rather than reducing them, particularly where PWD accessibility standards or gender-responsive budgeting are not embedded in project design.

Geographic and logistical constraints further increase the cost and complexity of adaptation. Dispersed populations, remote locations, and limited economies of scale make infrastructure development and maintenance more challenging and expensive, with exclusion risks compounding fastest in outer islands where transport and service nodes are limited.

These constraints highlight the need for climate finance and programmatic approaches that can support large-scale, coordinated investments in resilience.

5.6 Rationale for a Programmatic and Transformational Approach

The scale and complexity of climate risks in the Pacific require a shift from project-based interventions to programmatic and transformational approaches.

A programmatic approach allows for coordinated investment across sectors and geographic areas, addressing interdependencies and reducing the risk of fragmented or sub-optimal outcomes. It also enables the scaling of successful approaches and the integration of climate resilience into broader development planning, ensuring that equity considerations are embedded across infrastructure, finance, and service delivery rather than treated as add-ons.

Transformational impact is required because incremental adaptation may be insufficient under higher-emissions scenarios. In some cases, adaptation will require fundamental changes in infrastructure design, spatial planning, and resource management, including relocation, redesign of systems, and adoption of new technologies.⁴⁴ Such shifts can either dismantle or entrench exclusion, depending on whether gendered livelihood roles and PWD accessibility needs are integrated into relocation and redesign processes.

The Regional Programmatic Approach to Climate Action (RPACA) is well aligned with these requirements, as it provides a framework for coordinated, cross-sectoral investment in climate resilience across multiple countries.

RPACA is well positioned to embed Gender-Transformative Climate Action (GTCA) through a long-term regional approach that works across governance, climate finance, infrastructure, and multiple sectors. By institutionalising gender equality and social inclusion (GESI) in planning and budgeting, promoting more equitable access to climate finance, and advancing infrastructure and service design that reduce barriers to participation, RPACA can shift adaptation from fragmented projects to structural change. This programmatic approach empowers women and youth as active leaders in governance, enterprise, and sectoral innovation, while also requiring institutional accountability mechanisms to ensure PWD inclusion is not sidelined in regional coordination. Enabling transformative social change that strengthens institutions, redistributes benefits, and embeds equity into resilience across the region.

5.7 Summary

The climate rationale for intervention in the Pacific is grounded in the interaction of increasing climate hazards, high exposure, and structural vulnerability, which together create the conditions for cascading and systemic impacts.

Infrastructure systems play a central role in these dynamics, acting as both sources of vulnerability and critical enablers of resilience. Climate change is increasing the frequency and intensity of hazards, as well as the likelihood of compound events and system failure.

Without external support and coordinated, programmatic intervention, PICs are unlikely to be able to manage these risks effectively. Climate finance is therefore essential to support the transition toward resilient, integrated systems capable of withstanding current and future climate conditions. A long-term regional approach can strengthen governance, finance, and infrastructure while working across sectors to reduce systemic vulnerability. By embedding GESI considerations, such an

approach ensures that resilience measures are not only technically sound but also socially transformative, empowering women and youth to play active roles in shaping adaptation pathways, while institutionalising accountability mechanisms that ensure PWD inclusion and equitable benefit-sharing across diverse island contexts.

6 Baseline Assessment

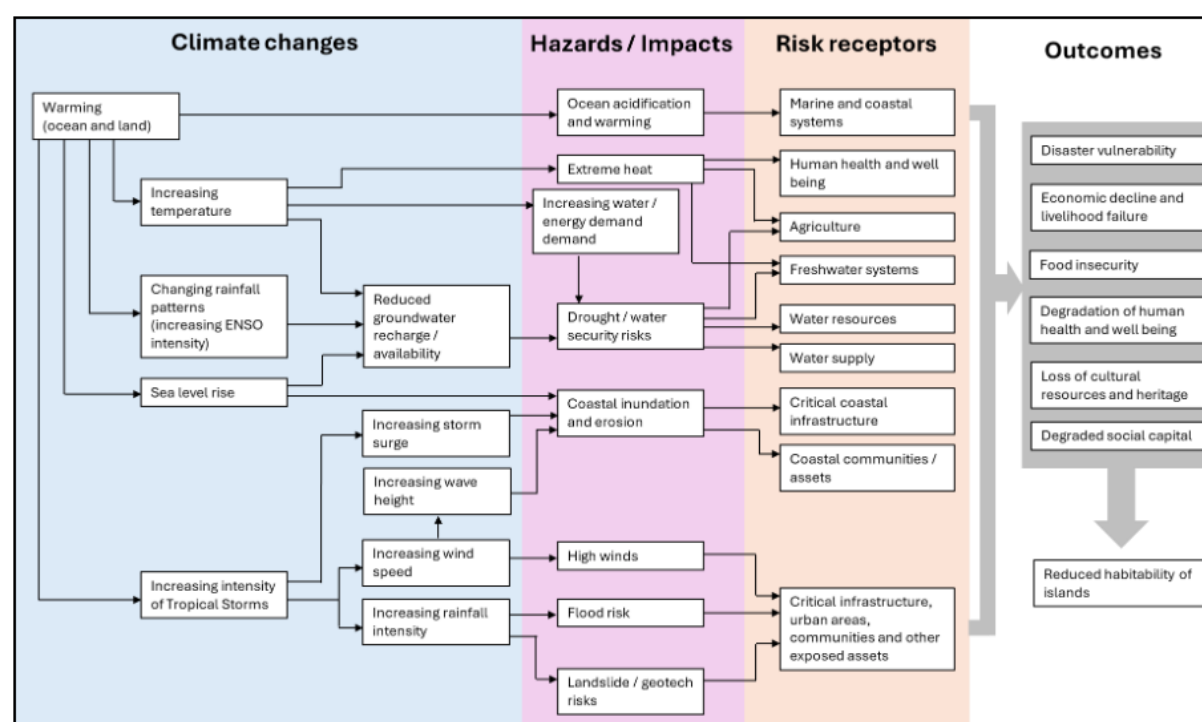
6.1 Current Infrastructure Planning and Development in Pacific Island Countries

6.1.1 Overview

Infrastructure systems across PICs form the backbone of economic activity, service delivery, and regional connectivity, particularly in sectors such as transport (including ports and airports), energy, water supply and sanitation, and urban development. These systems are predominantly concentrated in coastal zones and low-lying areas, reflecting historical settlement patterns, geographic constraints, and the logistical requirements of island economies. As a result, infrastructure assets are inherently exposed to climate-related hazards, including coastal flooding, cyclones, extreme rainfall, and sea-level rise.⁹³

The current state of infrastructure planning and development in PICs is a key component of the baseline against which RPACA is positioned. While there has been significant progress in strengthening policy frameworks and increasing climate awareness, infrastructure systems continue to face structural challenges related to scale, capacity, financing, and integration of climate risk. These factors collectively shape a baseline that is characterized by incremental improvements but remains insufficient to address the scale and complexity of future climate impacts.⁹⁴ Typical vulnerability and impact pathways in the Pacific are presented in Figure 3. **Error! Reference source not found..**

Figure 3: Typical Impact/Vulnerability Pathways in the Pacific



Note: The above has been simplified and does not illustrate cross-sectoral and compounding risks.

Source: Asian Development Bank.

6.1.2 Planning Frameworks and Institutional Context

Infrastructure planning in PICs is typically guided by a combination of national development strategies, sector plans, and medium-term expenditure frameworks. Many countries have established national adaptation plans and climate policies that recognize the importance of resilient infrastructure.

⁹³ Intergovernmental Panel on Climate Change (IPCC). (2022). *Climate Change 2022: Impacts, Adaptation and Vulnerability*. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, and Asian Development Bank. 2022. *Sea-Level Change in the Pacific Islands Region: A Review of Evidence to Inform Asian Development Bank Guidance on Selecting Sea-Level Projections for Climate Risk and Adaptation Assessments*. Manila: ADB.

⁹⁴ World Bank. 2013. *Acting on Climate Change and Disaster Risk for the Pacific*. Washington, DC. World Bank.

However, the translation of these high-level strategies into actionable, enforceable planning instruments remains uneven across countries and sectors.⁹⁵

Institutional arrangements for infrastructure development are often fragmented, with responsibilities distributed across multiple ministries and agencies. Coordination mechanisms exist but are frequently constrained by limited technical capacity and resource availability. This fragmentation can lead to inconsistencies between sectoral priorities, duplication of efforts, and gaps in the integration of cross-cutting issues such as climate risk, land-use planning, and environmental management with GESI priorities often sidelined when institutional mandates are unclear or under-resourced.⁹⁶

In practice, infrastructure planning is frequently driven by project-level opportunities linked to external financing, rather than by fully integrated, long-term national or regional strategies. While development partners play a critical role in supporting infrastructure investment, this can result in a portfolio of projects that are individually robust but not always optimized at the system level. The absence of unified planning frameworks that integrate climate projections, demographic trends, and economic development pathways limits the ability to prioritise investments based on long-term resilience outcomes.⁹⁷

6.1.3 Infrastructure Design and Development Practices

Current infrastructure design practices in PICs reflect a transition phase between traditional engineering approaches and emerging climate-resilient standards. While there is increasing recognition of the need to incorporate climate considerations into design, implementation remains inconsistent. In many cases, infrastructure is still designed using historical climate data or simplified assumptions, with limited application of probabilistic risk assessments or scenario-based planning.⁹⁸

Design standards and building codes, where they exist, are not always fully aligned with projected future conditions or are unevenly enforced. This is particularly evident in sectors such as transport and coastal infrastructure, where assets are frequently exposed to multiple and interacting hazards. As a result, infrastructure systems may meet current performance requirements but remain vulnerable to future climate conditions, leading to reduced service life and increased maintenance needs⁵⁴ with accessibility gaps for PWD and gendered service needs not always factored into design parameters.

Procurement and construction practices also influence resilience outcomes. The emphasis on cost minimization in procurement processes can constrain the adoption of more resilient design options, particularly where lifecycle costing is not systematically applied. Additionally, local construction capacity, while essential for sustainability, may be limited in terms of access to advanced materials, technologies, and specialized engineering expertise required for climate-resilient infrastructure.⁹⁹

6.1.4 Asset Management, Maintenance, and Performance

A critical aspect of the current baseline is the management and maintenance of existing infrastructure assets. Across PICs, maintenance regimes are often under-resourced, leading to a gradual decline in asset condition and performance. Preventive maintenance is frequently deferred in favour of reactive

⁹⁵ United Nations Framework Convention on Climate Change (UNFCCC). 2024. *National Adaptation Plans 2024: Progress in the Formulation and Implementation of National Adaptation Plans*. Bonn: UNFCCC Secretariat; and Pacific Community (SPC), Secretariat of the Pacific Regional Environment Programme (SPREP), Pacific Islands Forum Secretariat (PIFS), United Nations Development Programme (UNDP), United Nations Office for Disaster Risk Reduction (UNDRR), and University of the South Pacific (USP). (2016). *Framework for Resilient Development in the Pacific: An Integrated Approach to Address Climate Change and Disaster Risk Management (FRDP) 2017-2030*.

⁹⁶ Organisation for Economic Co-operation and Development (OECD). 2018. *Climate-Resilient Infrastructure*. OECD Environment Policy Paper No. 14. Paris

⁹⁷ Pacific Islands Forum Secretariat (PIFS). 2022. *Infrastructure for Building Pacific Resilience. Forum Economic Ministers Meeting Information Paper 10*. Suva: PIFS.

⁹⁸ Asian Development Bank. *Key Indicators*, and SPREP. 2022. *Climate Change in the Pacific 2022: Historical and Recent Variability, Extremes and Change*. Apia: SPREP

⁹⁹ OECD. 2024. *Integrating Climate Change in Infrastructure Project Appraisal*. Paris: OECD Publishing.

repairs, particularly following extreme events. This approach increases long-term costs and reduces the reliability of infrastructure systems.¹⁰⁰

Asset management systems, including inventories, condition assessments, and lifecycle planning tools, are at varying stages of development across countries. In many cases, data limitations constrain the ability to prioritise maintenance and rehabilitation interventions effectively. This is particularly challenging in geographically dispersed island settings, where logistical constraints increase the cost and complexity of maintenance activities.¹⁰¹

The performance of infrastructure systems under current conditions already reflects these challenges. Disruptions to transport networks following heavy rainfall or cyclones, intermittent water supply due to system failures, and vulnerabilities in energy distribution systems are common across the region. These performance issues are expected to be exacerbated by climate change if current practices persist.¹⁰²

6.1.5 Financing and Investment Dynamics

Infrastructure development in PICs is heavily dependent on external financing from development partners, including multilateral development banks, bilateral agencies, and climate funds. Domestic resources are limited, and high levels of public debt in some countries constrain fiscal space for large-scale infrastructure investment. As a result, investment decisions are often influenced by the availability and conditions of external funding.¹⁰³

While significant resources have been mobilized for infrastructure and climate adaptation, financing remains fragmented and project-specific. This limits the ability to implement integrated, multi-sectoral programs that address systemic risks. Furthermore, the distinction between development and climate finance can create challenges in aligning investments with long-term resilience objectives, particularly where adaptation benefits are not fully quantified or prioritized¹⁰⁴ and where equitable access to climate finance for women's enterprises are not always systematically tracked.

Private sector participation in infrastructure development is limited in many PICs due to small market size, perceived risks, and regulatory constraints. Where public-private partnerships are pursued, they are typically focused on specific sectors such as energy or telecommunications, with limited application in climate-resilient infrastructure.¹⁰⁵

6.1.6 Integration of Climate Risk and Resilience

The integration of climate risk into infrastructure planning and development is improving but remains uneven. Many PICs have undertaken climate risk assessments and vulnerability studies, often with support from development partners. However, the application of these assessments in decision-making processes is not yet systematic.¹⁰⁶

Climate information is often available at a scale or level of complexity that is not easily translated into engineering design parameters or planning decisions. This creates a gap between climate science and infrastructure practice. In addition, uncertainty in climate projections, particularly at local scales,

¹⁰⁰ PRIF. 2013. *Infrastructure Maintenance in the Pacific: Challenging the Build-Neglect-Rebuild Paradigm*. Sydney.

¹⁰¹ PRIF. (2024). *Guide to Asset Management Improvement Planning for the Pacific Water Sector*. Sydney: PRIF.

¹⁰² Footnote 10, Chapter 12. Intergovernmental Panel on Climate Change. 2021. *Climate Change 2021: The Physical Science Basis*. Contribution of Working Group I to the Sixth Assessment Report. Cambridge University Press, Chapter 12.

¹⁰³ International Monetary Fund (IMF). 2026. *Climate Finance and Adaptation Needs in Pacific Island Countries*. IMF Working Paper No. 2026/083. Washington, DC: IMF.

¹⁰⁴ Green Climate Fund (GCF). 2015. *Initial Investment Framework: Activity-Specific Sub-Criteria and Indicative Assessment Factors*. Decision B.09/05(b).

¹⁰⁵ United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP). 2015. *Infrastructure Development in the Pacific Islands: Financing Modalities and Public-Private Partnerships*.

¹⁰⁶ United Nations Framework Convention on Climate Change (UNFCCC). 2024. *National Adaptation Plans 2024: Progress in the Formulation and Implementation of National Adaptation Plans*. Bonn: UNFCCC Secretariat.

can lead to conservative or delayed decision-making, further reinforcing reliance on traditional approaches.

Where climate-resilient approaches have been implemented, they are often associated with pilot projects or externally funded initiatives, rather than being embedded as standard practice across all infrastructure investments. This highlights the need for institutionalization of climate risk management within planning, design, and asset management processes.¹⁰⁷

6.1.7 Cross-Sectoral and Spatial Considerations

Infrastructure systems in PICs are highly interconnected, both functionally and spatially. Disruptions in one sector, such as transport, can have cascading effects on others, including energy, water supply, and emergency response. However, current planning approaches often remain sector-specific, with limited integration of interdependencies and cascading risks.

Spatial planning frameworks, where they exist, are not always fully aligned with infrastructure investment decisions. This is particularly relevant in coastal areas, where competing land uses, population pressures, and environmental considerations require integrated approaches. The lack of dynamic spatial planning that incorporates climate risk further constrains the ability to manage exposure and guide development toward safer areas, with informal settlements and gendered livelihood zones often left outside formal hazard zoning.¹⁰⁸

6.1.8 Baseline Summary and Implications for RPACA

The current baseline for infrastructure planning and development in PICs can be characterized as one of progressive but incomplete transition toward resilience. There is clear recognition of climate risks and increasing incorporation of resilience considerations in policy and project design. However, systemic challenges remain in translating this recognition into consistent, large-scale practice across all sectors and countries.

Key features of this baseline include fragmented planning frameworks, limited integration of long-term climate projections, constrained maintenance and asset management systems, and a reliance on project-based financing. These factors collectively result in infrastructure systems that are functional under current conditions but increasingly vulnerable to future climate impacts.

For RPACA, this baseline underscores the need for a programmatic approach that addresses not only infrastructure investments but also the enabling systems that support resilient development. This includes strengthening institutional capacity, standardizing climate-resilient design practices, enhancing asset management systems, and aligning financing mechanisms with long-term resilience objectives. By building on existing progress while addressing systemic gaps, RPACA is positioned to support a step change in how infrastructure is planned, delivered, and managed across the Pacific region.

6.2 National Responses

The following were assessed: (i) the national climate strategy and policy frameworks; (ii) the existing GCF country programme and climate investments; (iii) the capacity of the accredited and executing entities; (iv) the role of the National Designated Authority; and (v) stakeholder engagement and Inclusivity.

Of the 14 PICs, 11 have submitted NDC3.0¹⁰⁹ to UNFCCC, seven have developed NAPs or NAP equivalents (of which six have been submitted to UNFCCC). However, several of these are now

¹⁰⁷ Nunn et al. 2016. Classifying Pacific Islands. *Geoscience Letters* 3(1).

¹⁰⁸ Pacific Community (SPC), Secretariat of the Pacific Regional Environment Programme (SPREP), Pacific Islands Forum Secretariat (PIFS), United Nations Development Programme (UNDP), United Nations Office for Disaster Risk Reduction (UNDRR), and University of the South Pacific (USP). (2016). *Framework for Resilient Development in the Pacific: An Integrated Approach to Address Climate Change and Disaster Risk Management (FRDP) 2017-2030*.

¹⁰⁹ NDC3.0 refers to the present NDC cycle, due for submission in 2025.

dated. All other PICS are understood to be preparing their NAP. Nine of the PICS have public GCF Country Programs. Table 4 provides more details on these policy and planning documents.

Table 4: Summarizing Status of Key Planning and Policy Documents

Pacific DMC	NDC 3.0 Status	NAP Approval year or status	GCF Country Programme
Cook Islands	Validated but not submitted.	JNAP II (2016)	Period: 2018 -2030
Fiji	Submitted (November 2025)	NAP (2018)	Period: 2022 to 2029
Federated States of Micronesia	Submitted (September 2025)	National NAP under preparation with GCF readiness support	Period: 2024-2027
Kiribati	Unknown ^a	KJIP (2019)	Dated 23 Nov 2023
Republic of Marshall Islands	Submitted (February 2025)	NAP (2023)	Dated 22 Apr 2021
Naoero	Submitted (January 2026)	Updated NAP under preparation with GCF readiness support	Formal country programme document not yet published
Niue	Submitted (July 2025)	Updated NAP under preparation with GCF readiness support	No formal country programme.
Palau	Submitted (January 2026)	Under preparation	Planned with support from GCF/SPC
Papua New Guinea	Under preparation	NAP (2023)	03 Sep 2020
Samoa	Submitted (January 2026)	NAP consultations underway	N/A
Solomon Islands	Submitted (August 2025)	Under preparation	23 Nov 2023
Tonga	Submitted (September 2025)	JNAP II (2021)	31 Oct 2018
Tuvalu	Submitted (September 2025)	NAP (2025)	N/A
Vanuatu	Submitted (September 2025)	National validation and prioritization workshop held in February 2026	01 Mar 2021

GCF= Green Climate Fund, JNAP= Joint National Action Plan, KJIP= Kiribati Joint Implementation Plan for Climate Change and Disaster Risk Management, NAP= National Adaptation Plan, and NDC= Nationally Determined Contribution.

^a In April 2025 Kiribati sought tenders to update the NDC 2 implementation and investment plans but not explicitly linked to NDC 3.0 preparation.

Source: Asian Development Bank.

The assessment also considered the integration of climate adaptation through sectors. It looked at sectoral institutions, plans, policies and system. It found that although climate adaptation is increasingly present in policy frameworks, it has not yet been systematically operationalized within sector institutions. Ownership of climate change adaptation remains predominantly centralized within national climate change departments and ministries. Sector ministries rarely have designated climate

focal points, and the national climate change department typically lacks sector-specific expertise to act as in-house focal point for the sector. This produces a structural disconnect that constrains the translation of national climate policy into sector operational practice.

6.3 Regional Partners and Related Initiatives

Over a 15-year period, total annual development assistance from all development partners to the PIC-12 has doubled, from \$1 billion in 2008 to \$2.1 billion in 2023. For some countries this growth has been even more pronounced, for example in Tuvalu where development assistance has grown six times from \$16 million to \$87 million over the same period. At the same time, the number of development partners has almost doubled from 40 to 72, suggesting a broadening development partner landscape that appears to include a mix of new bilateral donors, potentially reflecting increased geographical focus on the Pacific, as well as philanthropic actors and smaller NGOs.))

Table 5 summarises the key regional initiatives, organisations and partners active in climate adaptation, resilience and climate finance in the Pacific, with specific relevance to Green Climate Fund (GCF) regional and multi-country programming. Together, these initiatives form a complementary ecosystem spanning political coordination, technical delivery, finance mobilisation, and accredited entity implementation. The overview is intended to provide clarity on who is doing what, how these efforts interrelate, and how regional programming approaches—such as RPACA—are being developed within, and aligned to, existing GCF relevant structures rather than duplicating them.

Table 5: GCF Accredited Entities and Delivery Partners

Organisation	GCF Role	Current Regional Work of Relevance to GCF
SPREP	GCF Accredited Entity (Regional)	Develops and implements multi-country and regional GCF adaptation and resilience programmes; leads NDC support, adaptation planning, climate services and ecosystem-based adaptation; hosts the Pacific Climate Change Centre supporting regional capacity and GCF readiness
SPC	GCF Accredited Entity (Regional)	Provides scientific and technical services including climate risk analytics, geospatial data, coastal and infrastructure resilience, food systems and water security; supports regional pipeline development and evidence-based programme design suitable for GCF investment
ADB	GCF Accredited Entity (International)	A key climate change donor and development partner in the Pacific region; implements large-scale and regional GCF programmes in the Pacific; delivers adaptation finance, climate-resilient infrastructure, and programmatic approaches aligned with GCF results areas
UNDP / UNEP	GCF Accredited Entities (International)	Support country-driven and regional GCF programmes, readiness, and adaptation projects; long-standing delivery partners in Pacific climate adaptation and early regional programmes (e.g. PACC, SPREP)

ADB= Asian Development Bank, GCF= Green Climate Fund, PACC= Pacific Adaptation to Climate Change, SPC= The Pacific Community, SPREP= Secretariat of the Pacific Regional Environment Programme, UNDP= United Nations Development Programme, UNEP= United Nations Environment Programme.

Source: Asian Development Bank.

Table 6: Regional Programming and Prioritisation Frameworks Relevant to GCF

Initiative	Role in Regional Architecture	GCF Relevance
Framework for Resilient Development in the Pacific	Pacific-endorsed framework integrating climate change adaptation and disaster risk management	Provides a strategic reference framework for GCF regional and multi-country programming, supporting coherence with national and regional resilience priorities

2050 Strategy for the Blue Pacific Continent	Long-term political and strategic vision	Establishes regional climate and resilience direction to 2050, aligning with GCF's long-term, transformational investment objectives
Pacific NDC Hub	Platform to support NDC implementation	Translates NDC commitments into implementable actions; provides a pipeline of adaptation and resilience priorities relevant to GCF programming, particularly for multi-country aggregation

NDC= Nationally Determined Contribution, GCF= Green Climate Fund
Source Asian Development Bank.

Table 7: Climate Finance Coordination and Complementary Financing Mechanisms

Initiative	Role	Relationship to GCF
CFAMS	Regional climate finance access framework	Strengthens national and regional capacity to access GCF and other climate funds; improves readiness, accreditation pathways, and coordination across funding sources
PRF	Pacific-owned regional financing mechanism (grant-based)	Provides complementary, small-grant financing for community-level adaptation and resilience; designed to work alongside GCF by addressing scale and access gaps rather than duplicating GCF investments
PIFS	Regional political and economic coordination	Oversees CFAMS and PRF; provides political coordination and ensures alignment between regional climate finance initiatives and GCF-supported programming

CFAMS= Pacific Climate Finance Access and Mobilisation Strategy, GCF= Green Climate Fund, PIFS= Pacific Islands Forum Secretariat, PRF= Pacific Resilience Facility.
Source: Asian Development Bank.

Table 8: Regional Knowledge, Readiness, and Coordination Platforms

Organisation / Platform	Function	GCF relevance
PCCC	Regional knowledge and capacity hub	Supports GCF readiness, proposal development, climate information services, and regional learning across accredited entities and national counterparts
PRP	Multi-stakeholder coordination platform	Facilitates alignment among governments, accredited entities, donors, civil society and the private sector; supports coherence across GCF, MDB and bilateral investments

GCF= Green Climate Fund, MDB= multilateral development bank, PCCC= Pacific Climate Change Centre, PRP= Pacific Resilience Partnership
Source: Asian Development Bank.

Table 9: Adjacent Regional Programmes

Initiative	Lead Organisations	Primary Focus	Status/Scale
Weather Ready Pacific	SPREP	Pacific-led programme strengthening climate and weather services and early warnings	Regional across 14 PICs with a focus on regional integration. Core platform for implementation of EW4All.
PACC/PACC+	SPREP, UNDP, GEF	Sectoral adaptation (water, food security, coastal zones, infrastructure)	Completed foundational programme; lessons and tools continue to inform current adaptation investment
GCCA+ SUPA	SPREP, European Union	Ecosystem-based adaptation, resilient livelihoods, coastal resilience	Multi-year regional adaptation programme; supports national and regional EbA and resilience actions
Pacific Ecosystem-based Adaptation to Climate Change	SPREP	Nature-based solutions for climate adaptation and resilience	Regional EbA programme generating scalable NbS adaptation models

Pacific NDC Hub (Adaptation Component)	SPREP, SPC and partners	Translating NDC adaptation priorities into implementable actions	Ongoing regional support platform; feeds GCF and MDB adaptation pipelines
PCCC Technical Support Programme	SPREP, SPC and partners	Provides technical assistance, climate information services, capacity building, adaptation planning, climate finance readiness, and support for implementation of NDCs and NAPs. Supports climate-resilient development across multiple sectors.	Ongoing regional programme supporting all Pacific Island Countries and Territories, with assistance delivered through national requests and regional initiatives.
COSPPac	SPC, Australian Bureau of Meteorology, Commonwealth Scientific and Industrial Research Organisation	Strengthens climate services, seasonal forecasting, early warning systems, ocean monitoring, and climate information for adaptation and disaster risk management. Supports climate-informed decision-making across water, agriculture, fisheries, health and infrastructure sectors.	Multi-phase regional programme operating across 15 Pacific Island countries and territories since 2012. Current phase continues to strengthen national meteorological and hydrological services.
Data Science Driving Innovation in Climate Change and Natural Disasters	SPC (Statistics for Development Division)	Develops an integrated, data-driven decision support system for climate change adaptation and disaster risk management. The initiative combines reproducible analytical pipelines, Digital Earth Pacific satellite imagery, administrative datasets, and management information systems to forecast climate impacts, estimate loss and damage, support disaster preparedness, improve fiscal planning, and accelerate post-disaster response and recovery.	Pilot implementation in Vanuatu (2023–2025) under the PACSTAT programme, with potential for replication across Pacific Island Countries. Represents an innovative regional model for applying data science, geospatial analytics and artificial intelligence to climate adaptation, disaster preparedness and loss and damage assessment.
ADB Pacific Climate Resilience Programmes	Asian Development Bank	Climate-resilient infrastructure, coastal protection, adaptation financing	Ongoing multi-country adaptation and resilience investment programmes

COSPPac= Climate and Oceans Support Programme in the Pacific, EbA= ecosystem-based adaptation, EW4All= Early Warnings for All, GCCA + SUPA= Global Climate Change Alliance Plus Scaling Up Pacific Adaptation, GEF= Global Environment Facility, MDB= multilateral development bank, NAP=National Adaption Plan, NbS= nature-based solutions, PACC= Pacific Adaptation to Climate Change, PACC+ Pacific Adaptation to Climate Change Project Plus, PACSTAT= Statistical Innovation and Capacity Building in the Pacific Islands, PCCC= Pacific Climate Change Centre, PIC= Pacific Island Countries, SPC= The Pacific Community, SPREP= Secretariat of the Pacific Regional Environment Programme, UNDP= United Nations Development Programme. Source: Asian Development Bank.

6.4 ADB Programme in the Pacific

The ADB Pacific programme in the Pacific is a key, integral component of the baseline to RPACA. RPACA is designed and developed to build on and influence through the ADB Pacific programme, one of the key RPACA operational strategies.

The ADB programme in the Pacific covers fourteen countries, collectively referred to as the 'Pacific Island Countries' (PIC). This includes the twelve smaller Pacific island states (the PIC-12) and two larger economies—Fiji and Papua New Guinea. ADB programming in the Pacific is guided by Strategy 2030 and is operationalized in the PIC-12 through the *Pacific Approach* (currently 2021–2025) and two complementary, separate Country Programme Strategies (CPS) for the larger Fiji (2024–2028) and Papua New Guinea (2021–2025). These are translated into annual country operations business plans (COPB) for each of the 14 countries. For the PIC-12, the Pacific Approach provides a regional strategic framework and allows for differentiated interventions tailored to the

needs, challenges and opportunities in each country. Box 4Error! Reference source not found. provides a summary of findings on an ongoing assessment of the current Pacific Approach.

Box 4: Findings of the Ongoing Review of ADB Pacific Approach, 2021-2025

ADB, 2026. *Pacific Approach, 2026-2030. Issues Paper for Strategic Priorities Meeting* (April 2026) (ADB internal documentation). ADB, 2026. *Inclusive and Sustainable Growth Assessment* (for Strategic Priorities Meeting).

As part of the process to develop the forthcoming Pacific Approach (to cover the period 2026-2030), ADB has undertaken a review of the situation and implementation of the current Pacific Approach (2021-2025).^a

The current Pacific Approach is structured under three pillars with the vision of ‘*Supporting a Resilient Pacific*’. The pillars are (i) Preparing for and Responding to Shocks; (ii) Delivering Sustainable Services; and (iii) Supporting Inclusive Growth. In addition, the Pacific Approach identifies a range of cross-cutting themes and implementation priorities for SIDS and FCAS. These include addressing climate change, improving capacity development, strengthening gender equality, enhancing partnerships, knowledge support, leveraging regional cooperation and emphasizing project.

The review identified several themes emerging or growing rapidly across the PIC-12. These are notably: (i) continued pressures on absorptive capacity for development assistance; (ii) growing skilled labor shortages across both the public and private sectors; (iii) increasing concerns about climate-induced crises and shocks; and (iv) demands for infrastructure that continue to exceed available development resources in the region.

The review included a diagnostic assessment of the private sector in the Pacific. This identified constraints that undermine private sector performance. These include the high costs of doing business, shallow financial systems, weak competition, and limited institutional capacity. These are found to disproportionately impact on Micro, Medium and Small Enterprises and women-led enterprises. These challenges are compounded by high informality, small market size, and geographic isolation.

Based on this overall assessment, the review offers 10 recommendations for the Pacific Approach, 2026-2030. These are: (i) maintain resilience as the foundational strategy; (ii) promote transformational engagement; (iii) further strengthen fiscal sustainability and scale up climate financing; (iv) sharpen ADB's approach to private sector development; (v) enhance partnerships for capacity development; (vi) refine and differentiate engagement at the country level; (vii) ensure adequate financial and human resources for stronger and sustained development effectiveness; (viii) emphasize measures to improve sustainability; (ix) deepen partnerships to reinforce ADB's convening and catalytic role; and (x) advance transformative actions on climate, gender, and digitalization.

FCAS = fragile and conflict affected states, PIC = Pacific Island Countries, and SIDS = small island developing states

^aADB internal documentation, ADB, 2026. *Pacific Approach, 2026-2030. Issues Paper for Strategic Priorities Meeting* (April 2026) and ADB, 2026. *Inclusive and Sustainable Growth Assessment* (for Strategic Priorities Meeting).

Source: Asian Development Bank.

ADB importance in the region has been growing. Since 2010, ADB commitments to the PIC-12 have grown from \$293 million across 22 projects to \$1.85 billion across 80 projects in 2025, a rate three times faster than total development assistance. Over a 10-year period from 2014 to 2023, ADB disbursed 6% of total development assistance to the PIC-12. In 2022, ADB disbursed 12% of total development assistance in the region. Accordingly, ADB plays a critical coordinating role to ensure coherence, avoid duplication, and leverage complementarity across development partners. Platforms, for example, the Pacific Regional Infrastructure Facility and Friends of Budget Support, are supported by ADB as mechanisms to support policy dialogue and coordinate financing.

ADB's Pacific programme reached historically high levels in 2024 when it committed a record \$1.3 billion to Pacific developing member countries, and disbursed over \$558 million, reflecting both expanded lending capacity and strong demand from governments. Of this total commitment, around \$450 million was climate finance, supporting climate resilient water and sanitation, renewable energy, transport, and disaster preparedness, while nearly \$495 million came from the ADF to ensure highly concessional support for the poorest and most vulnerable countries. Climate change, gender equity,

and resilience are now mainstreamed across the portfolio, with increased use of regional projects, technical assistance, and policy based lending to strengthen institutions and accelerate reforms.⁹

Looking ahead, ADB plans to further deepen and adapt its Pacific engagement under Strategy 2030 and the ADF-14 replenishment (2025–2028), which is considered a critical source of grant finance for most Pacific island countries. With capital reforms unlocking an additional \$10 billion per year in overall ADB lending capacity globally, the bank intends to maintain high annual commitments in the Pacific, with a stronger focus on climate adaptation, regional cooperation, private sector participation, and delivery capacity. Future operations will increasingly emphasize pooled regional solutions, simpler project designs suited to small administrations, and mobilization of cofinancing so that limited public resources can deliver larger and more durable development and resilience outcomes across the Pacific.¹⁰

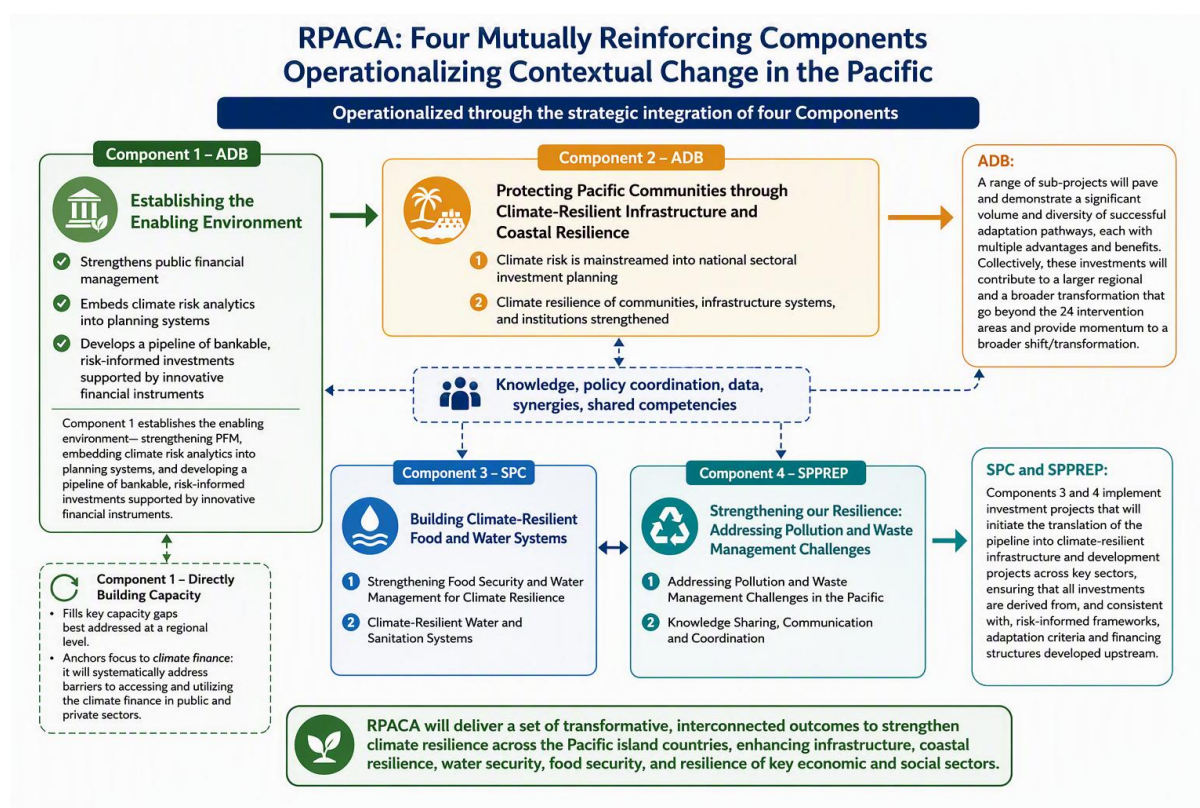
6.5 RPACA: A Critical Addition to the Regional Response

The Regional Programme for Adaptation and Climate Action (RPACA) is a multi-country, multi-sector initiative designed to strengthen resilience across Pacific Island Countries (PICs). It responds to the region's urgent need for adaptation measures that are inclusive, practical, and sustainable. Initially, the proposed programme is financed by the Green Climate Fund (GCF), the Asian Development Bank (ADB), the Pacific Community (SPC) and the Secretariat of the Pacific Regional Environment Programme (SPREP).

RPACA was initiated and developed by Pacific Leaders. It was developed through a consultative process originating in 2023. It is designed to be strongly aligned to the Framework for Resilient Development in the Pacific (FRDP) and the 2050 Strategy for the Blue Pacific Continent. It also responds to global commitments including the Paris Agreement under the UNFCCC, the Sendai Framework for Disaster Risk Reduction, and the Sustainable Development Goals (SDGs) embedding gender equality and social inclusion as cross-cutting obligations rather than optional co-benefits.

RPACA is operationalised through the strategic integration of four Components (see Figure 4). Component 1 establishes the enabling environment— notably strengthening public financial management, embedding climate risk analytics into planning systems, and developing a pipeline of bankable, risk-informed investments supported by innovative financial instruments. Components 2, 3 and 4 translate this pipeline into climate-resilient infrastructure and development projects across key sectors, ensuring that all investments are derived from, and consistent with, risk-informed frameworks, adaptation criteria and financing structures developed upstream. This linkage works to ensure that infrastructure investments are not standalone assets but part of a continuously evolving system in which risk information, fiscal decision-making, and investment delivery are mutually reinforcing.

Figure 4: How RPACA's Initial Four Components are to Operationalize Contextual Change in the Pacific



Source: Asian Development Bank.

6.6 RPACA Alignment with GCF Programming

RPACA aligns strongly with the Green Climate Fund's emphasis on programmatic, multi-country approaches, regional aggregation, and transformational scale. By identifying shared regional priorities and structuring them into coherent investment pathways, RPACA supports the GCF's objective to move beyond fragmented, stand-alone projects toward coordinated programmes capable of delivering sustained impact across multiple countries and sectors while embedding equity criteria that ensure women, youth, and PWD are not excluded from aggregated benefits.

RPACA is designed to operate within existing GCF architectures, working through GCF-accredited entities in the Pacific (including SPREP, SPC and international accredited entities) and aligning with established regional strategies and country priorities. In doing so, it strengthens country ownership and regional coherence, while respecting established roles for concept development, fiduciary oversight, and implementation under the GCF's accreditation framework with accountability mechanisms needed to track whether GESI priorities are consistently integrated into concept notes and funding proposals.

Through its focus on regional sequencing and aggregation, RPACA enhances the bankability of Pacific climate action by supporting scale, replication and learning across countries facing similar climate risks. This approach directly supports GCF investment criteria related to paradigm shift potential, efficiency and effectiveness, and long-term impact, particularly in adaptation and resilience contexts where small, isolated investments have historically limited transformational potential, and where gender-responsive and disability-inclusive design can demonstrate added value in meeting GCF's paradigm shift benchmarks.

Importantly, RPACA does not constitute a new financing mechanism nor an implementation entity. Instead, it strengthens the quality and coherence of the upstream investment pipeline, enabling the GCF and other climate finance partners to deploy resources more strategically, predictably, and

efficiently within the region, while reducing transaction costs that often disproportionately burden smaller women-led and PWD-led organisations seeking access to climate finance.

6.6.1 Complementarity, Additionality and Coordination with Existing Regional and National Initiatives

RPACA is designed to complement and build upon existing regional and national climate and development initiatives, rather than duplicate them. The programme leverages ongoing investments by governments, ADB, GCF, the World Bank, Australia, New Zealand, SPC, SPREP, PIFS, and other development partners, which have strengthened climate information, sector planning, institutional capacity, and infrastructure development across the Pacific. However, significant gaps remain in translating planning into implementation, developing bankable adaptation investments, mainstreaming climate risks into public financial management and investment planning, and financing the climate-resilient upgrades needed to protect critical infrastructure and essential services. Component 1 addresses these gaps by strengthening climate-responsive planning, fiscal risk management, investment prioritisation, and regional knowledge sharing, while Component 2 provides incremental financing for climate-resilient infrastructure and systems that extend beyond conventional development investments.

Across participating countries, RPACA finances the climate additionality of investments by integrating future climate design standards, climate-proofing critical infrastructure, nature-based solutions, climate-informed asset management, and long-term adaptation pathways into sectors including transport, water, coastal protection, energy, urban development, health, and education. The programme will be implemented in close coordination with national governments, implementing agencies, regional organisations, and development partners through existing coordination mechanisms and the RPACA Regional Steering Committee, ensuring strong country ownership, avoiding duplication, and maximising synergies. By filling critical adaptation financing gaps and operationalizing resilient investment pipelines, RPACA advances the GCF investment criteria by delivering high climate impact, supporting paradigm shift, responding to the unique needs of Pacific SIDS, and improving the efficiency and effectiveness of climate finance.

Based on discussions between RPACA, ADD and Pacific Resilience Facility (PRF) during the RPACA design phase, RPACA and the PRF occupy different but complementary parts of the Pacific climate finance ecosystem. Rather than competing, they address different financing gaps, scales of investment and implementation modalities. The following complementarities and coherence could be articulated. RPACA and PRF finance different segments of the adaptation market. RPACA focuses on upstream enabling systems, climate-responsive public financial management, preparation of investment pipelines, innovative climate finance, and medium- to large-scale sovereign adaptation investments. In contrast, PRF has been established specifically to finance small-scale community-based resilience projects, an area that has historically been underserved by multilateral development banks. Together they create a continuum of adaptation finance: Community adaptation, national adaptation planning and investment readiness (RPACA Component 1), Large sovereign adaptation investments (RPACA Component 2), sectoral resilience (SPC) and regional knowledge and coordination (SPREP). This allows adaptation actions to occur from village to national to regional scales.

Table 10: Complementarity and Coherence between RPACA and Pacific Resilience Facility

Focus Area	RPACA (ADB/SPC/SPREP)	PRF	Complementarity/ Coherence
Primary Objective	Mobilise large-scale adaptation finance and strengthen national adaptation systems	Finance small-scale community resilience projects	RPACA addresses national and sectoral resilience while PRF addresses community-level adaptation, creating a continuum of investments.
Scale of Investment	Large national level sovereign and regional investments	Small grants for community projects	Different financing scales fill different adaptation financing gaps rather than duplicating each other.
Implementing Entities	National ministries, executing agencies, ADB, SPC and SPREP	Community organisations and local institutions through national arrangements	National investments under RPACA can be complemented by locally led adaptation supported through PRF.
Focus	Climate-responsive public financial management, resilient infrastructure, adaptation finance, policy reform and sector resilience, waste and pollution	Community resilience, local adaptation priorities and grassroots implementation	PRF strengthens resilience from the bottom up while RPACA strengthens systems from the top down.
Financing Instruments	GCF grants, concessional finance, ADB sovereign financing, technical assistance and blended finance	Primarily grant financing	Instruments are complementary and target different financing needs.
Pipeline Development	Develops national investment pipelines and bankable projects	Supports implementation of community priorities that generally fall below MDB investment thresholds	RPACA fills the missing middle between policy reform and large infrastructure, while PRF fills the small-scale community financing gap.
Knowledge and Capacity	Strengthens ministries of finance, planning agencies and sector ministries	Builds community capacity and local resilience	Lessons can flow in both directions, improving national policy and local implementation.
Regional Coordination	Embedded within Pacific regional architecture (ADB, SPC, SPREP) and ADB	Governed by Pacific Finance Ministers	Shared membership and regional governance promote alignment of priorities and coordination.

	country programming processes		
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ADB= Asian Development Bank, PRF Pacific Resilience Facility=,SPC= Pacific Community, SPREP= Secretariat of the Pacific Regional Environment Programme.

Source Asian Development Bank.

6.6.2 Key Takeaways for GCF Stakeholders

RPACA provides a Pacific-led, programmatic bridge between regional strategies and GCF financing, improving alignment without duplication.

It supports regional aggregation and scale, directly addressing challenges the GCF has identified in financing adaptation and resilience in Small Island Developing States, while ensuring equity filters are applied to aggregated investments.

RPACA strengthens collaboration among regional accredited entities, national governments, and financing partners, helping to streamline concept development and reduce transaction costs, with explicit attention to lowering barriers for women's enterprises and PWD-focused initiatives.

By enhancing the strategic coherence of the investment pipeline, RPACA enables GCF resources to achieve higher impact per dollar deployed, while reinforcing country ownership and regional political legitimacy.

In summary, RPACA represents a value-adding enabling mechanism that helps the GCF deliver on its mandate in one of the world's most climate-vulnerable regions—by making Pacific climate action more coherent, scalable, and investment-ready, and by embedding gender equality and social inclusion as measurable criteria for transformational impact.

7 Gaps in the Baseline, Barriers and Missed Opportunities

7.1 Gaps

The previous sections assessed the climate hazards, vulnerabilities and impacts across the Pacific region, and the current responses to these impacts. Despite the fact that the scale of adaptation efforts is growing, a clear mismatch emerges between the scale and complexity of the challenges and the current response.

One gap relates to the *type* of infrastructure projects being developed. All infrastructure investments, if well-conceived and designed, have the potential to advance overall resilience. However, currently, efforts are focussed mostly on climate proofing existing infrastructure or building new infrastructure that is climate proof. There have only been limited attempts to fundamentally revisit infrastructure development and design it so as to contribute optimally to overall sector resilience. There have been even fewer attempts to design and construct infrastructure with the sole objective of climate change adaptation or resilience, with accessibility standards for PWD and gender-responsive service design rarely embedded as primary objectives.

A second gap falls between the climate finance that is available and accessed, and the levels of climate finance that is required. This relates both to the *quantity* of climate finance available in the Pacific – there is too little. PIFS estimate that current annual climate finance is around \$220 million, only about 20% of the required \$1 billion.¹¹⁰ This also relates to the ease of access to the available finance – access is far too complicated. This mismatch applies to both public sector finance and finance for private sector investments. This also relates to operational capacity, the capacity to turn climate finance efficiently into implemented projects, with smaller women-led and PWD-led organisations facing the steepest transaction costs and capacity barriers.

A third important gap relates to how climate finance, climate projects and resilience investments are targeted. Currently, climate finance and climate investments across the Pacific are not finetuned to target the climate vulnerable (see Box 5).¹¹¹ Typically, these investments benefit all groups, or all sectors, or all sites – often equally benefitting, or more, those that are not vulnerable nor particularly in-need. This approach is appropriate for some climate threats in the region - e.g. very often this works for rising sea level on atolls. However, in most cases this results in a low efficiency in terms of adaptation benefits, and limited impacts overall ¹¹², with exclusion risks compounded when gendered livelihood systems and PWD accessibility needs are not explicitly prioritised in targeting frameworks.

¹¹⁰ Economic Ministers Meeting, 10-12 August 2022, Agenda Item 6A

¹¹¹ The climate vulnerable includes historically vulnerable groups and communities such as women headed households and remote populations. It also includes populations, communities, and sectors that are not historically vulnerable but are vulnerable to climate change impacts such as communities living close to the sea in an area that experiences high levels of erosion. It also includes groups that may become vulnerable because of climate change impacts. The latter could include small/medium scale tourist operators or agricultural enterprises. These may have been performing well for decades, but changing cyclone patterns or dry periods could render the enterprises non-profitable.

¹¹² See, for example, E. Wilkinson et al. 2023. *A fair share of resilience finance for Small Island Developing States: closing the gap between vulnerability and allocation*, and K. Owens et al Bridging the adaptation-finance gap: Pathways for the green climate und in the Pacific, in *Earth System Governance*, Volume 24.

Box 5: The Need for Vulnerability Sensitized Approaches

Vulnerability in the Pacific is not uniform; it is differentiated across countries, islands, locations, population groups, and economic sectors due to the varying levels of exposure and adaptive capacity. Physical geography plays a central role: atoll nations and low-lying outer islands face existential risks from sea level rise, coastal erosion, saltwater intrusion, and storm surge; while high islands may experience more intense flooding, landslides, and riverine hazards. Within countries, exposure varies sharply between urban centres, rapidly growing peri-urban settlements, and remote outer islands characterized by limited infrastructure, high transport costs, and constrained access to services. These spatial differences intersect with economic structures. For example, communities and locations dependent on climate sensitive sectors such as rain fed agriculture, coastal fisheries, and tourism experience disproportionate impacts when climate hazards disrupt production systems, ecosystems, or critical access routes.

Vulnerability is also highly differentiated across social and demographic groups. Households with limited assets, insecure land tenure, or heavy reliance on subsistence and informal livelihoods have fewer buffers to absorb shocks and fewer options to adapt or relocate. Women, children, older persons, and people with disabilities often face heightened risks due to unequal access to resources, mobility constraints, health vulnerabilities, and care responsibilities, which can intensify during climate shocks. Indigenous and customary resource dependent communities may face particular challenges where climate impacts undermine ecosystems central to food security, identity, and cultural continuity. Without vulnerability-sensitised approaches, adaptation measures risk reinforcing these inequities rather than reducing them.

At the same time, adaptive capacity varies by education, income, social networks, and access to institutions and services, meaning that the same hazard can produce vastly different outcomes across households and social groups even within the same locality. Importantly, climate change in the Pacific will not only exacerbate existing vulnerabilities but also create newly vulnerable groups by altering the conditions that previously underpinned resilience.

Incremental climate stressors—such as rising temperatures, changing rainfall patterns, ocean warming, and gradual sea level rise—can erode livelihoods and coping mechanisms over time, transforming previously viable economic activities into marginal or unsustainable ones. For example, smallholder farmers or fishers who have historically adapted through seasonal adjustments may cross thresholds beyond which productivity declines, costs increase, or risks become unmanageable. Similarly, urban households that were not traditionally considered vulnerable can become newly exposed as heat stress, water scarcity, flooding, or infrastructure failures affect informal settlements, labour productivity, and access to basic services.

Vulnerability in the Pacific is dynamic, cumulative, and path dependent. It is shaped and re-shaped by interactions between climate hazards, development trajectories, and institutional capacity. As climate impacts cascade across systems—damaging infrastructure, disrupting services, constraining fiscal space, and degrading ecosystems—they can progressively narrow adaptation options and lock households and communities into cycles of vulnerability. This underscores the need for adaptation responses that explicitly account for differentiated and emerging vulnerability, anticipate future risk profiles rather than relying on historical exposure, and strengthen adaptive capacity across multiple scales. Without such an approach, climate impacts will continue to widen inequities within and between Pacific countries, even as overall exposure intensifies

Source: Asian Development Bank

Other important gaps are:

- The fact that current infrastructure investments focus on hard or technical solutions. There is little consideration of nature-based solutions. There is limited experimentation with community-led approaches. And, finally, there is limited evidence of mobilizing private sector investments towards addressing climate threats.¹¹³
- The very high transaction costs in the region, and the limited funds available, and limited revenue generated.

Each of these gaps can be addressed, individually, in each sector, at each site. This is the current situation. There are many ongoing initiatives that address these gaps. Yet, it is too little, too slow. In

113 E. Wilkinson et al. 2023. *A fair share of resilience finance for Small Island Developing States: closing the gap between vulnerability and allocation*,

order to address all gaps, in an accelerated manner, a **transformation** or paradigm shift in the approach to adaptation is required. It is necessary to transform current ‘development’ pathways that are incrementally changing into long-term, resilient, adaptation pathways on which change is rapid. This transformation necessitates and will bring change at many levels – the community, the site, the sector and the country. Naoero (see Box 6) has identified such an adaptation pathway. However, on Naoero, as across the Pacific, there are many barriers to operationalizing this transformation. These barriers are technical, institutional, and financial. Furthermore, as explained below, there are clear opportunities to leverage and accelerate this transformation – and these are not currently being taken. Accelerating transformation requires the reducing or removing of the barriers and the seizing of the opportunities.

Box 6: Naoero's Response to Climate Change ^a

Naoero is a low-lying, densely populated small island state that is already experiencing severe impacts from sea-level rise, coastal erosion, flooding, and saltwater intrusion. An estimated 80–90% of the population live along the coast. Naoero's response to climate change is centred on a long-term strategy of planned relocation and national transformation, combined with short- to medium-term measures to protect vulnerable coastal assets.

At the core of Naoero's long-term adaptation strategy is the Higher Ground Initiative (HGI), a 50-year, generational adaptation and development plan to progressively relocate housing, critical infrastructure, and essential services from low-lying coastal areas (“Bottom side”) to the higher inland plateau (“Topside”). The HGI is multi sector and multi stakeholder and aims to fundamentally transform Naoero's development pathway.

While the HGI provides a long-term solution, the Government of Naoero recognises that full relocation will take decades. Over the short- to medium-term (up to ~50 years), Naoero is therefore pursuing an adaptive approach that seeks to protect and manage coastal areas while preparing for gradual relocation.

However, Naoero faces significant barriers. The HGI is capital-intensive and technically complex, there are significant capacity constraints and limited data availability, and costs are high.

^a SPREP. 2024. [Rebuilding Nauru — the island nation's ambitious climate change adaptation plan](#). 6 July. Source: Asian Development Bank.

7.2 Barriers

The barriers to transforming the approach to climate change can be categorized as technical, institutional and financial. See the example of the Marshall Islands in Box 7.

Box 7: Barrier Analysis, Marshall Islands

The National Adaptation Plan of the Republic of the Marshall Islands (2023) identifies cross-cutting and sector specific barriers to transformational climate change. The sectors analyzed include infrastructure (with utilities, energy and transport), healthcare and social services, education, fisheries, natural resources and commerce.

The cross-sectoral barriers identified are:

- Agencies and organizations face funding, communication challenges, and confusing roles in climate adaptation.
- Shortage of skilled professionals in areas related to climate change adaptation hinders development, exacerbated by the migration of qualified experts.
- Geographical isolation of neighbouring islands and limited transportation to the atolls reinforces this barrier.

Limited understanding of various detailed climate change impacts in the different sectors:

- Donor-funded infrastructure focuses on 'direct' climate change adaptation but less on activities indirectly reducing local vulnerability to climate change.
- Limited climate change information sharing hinders long-term adaptation, with challenges like the disrupted communication across atolls.
- Gaps in data collection.
- Socio-economic challenges and ad hoc community demand for immediate fixes can divert resources and hamper holistic, long-term planning climate change adaptation and resilience.

And the infrastructure-specific barriers are:

- Economic challenges in the RMI stemming from limited inter-atoll connectivity, resulting in restricted access to services.
- Infrastructure is vulnerable due to environmental and resource challenges.
- No current planning framework guides appropriate development. Marshallese landowner rights may impact the adoption of certain adaptation measures on their property.

Source: Asian Development Bank.

Across the Pacific region, the commonly cited *technical* barriers include:

- The insufficient and misaligned capacity to undertake system, upstream climate assessments. Climate assessments are often considered an 'add-on' to investment design rather than a driver of investment conception and design. As a result, climate assessments are used to validate climate proofing, rather than to create opportunities for advancing overall or sector resilience.
- The limited capacity to identify and develop, collaboratively, adaptation pathways. Identification of alternative development pathways is a new need, it requires new skills, new information, and in particular new interconnections of skillsets and information bases. This is only developing slowly in the region.
- In general, the solutions to climate change are known – for example more mangroves, or higher walls, or retreat. However, the detailed capacity to develop solutions that are specific for each and every investment is lacking. This contributes to the “last mile” problem, or an inability to move from knowing what to do to being able to act at scale. Powerful, regionally pertinent examples of this are: (i) the shortage of capacity and skills to identify and design nature-based solutions; (ii) the capacity to generate cross-sectoral solutions to cross-sectoral challenges, and (iii) the capacity to develop multi-country investments that lead to climate resilience.

Across the Pacific region, the commonly cited *institutional* barriers include:

- The prevailing institutional structures and procedures, at national and regional levels, in governments and development partners, ensure that, in practice, climate-assessments are

given a low priority in project development. And 'upstream' or system assessments are even lower priority.

- Building on the above, the institutional structures are not sufficiently conducive achieving climate resilience. This concerns the structures both across and within organizations. The mandates, responsibilities, linkages, capacities were designed for other purposes and are not aligned to climate resilience.
- Most available climate funding is 'project-based', be it for public sector, private sector or for non-governmental activities. Most climate funding has its origins in 'development finance', and as a result is project-based. This, in turn, leads to funding that is fragmented, short-term and unpredictable. This is not a basis for identifying and designing long-term investments.
- The high influence of development partners. Development partners typically have more skilled people, better processes and information than local governments. This leads to a bias where the development partners often drive development and climate resilience. This influences policies, funding flows, project cycles, etc.

Across the Pacific region, the commonly cited financial barriers are:

- Insufficient funds available for climate change in the Pacific. This is linked to the unpredictability of the available funds;
- The financial architecture - for public, private and community investments - is geared to development, to business-as usual - not to resilience/adaptation.

7.3 Opportunities

In addition to barriers, there are also opportunities that are not being seized. Seizing these opportunities, realizing this potential, could greatly accelerate and strengthen transformational adaptation to climate change across the Pacific. Commonly cited examples are:

1. The potential of gender and youth. Currently, in development, gender and youth are treated as a social safeguard issue – to ensure that development does not negatively impact women and youth. However, women and young people are large groups of high potential. Involving women and youth in all steps on the development pathway would lead to more ideas, more resources, more creativity and more appropriate activities. Unlocking this potential requires shifting from procedural inclusion to structural leadership roles, backed by financing and institutional accountability.

Dimensions of this are:

- Currently, women and youth are often included procedurally (e.g. as targets, or through consultations, or as beneficiaries of standardized training). However, their full adaptive potential lies in leadership, innovation, and continuity, not just participation.
- Women are in particular central to informal and community-level systems such as resource management, care for the vulnerable and ensuring food security. These systems are often the most vulnerable. However, they are often only weakly connected to national economic or political systems. Involving women will integrate these 'informal' systems into the formal systems.
- The youth can bring improved time horizons, vast digital skills and increased mobility. These are all factors that align well with, or contribute to, a transformational adaptation (e.g. through data systems, early warning dissemination, climate services, entrepreneurship).

2. The opportunity to share and pool across countries. The PIC countries are small, and their resources are likewise small, too small to address major challenges. This can mean human resources, equipment, data, finance. If pooled, the aggregate resources will be far larger. Pooling and sharing can lead to:

- Economies of scale (e.g. regional climate services, procurement, asset management).

- Depth and specialization (regional experts embedded across countries rather than one-off, external consultants).
- Risk-sharing (financial, technical, and political risks).
- Increased credibility with climate financiers, allowing access to programmatic and long-term funding.
- Reduced dependence on donor-driven technical assistance – that can often be fragmented and unpredictable, while also creating opportunities to embed gender and disability expertise regionally rather than relying on ad hoc consultations.

3. The missing private sector. Private sector has enormous potential to mobilise resources and technologies towards resilience. However, institutional and policy frameworks discourage private sector investment, and there is limited evidence of incentives for women-owned enterprises or PWD-focused ventures to participate in resilience markets.

7.3.1 Mutually Reinforcing Barriers and Missed Opportunities

Many of the above barriers and missed opportunities are inter-related or act in a cascading manner. For example, the high influence of development partners is magnified by the prevailing, weak institutional structures. The shortage of skills makes it impossible to overcome this. Pooling skills across countries, or empowering women in more leadership positions, could act to strengthen institutional structures, engage more effectively with development partners, and therefore have more and better investments, while also ensuring that PWD inclusion and gender-responsive priorities are embedded in regional coordination rather than treated as secondary.

PART 2 PROBLEM ANALYSIS, PROGRAMME DESIGN AND INVESTMENT PROGRAMME

8 Theory of Change

8.1 RPACA Components

Components 2, 3 and 4 include significant transformational adaptation investments across the region and across sectors. These will immediately deliver resilience to a large number of diverse beneficiaries. Further, the range and diversity of activities under Components 2, 3 and 4 will collectively lead to the *demonstration* of a large number of practices and approaches that successfully deliver resilience. This will generate knowledge of how to adapt in diverse contexts, in various sectors, across the region. Further, the learning-by-doing *approach* to Components 2, 3 and 4 will ensure that capacity is built. All activities under Components 2, 3 and 4 will be designed to be implemented in a manner so as to strengthen adaptive capacity to access, absorb and deliver climate finance to deliver on NDC and NAP priorities. Finally, the RPACA ambition is that the scale of Components 2, 3 and 4 will take Pacific climate resilience efforts to a tipping point - after which approaches that are currently considered transformational will become standard, with equity-focused design ensuring that resilience gains are not only scaled but redistributed to those most excluded under BAU pathways.

Component 1 provides the necessary capacity building, technical assistance and knowledge management to ensure that all activities across RPACA are implemented in an optimal manner and have optimal benefits. Based on in-depth assessments, Component 1 will fill key capacity gaps that are best addressed at a regional level. This will notably target public climate finance, staff retention and pooling resources. In terms of technical assistance, Component 1 will provide support to Component 2 to ensure that all actions under Component 2 are of high quality and ensure coherence across the region. This technical support will notably be related to undertaking system-scale climate risk and vulnerability assessments, addressing gender and vulnerability, mobilizing finance and using nature-based solutions. In terms of knowledge management, Component 1 (and later in connection with Component 4) will ensure that all data and knowledge is collected and stored and easily accessible for future users. Component 1 also includes a strong focus on accessing and managing climate finance. This covers both public sector climate finance, and private sector financed that is used to deliver or lever adaptation gains, with accountability mechanisms required to track whether women's enterprises and PWD-focused initiatives are equitably accessing these flows.

One important element underlying all components is the need for proper climate assessments when identifying, conceptualizing, developing and designing both climate adaptation and development projects. A 'proper' climate assessment is one that is:

- linked to identifiable adaptation pathways and a clear system definition;
- undertaken suitably early in the project cycle, upstream;
- suitably systematic or broad;
- sufficiently well-resourced;
- based on adequate data;
- a suitable balance of assessments of hazards, risks, vulnerabilities, alternatives and social and physical sciences.

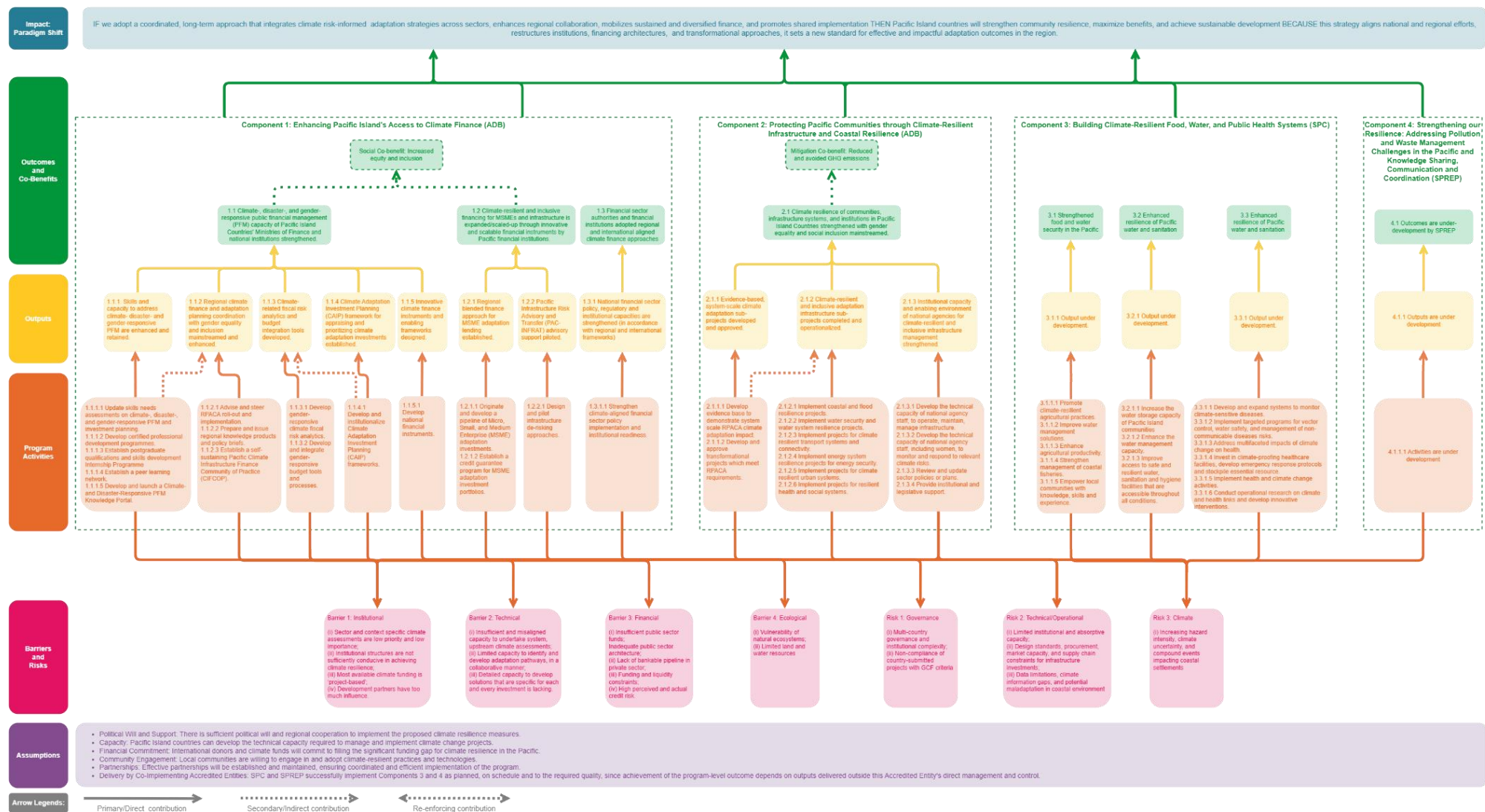
Both Components 1 and Components 2 contribute to this. Component 1 ensures that the Ministries of Finance understand, utilise and support the undertaking of proper climate assessments, initially in order to provide strengthened climate fiscal risk assessments in their role as Ministry of Finance. This understanding will generate a demand for proper climate assessments. Component 2, as part of the project cycle, will demonstrate how to undertake climate assessments, it will demonstrate the benefits of the climate assessments, and it will build capacity to undertake climate assessments.

The focus of Component 2 is the *transformation* of the approach to implementing infrastructure projects. Component 2 will demonstrate how to fully integrate system-scale climate risk and vulnerability assessments upstream into the project cycle – to deliver transformational and scalable adaptation projects. The CRVAs will enable identification of interdependencies, cascading risks, and system-wide vulnerabilities to drive project development that would not be captured through traditional project-level assessments

Component 2 will deliver up to 21 climate adaptation investments, providing both hard and soft deliverables. The 21 projects will cover a diverse range of sectors, countries, contexts. They will include projects for which climate resilience is the core and primary objective and projects with development and climate resilience objectives that, with the help of Component 2, have been modified to substantively increase the climate resilience benefits.

8.2 Theory of Change Diagram

Figure 5: RPACA Theory of Change



8.3 Theory of Change Description

Vision Statement. The RPACA envisions a resilient, inclusive, and climate-secure Blue Pacific Continent where all people can lead safe, healthy, and prosperous lives in the face of accelerating climate change and disasters, consistent with the *2050 Strategy for the Blue Pacific Continent*.¹¹⁴ Over a 10-year horizon, the Programme aims to transform fragmented climate interventions into a coordinated regional platform that scales country-led adaptation, strengthens low-carbon development pathways, and mobilises finance through integrated national programming cycles and partnerships.

By embedding equity, science-based planning, and regional cooperation, the programme seeks to empower women, youth, older persons, and persons with disabilities as active agents of resilience while strengthening institutions and ecosystems. In doing so, RPACA supports Pacific Island countries to enhance adaptive capacity, unlock climate finance at scale, and reinforce the region's leadership in global climate action. The RPACA vision also aligns to the *“Framework for Resilient Development in the Pacific.”*¹⁰⁸ This is a long-term vision of a Pacific Region of peace, harmony, security, social inclusion and prosperity, ensuring that all Pacific people can lead free, healthy and productive lives in changing conditions and extreme events, with resilience pathways explicitly designed to dismantle structural exclusions rather than replicate them.

Goal Statement. The goal is for climate impacts and threats, including sea level rise, drought, coastal erosion, ecosystem degradation and flooding, to be sustainably managed across the Pacific and for the vulnerability of key communities and sectors to be significantly reduced. Reducing vulnerability requires enabling those most at risk to participate fully in adaptation and resilience efforts and ensuring that their leadership is institutionalized rather than treated as procedural.

Theory of Change Statement

IF we adopt a coordinated, long-term approach that integrates climate risk-informed adaptation strategies across sectors, enhances regional collaboration, mobilizes sustained and diversified finance, and promotes shared implementation

THEN Pacific Island countries will strengthen community resilience, maximize benefits, and achieve sustainable development

BECAUSE this strategy aligns national and regional efforts, restructures institutions, financing architectures, and transformational approaches, it sets a new standard for effective and impactful adaptation outcomes in the region. Integrating the leadership and capacities of vulnerable groups ensures resilience gains are not only equitable but also transformative, shifting power dynamics within institutions and financing systems.

The comprehensive, multi-partner approach is designed to enable the transformation of Pacific Island economic sectors and systems, urban spaces and communities.

8.3.1 Strategic implementation

Addressing this multidimensional barrier landscape requires RPACA to pursue a coordinated, inclusive, and science-informed programmatic approach that go beyond incremental adjustments to fundamentally transform how development occurs in the Pacific. This includes strengthening institutions, building technical capacity, unlocking climate finance, and enabling regional cooperation to drive long-term resilience across food, water, ecological and social systems. To address these multidimensional barriers, RPACA will adopt a phased, collaborative, and regionally integrated approach. This includes:

¹¹⁴PIFS. 2022. *2050 Strategy for the Blue Pacific Continent*. Specifically with regards to climate change, the Blue Pacific Continent Strategy envisions that “all Pacific peoples remain resilient to the impacts of climate change and disasters and are able to lead safe, secure and prosperous lives. The region continues to play a leadership role in global climate action”. This vision recognises that women, youth, older persons, and persons with disabilities face heightened vulnerability, and must be empowered as active agents of resilience and climate solutions.

- Strengthening institutional and technical capacities across borders and sectors;
- Unlocking climate and blended finance through pipeline development, risk-sharing mechanisms to reduce public debt, which currently restricts national adaptation budgets;
- Shifting investment from small-scale, disjointed projects to targeted large-scale, sustained, and programmatic climate finance. Key financial instruments include debt-for-climate swaps
- Fostering inclusive participation of vulnerable and underrepresented groups in decision-making with institutional accountability to ensure their leadership is embedded rather than procedural; and
- Building regional learning systems to accelerate knowledge exchange and scale-up effective interventions, including equity-focused monitoring that tracks whether resilience gains reach women, youth, and PWD.

8.3.2 Strategic Imperative

The comprehensive, multi-partner approach is designed to enable the transformation of Pacific island economic sectors, urban spaces and communities.

8.3.3 Expected Outcomes

RPACA will deliver a set of transformative, interconnected outcomes that strengthen climate resilience across the Pacific island countries that promote sustainable development aligned with national strategies and the 2050 Blue Pacific Strategy and helps countries achieve their long-term climate ambition set out in the NDCs. By addressing systemic barriers and scaling integrated adaptation measures, RPACA will enhance infrastructure and coastal resilience, water security, food security, resilience of key economic sectors as well as the social protection, education and health systems. These outcomes will also reduce the heightened vulnerability of women, youth, older persons, and persons with disabilities, ensuring they are empowered as active participants in resilience efforts, with benefit-sharing mechanisms explicitly designed to redistribute gains to those historically excluded from infrastructure and finance systems.

As described above, RPACA Components 2, 3 and 4 include significant transformational adaptation investments across the region and across sectors. These will immediately deliver resilience to a large number of diverse beneficiaries. Further, the range and diversity of activities under Components 2, 3 and 4 will collectively lead to the *demonstration* of a large number of practices and approaches that successfully deliver resilience. This will generate knowledge of how to adapt in diverse contexts, in various sectors, across the region. Further, the learning-by-doing *approach* to Components 2, 3, and 4 will ensure that capacity is built. All activities under Components 2, 3 and 4 will be designed to be implemented in a manner so as to strengthen adaptive capacity to access, absorb and deliver climate finance to deliver on NDC and NAP priorities. Finally, the RPACA ambition is that the scale of Components 2, 3 and 4 will take Pacific climate resilience efforts to a tipping point - after which approaches that are currently considered transformational will become standard. This scale will also embed inclusive practices, ensuring resilience gains are equitably shared across households and communities, and tracked through equity-focused monitoring frameworks that measure distributional impacts across gender, age, and disability groups.

Component 1 provides the necessary capacity building, technical assistance and knowledge management to ensure that all activities across RPACA are implemented in an optimal manner and have optimal benefits (Table 3). Most importantly, Component 1 will systematically address the climate finance barriers across all other components - both in public and private sectors. Component 1 will fill key capacity gaps that are best addressed at a regional level. This will notably target public climate finance, staff retention, and pooling resources. In terms of technical assistance, Component 1 will provide support to **Component 2** to ensure that all actions under Component 2 are of high quality and ensure coherence across the region. This technical support will notably be related to undertaking system climate assessments, addressing gender and vulnerability, mobilizing finance, and using nature-based solutions. In terms of knowledge management, Component 1 (and later in connection with Component 4) will ensure that all data and knowledge is collected and stored and easily accessible for future users. By systematically addressing vulnerability and enabling participation of those most at risk, Component 1 ensures that capacity building and finance access strengthen

resilience across all social groups, with institutional accountability mechanisms to prevent GESI priorities from being sidelined in regional coordination.

Table 11: GCF-Aligned Outcome Framework for Climate-Resilient Development under the RPACA, with a Focus on ADB Components

Programme Component	Outcome	Outputs	Description of Likely Activities
Component 1: Enhancing Pacific Island Countries' Access to Climate Finance	Outcome 1.1: Climate-, disaster-, and gender-responsive public financial management capacity of Pacific Island Countries' Ministries of Finance and national institutions strengthened.	Output 1.1.1. Skills and capacity to address climate- disaster- and gender-responsive PFM are enhanced, retained, and applied.	Strengthens Ministries of Finance and public institutions to integrate climate and disaster risks into budgeting, fiscal planning, and investment management through training, professional development, peer learning, knowledge systems, and regional coordination mechanisms.
		Output 1.1.2 Regional climate finance and adaptation planning coordination with gender equality and inclusion mainstreamed and enhanced.	Establishes a platform to embed climate risk in fiscal policy, strengthen climate fiscal risk analysis, improve public investment planning, and develop bankable adaptation pipelines while expanding access to public, private, and blended finance instruments.
		Output 1.1.3 Climate-related fiscal risk analytics and budget integration tools developed	
		Output 1.1.4 Climate Adaptation Investment Planning framework for appraising and prioritizing climate adaptation investments established.	
		Output 1.1.5 Innovative climate finance instruments and enabling frameworks designed.	
Component 1: Enhancing Pacific Island Countries' Access to Climate Finance	Outcome 1.2 Climate-resilient and inclusive financing for MSMEs and infrastructure is expanded/scaled-up through innovative and scalable financial instruments by Pacific financial institutions.	Output 1.2.1 Regional blended finance approach for MSME adaptation lending established	Mobilizes private capital and reduces investment risk through blended finance, guarantees, insurance and risk transfer mechanisms.
		Output 1.2.2 Pacific Infrastructure Risk Advisory and Transfer advisory support piloted.	
	Outcome 1.3 Financial sector authorities and financial institutions adopted regional and international aligned climate finance approaches	Output 1.3.1 National financial sector policy, regulatory and institutional capacities are strengthened (in accordance with regional and international frameworks)	Enhances financial sector capacity to integrate climate risk into supervision, regulation, lending, and disclosure systems through regional tools, training, taxonomies, and technical assistance.
Component 2: Protecting Pacific Communities through Climate-Resilient Infrastructure and Coastal Protection	Outcome 2.1: Climate resilience of communities, infrastructure systems, and institutions in Pacific Island Countries strengthened with gender equality	Output 2.1.1 Evidence-based climate adaptation sub-projects designed and approved.	Embeds system-scale climate risk assessments into infrastructure planning, ensuring country-specific investments are identified, designed, and approved based on climate science, vulnerability analysis, and inclusion standards
		Output 2.1.2 Climate-resilient and inclusive adaptation infrastructure sub-projects completed and operationalized.	Delivers up to 21 national sub-projects across coastal, water, transport,

	and social inclusion mainstreamed.	Output 2.1.3 Institutional capacity and enabling environment of national agencies for climate-resilient infrastructure management strengthened.	energy, urban, and social systems while strengthening institutional capacity, policy frameworks, and long-term operations and maintenance systems.
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MSME= micro small medium enterprise

Source: Asian Development Bank.

8.3.4 Key Assumptions

The successful implementation of the RPACA programme is based on several key assumptions that must hold for the intended outcomes and long-term impacts to be achieved. These relate to sustained political commitment and regional cooperation across the PICs, effective institutional coordination at national and regional levels, stable and predictable climate finance flows, and strong engagement of communities and stakeholders. The most important of these, and specific to RPACA are:

- **Sustained political commitment, support and regional cooperation** are maintained across Pacific Island governments, including continued alignment with NDCs, NAPs, and regional frameworks such as the 2050 Strategy for the Blue Pacific Continent and FRDP. This will include institutional engagement and coordination, with accountability mechanisms to ensure GESI priorities are not sidelined in political negotiations.
- **Technical and absorptive capacity** is progressively strengthened, enabling Pacific Island Countries to design, implement, and maintain climate resilient investments and systems, including the integration of gendered livelihood roles and PWD accessibility standards into technical training and project cycles.
- **Adequate and predictable climate finance** is mobilized, including timely disbursement of GCF resources, donor contributions, and complementary co-financing from governments and partners, with equity filters applied to track whether women's enterprises and PWD-focused initiatives are accessing funds.
- **Partnerships:** Effective partnerships will be established and maintained, ensuring coordinated and efficient implementation of the programme. This encompasses increased private sector participation in adaptation finance, **with incentives for women-owned and PWD-led enterprises to enter resilience markets.**
- **Community acceptance and engagement are sustained**, with local populations willing to adopt and maintain climate-resilient practices, technologies, and governance reforms provided that adaptation pathways reflect differentiated vulnerabilities and embed inclusive decision-making.

Two other important assumptions relate to climate and disaster risks remaining within manageable bounds for implementation; and the need for economic and geopolitical stability, including manageable climate hazard levels and no major political instability, conflict, or large-scale displacement.

8.3.5 Expected Co-benefits

RPACA delivers a transformative, system-wide adaptation benefit for the Pacific by strengthening the resilience of infrastructure, ecosystems, economies, and essential services, thereby reducing climate-driven losses, protecting livelihoods, and enabling sustainable and inclusive development across highly climate-vulnerable island systems.

Mitigation Co-Benefits: Although primarily an adaptation programme, RPACA contributes to emissions avoidance and energy security that improves the resilience of Pacific communities. This is achieved through increased deployment of renewable energy, reduced reliance on diesel generation, and improved energy and transport system efficiency, leading to lower greenhouse gas emissions across key infrastructure sectors.

Ecological Co-Benefits: The programme strengthens the resilience and functionality of coastal, marine, and urban ecosystems. It reduces ecosystem degradation from climate hazards, supports restoration of mangroves and coastal habitats, and enhances biodiversity and fisheries productivity. RPACA promotes ecosystem-based adaptation and nature-based solutions, improves urban environmental management (including waste, drainage, and sanitation), and protects coastal food systems that underpin local livelihoods and food security.

Social Co-Benefits: RPACA delivers improvements in human well-being, equity, and service delivery in the Pacific. It enhances access to safe and reliable infrastructure services (water, health, education, energy, and transport), reduces climate-sensitive health risks, and strengthens resilience of vulnerable groups including women, children, older persons, and coastal communities. The programme reduces service disruption during disasters, improves livelihood stability, and enhances quality of life through safer and more reliable living conditions. It also strengthens institutional and community capacity for inclusive climate resilience and supports human capital development through reduced education disruption, while embedding monitoring frameworks that measure distributional impacts across gender, age, and disability groups.

Economic Co-Benefits: RPACA generates macroeconomic and household-level gains by reducing climate-related losses and improving efficiency across key systems. These include avoided GDP losses from infrastructure disruption, reduced damage and maintenance costs, improved transport and trade connectivity, and protection of tourism-dependent economies. The programme also reduces fuel import dependence through energy security, improves utility efficiency and revenue collection, and enhances productivity by reducing time poverty and service interruptions. Additional gains arise from avoided health-related economic losses and strengthening reliability of critical economic corridors, with equity-focused benefit-sharing mechanisms ensuring that gains reach marginalised households rather than concentrating among elites

Together, these co-benefits position RPACA as a paradigm-shifting programme that delivers measurable, long-term contributions to climate-resilient development in the Pacific, while advancing the GCF's mandate to strengthen adaptation, sustainability, and inclusive growth across highly climate-vulnerable Small Island Developing States. The Programme's multidimensional benefits will be tracked through specific indicators across economic resilience, ecosystem integrity, social inclusion, and institutional capacity as outlined in the Results Framework (Section E).

8.3.6 Barrier Landscape: Business as Usual Scenario in the Pacific Islands

Despite the fact that the scale of adaptation efforts is growing, a clear mismatch emerges between the scale and complexity of the challenges and the current response. Three key aspects of this are: (i) the *type* of infrastructure projects being developed; (ii) the level of climate finance that is available and difficulties accessing it; and (iii) the skewed targeting of climate and resilience interventions and reaching vulnerabilities. The many ongoing initiatives are too little, too slow and not reaching the most affected communities and locations in the Pacific.¹¹⁵ An accelerated *transformation* or paradigm shift is required to transform current 'development' pathways that are incrementally changing into long-term, resilient, adaptation pathways on which change is rapid. Within this broader shift, RPACA applies the Gender-Transformative Climate Action (GTCA) approach, as outlined in the GAAP, to dismantle structural barriers to equity and inclusion. This ensures that women are empowered as leaders in resilience efforts, and that youth, older persons, persons with disabilities, and SOGIESC groups are recognised and engaged as active agents in climate solutions rather than treated as passive beneficiaries, with institutional accountability mechanisms required to prevent their roles being reduced to symbolic participation.

The detailed barrier assessment (Annex 2, Section 8.2) identified a series of critical technical, institutional, financial, and ecological barriers to this transformation. These are summarized in Table 12: Table 12: also provides information on how the proposed RPACA activities will address the barriers. Gender equality and social inclusion barriers are not treated as a separate category; instead, empowerment, and inclusion logic is mainstreamed across institutional, technical, financial, and

¹¹⁵ R. Maguire et al. 2023. *Institutional barriers to climate finance through a gendered lens in Fiji, Samoa, and Solomon Islands*.

ecological barriers, ensuring that equity considerations are embedded in every barrier solution rather than siloed as a safeguard.

Table 12: Summary of Barriers and Proposed Solutions for Advancing Climate Transformation in the Pacific under the RPACA Programme

Barrier	Description	Proposed Solutions
Institutional		
Sector and context specific climate assessments are low priority and low importance	The prevailing institutional structures and procedures, at national and regional levels, in governments and development partners, ensure that, in practice, climate-assessments are given a low priority in project development. Further, 'upstream' and 'system' assessments are of even lower priority.	Output 1.2.1 should increase priority allocated to these assessments; Output 2.1.1 should greatly increase familiarity, understanding, and lower barriers. Assessments will explicitly integrate gender equality and social inclusion, ensuring women, youth, older persons, persons with disabilities, and SOGIESC groups are visible in risk analysis and resilience planning.
Institutional structures are not sufficiently conducive achieving climate resilience.	The institutional structures are evolving, however, not sufficiently conducive to achieving climate resilience. This concerns the structures both across and within organizations. For both cases, the mandates, responsibilities, linkages, capacities were designed for other purposes and so are not aligned to climate resilience.	Component 2 will demonstrate across several sectors, in several countries, how institutions can and should work together to achieve climate resilience; Output 1.2.2 will provide regional institutional backing and solid technical support to this transformation. Institutional reforms will embed GESI mandates, empowering women and other under-represented groups to participate in governance and decision-making processes.
Most available climate funding is 'project-based'.	Most available climate funding is 'project-based', be it for public sector, private sector or for non-governmental activities. Most climate funding has its origins in 'development finance', and as a result is project-based, with the development partners committing to short timelines. This, in turn, leads to funding that is fragmented, short-term and unpredictable. This is a poor basis for identifying and designing long-term investments.	RPACA, as a programme, will demonstrate programme approaches. Outcome 1.2 will build PFM capacity – reducing a major barrier to programmatic and long-term approaches. Programmatic approaches will also ensure funding mechanisms dismantle exclusion barriers, enabling women, youth, and socially excluded groups to access and benefit from climate finance.
Development partners have too much influence.	Development partners typically have more skilled people, better data and information and more resources than Pacific governments. This leads to a bias where development partners often drive development and climate resilience. This influences policies, funding flows, project cycles, etc.	RPACA is regionally and nationally driven and exemplifies how development partners should work in support of national and regional partners. Outcome 1.2, and Outcome 2.3 to some extent, will build government capacity and confidence to drive and manage climate change adaptation. This shift will strengthen national ownership of GESI priorities, ensuring women's empowerment and inclusion of vulnerable groups are not sidelined by external agendas.
Technical		
Insufficient and misaligned capacity to undertake system, upstream climate assessments.	Climate assessments are often done at the national sector levels and considered an 'add-on' to investment design rather than a driver of investment conception and design. As a result, climate assessments are used to validate climate proofing, rather than to create opportunities for advancing overall or sector resilience. The skills and resources allocated to the climate assessment are similarly constrained.	Output 2.1.1. will enhance, develop, and mainstream the technical and institutional skills and practices required in order to prioritise upstream, system assessments. These assessments will integrate GESI, ensuring women, youth, older persons, persons with disabilities, and SOGIESC groups are visible in risk analysis and empowered to shape resilience pathways.
The limited capacity to identify and develop adaptation pathways, in a collaborative manner.	There is limited capacity of any one institution to design, implement, and monitor climate projects. This stems from a lack of skilled personnel, high turnover of skilled personnel, lack of retention of trained staff, inadequate infrastructure, and	Output 1.1.1 and 1.1.2 will target retaining trained staff and attract diaspora expertise in countries. Output 2.1.1., notably activity 2.1.1.2, will target this capacity gap. Capacity development will embed GTCA principles,

	insufficient access to relevant data and information. Current development pathways are not adapted to climate change, compound events and cascading risks. The identification of alternative development pathways is a new need. This requires new skills, new information, and in particular new interconnections of skillsets and information bases. This is only developing slowly in the region.	equipping institutions to co-design pathways that empower women and vulnerable groups as active participants in adaptation planning and monitoring.
The detailed capacity to develop solutions that are specific for each and every investment is lacking.	In general, the solutions to climate change are known and piloted – for example more mangroves, or higher walls, or retreat. However, the detailed capacity to develop solutions that are specific for each and every investment, at each site, is lacking. This contributes to the “last mile” problem, or an inability to move from knowing what to do to being able to act at scale. Powerful, regionally pertinent examples of this are: (i) the shortage of capacity and skills to identify and design nature-based solutions; (ii) the capacity to generate cross-sectoral solutions to cross-sectoral challenges, and (iii) the capacity to develop multi-country investments that lead to climate resilience.	Component 2, all outputs, will implement climate resilience across several sectors, developing and using detailed specific solutions. Learning by doing will ensure this capacity is sustainably maintained. Solutions will be tailored to address differentiated vulnerabilities, ensuring women, youth, persons with disabilities and socially excluded groups benefit equitably and are engaged in designing site-specific resilience measures.
Financial		
Insufficient public sector funds	Insufficient funds available for climate change in the Pacific. This is linked to the unpredictability of the available funds.	Outcome 1.1 is to enhance PFM capacity to access climate finance. Many other activities build the related and required capacities to operationalize this. Strengthening PFM will also ensure that women, youth, older persons, persons with disabilities, and other vulnerable and underrepresented groups are not excluded from resource allocation, embedding equity in budget tagging and expenditure tracking.
Inadequate public sector architecture	The prevailing financial architecture - for public, private and community investments - is geared to development, to business-as usual - not to resilience/adaptation.	Outcome 1.1, based on institutional mapping, will target this for the public sector. Outcomes 1.2 and 1.3 will target this for parts of the private sector (MSMEs in some sectors) Reforms will integrate GTCA principles, ensuring financial systems empower women, youth and socially excluded groups to access and influence adaptation investments.
Lack of bankable pipeline in private sector	Current MSME finance programs show cross-sector demand, but adaptation investments are still not a distinct or widely recognized asset class. Both MSMEs and financial institutions often lack the knowledge and capacity to develop, assess, and fund these investments. Women-led MSMEs face even greater challenges—such as limited access to finance and resources—which further restricts the creation of viable adaptation projects. This results in a shortage of bankable adaptation finance opportunities, especially for women-owned businesses.	Outcome 1.2 will support the development of bankable pipelines of MSME adaptation projects by strengthening project identification, structuring, and investment readiness, with targeted measures to address barriers faced by women-led enterprises and to promote inclusive access to adaptation finance.
Funding and risk appetite constraints	Financial institutions in small island markets often face structural funding constraints, including a high cost of capital and limited access to long-tenor funding. This results in lending structures that are misaligned with the longer investment horizons required for adaptation activities. In addition, the absence of refinancing mechanisms limits the ability of financial institutions to access stable, lower-cost funding to scale adaptation lending.	Outcome 1.2 will address these challenges through the development of inclusive refinancing mechanisms that provide longer-term, lower-cost liquidity to financial institutions. This will enable the extension of more affordable and better-aligned credit to adaptation-relevant borrowers, with targeted measures to improve access for women-led and other underserved groups
High perceived and actual credit risk	Risk appetite constraints remain a critical barrier. MSMEs are often perceived as high risk due to limited collateral and “thin file” characteristics, while	Outcome 1.3 aims to lower barriers for financial institutions by providing risk-sharing mechanisms and supporting improved risk

	adaptation investments introduce additional uncertainty due to limited data, unfamiliar business models, and concentrated exposures in small markets. Market-based risk transfer solutions remain underdeveloped, and technical capacity gaps limit effective risk assessment.	assessments. These measures will include gender-responsive strategies to reduce bias in credit evaluations and increase financing of women-led and underserved businesses involved in adaptation.
Ecological Barriers		
Vulnerability of Natural Ecosystems:	Pacific SIDS have fragile ecosystems that are highly vulnerable to climate change impacts, such as coral bleaching, sea-level rise, and extreme weather events. The degradation of these ecosystems further reduces the resilience of these nations to climate impacts.	Capacity building under Output 1.1.1 will contribute to managing these threats and increasing resilience. Some investments in Component 2 will contribute to enhancing resilience of ecosystems. Ecosystem resilience measures will dismantle structural barriers to participation, ensuring women are empowered in resource governance and that other under-represented groups are actively engaged in designing and implementing nature-based solutions such as mangrove restoration, coastal protection, and community-managed marine areas.
Limited Land and Water Resources:	Many Pacific SIDS have limited land and freshwater resources, making them more susceptible to the impacts of climate change. Over-reliance on natural resources can lead to environmental degradation and reduced resilience.	Soft and hard investments under Component 2 aim to increase sustainable availability and access to land and water resources. Investments will be structured to ensure equitable access, prioritising women, youth, persons with disabilities and other under-represented groups so that resource management strengthens both resilience and social inclusion.

GESI= gender equality and social inclusion, GTCA= Global Trade Credit Alliance, MSME= micro small medium enterprise, PFM= public financial management, SIDS= small island developing states.

Source: Asian Development Bank.

Risk Management: Risks identified in Annex 2 (Section 19) and Section F include technical, political, environmental, financial, operational, and institutional risks that may affect the successful delivery of RPACA. These risks reflect the complex and highly climate-vulnerable context of PICs, as well as the multi-country and systemic nature of the programme and are addressed through targeted mitigation measures embedded in programme design, supported by adaptive implementation approaches and continuous learning mechanism

8.4 What Makes RPACA Transformative

The need for transformation: Climate risks in the Pacific are characterised by high exposure across multiple hazards. Risks are not isolated but interact across sectors and spatial scales, creating complex, cascading and evolving impact pathways. Further, risks are cumulative and compounding, with repeated events eroding resilience over time, reducing the capacity of systems to recover and increasing vulnerability to future shocks. Importantly, climate impacts in the Pacific extend beyond physical and economic losses, threatening cultural heritage, traditional knowledge systems, customary practices, place-based identities, and spiritual connections to land and ocean. As a result, climate risks can undermine the social and cultural foundations of Pacific communities, with consequences that are often irreversible and not readily captured through conventional risk assessments.

The impacts of climate are also complex, cascading and evolving across the Pacific. For example, risks result in disruptions to essential services, reduced economic productivity, and increased recovery, and direct impacts on health, food security, and access to water and sanitation. These dynamics are particularly evident in atoll systems and rapidly urbanising areas.

Infrastructure systems are central to this challenge and to the solution. Infrastructure systems underpin economic activity and service delivery, including support to disaster impacts and

recovery. The vulnerability of infrastructure systems creates a risk multiplier effect. The financial, technical, institutional, geographic and logistical constraints reduce the capacity to respond.

Previous approaches are not able to meet these demands. Transformational approaches are required.

Transformational programmatic approach: The approach is based on commitment and adaptability. The programmatic approach increases predictability, fosters trust and enables for long-term planning, increasing national commitment to the programme and its component. The programmatic approach recognizes that climate transition takes time in the Pacific, that there is a need for progressive improvement and strategic incentives. It allows for long-term measures that address long-term and embedded issues. By replacing the project-by-project with long-term technical assistance for adaptive capacity, the programme removes fragmentation and competitiveness that can occur in the baseline, thereby shifting energy and decision-making to countries and local communities. This shift embeds inclusive governance, ensuring women, youth, persons with disabilities and other under-represented groups are part of long-term planning and monitoring. Finally, the long-term approach, by recognizing that truly adaptive responses take time, provides an opportunity for all partners to be fully committed.

Sustainability and institutional transformation: The programme demonstrates a high likelihood of sustainability by strengthening institutional capacity at both regional and national levels. By supporting enduring delivery platforms and capabilities, the programme ensures that benefits extend beyond the lifespan of individual investments. The focus on institutional strengthening and systems development provides confidence that climate action initiated under the programme can be sustained and expanded over time, even after initial GCF support concludes.

Rather than relying on temporary project implementation units or external technical assistance, the programme embeds climate finance functions within existing regional organisations and national institutions. This institutionalization is expected to reduce long-term reliance on external actors and increase country ownership over climate investment processes. Institutionalisation will also embed GESI mandates, ensuring equity and inclusion are sustained beyond donor cycles.

Further, RPACA is designed to support transformation from single issue or sector specific activities to strategic adaptation pathways. These, appropriately, include cross-cutting, integrated and inclusive system solutions.

Expanding adaptation partners to increase private sector participation: Currently the micro, medium and small-scale private sector plays only a small role in development, and almost no role in adaptation. RPACA is designed to initiate the transformation of Pacific societies to ones in which private sector contributes to advancing climate resilience. This is to be initiated via market and risk transformation. Blended finance approaches will be developed that enhance the attractiveness of investments by improving risk-return profiles and crowding in additional capital. Early-stage development and structuring risks will be absorbed, reducing the burden on individual countries and improving overall investment viability. Over time, these mechanisms are expected to reduce perceived investment risk in Pacific climate adaptation projects, lower transaction costs, and establish more favourable conditions. Specific measures will target women-led MSMEs and socially excluded entrepreneurs, ensuring private sector transformation is inclusive. This represents a meaningful shift in market dynamics consistent with the GCF's paradigm shift objectives.

Alignment and country driven: The programme is Pacific-led and has been designed collaboratively by participating countries, ensuring that priorities reflect regional needs, strengths and opportunities, rather than external agendas. Country-driven design will also ensure that national GESI priorities are embedded, preventing exclusion by external agendas

Technology alignment: RPACA is designed to support transformation, where appropriate, to (i) nature-based solutions, and/or (ii) community-led solutions; and/or (iii) solutions finely targeting the most vulnerable. These are all currently neglected approach across the Pacific. Technology alignment will prioritise solutions that dismantle barriers for women, youth, persons with disabilities and SOGIESC groups, ensuring they benefit equitably from innovation.

Scaling: The programme exhibits a high potential for scale, not through individual project size, but through a structure that enables rapid replication and expansion across multiple Pacific Island Countries. Regional aggregation allows small and medium-scale national investments to be bundled into bankable portfolios, addressing a key constraint in Pacific markets related to limited economies of scale. This design allows successful interventions to be extended to additional countries and sectors with marginal incremental costs. Scaling will also ensure inclusive models are replicated, embedding GESI principles across countries and sectors

The programmatic approach also enables scalability across future funding cycles by creating an investment pipeline that can leverage additional resources from the Green Climate Fund, other multilateral institutions, bilateral partners, and private capital. As such, the programme is expected to support a sustained increase in the volume and efficiency of climate finance mobilised in the region over time.

The transformational regional approach: This is designed to generate economies of scale. It is also designed to share capacities (expertise, data) and inputs (contractors, goods) thereby lowering costs and increasing efficiencies. It is further designed to generate and manage knowledge across the region. Regional knowledge sharing will include gender-responsive data and inclusive practices, ensuring lessons benefit all groups equitably.

8.4.1 Overall Transformational Impact

Overall, the programme is assessed to have high transformational impact due to its system-level focus, potential for replication and scale, institutional strengthening effects, and strong alignment with national and regional development pathways. By transforming the operating environment for climate finance rather than delivering isolated outcomes, the programme is well positioned to generate lasting climate resilience and development benefits consistent with the Green Climate Fund's mandate. Its transformational impact will be measured not only in resilience outcomes but also in dismantling structural barriers to equity and inclusion.

8.5 RPACA's Programmatic Approach to Securing Transformation

Climate risks in Pacific Island Countries are systemic, operating across interconnected sectors such as transport, water, energy, and coastal systems, and cannot be effectively addressed through isolated, project-level interventions. RPACA therefore establishes a unified framework that links system-scale climate risk assessment, integrated planning, and coordinated financing mechanisms to ensure that investments are grounded in a common understanding of risk and aligned with national and regional priorities. The programmatic approach enables countries to move beyond incremental adaptation toward a coherent transformation of how infrastructure systems are planned, financed, and managed under changing climate conditions.

The programme is operationalized through the integration of Component 1 and Component 2. Component 1 establishes the enabling environment; Component 2 implementing a pipeline of climate-resilient infrastructure across sectors.

The programme approach has several aspects. First, is the connective tissue that is woven across all activities. This includes the system-scale climate risk assessments that link hazards to sectors and to investments. This includes the use of the typology-based framework to guide interventions (atoll / volcanic / large island systems). Also is the upstream integration into policy and planning systems and the similar embedding of risk into fiscal systems and investment pipelines. Then there is the cross-sector network – linking transport–water–energy–coastal systems and the use of regional pooling of knowledge, finance and expertise. And then GESI aims are woven through the entire implementation framework.

A second aspect is the direct linkages between components 1 and 2. Through this, Component 1 creates the system that makes Component 2 possible, scalable, and climate-justified, see Table below.

Table 13: Showing Linkages between Component 1 and Component 2

Component 1 (Enabling System)	→	Component 2 (Investments)
PFM + climate finance access	→	Funds climate-resilient infrastructure
Risk analytics (CRAs)	→	Identify and design investment priorities
Pipeline development	→	Generates eligible investments
Financial instruments (blended finance, PAC-INFRAT)	→	De-risk and finance investments
Institutional capacity	→	Enables implementation and O&M

CRA= climate Risk Assessments, PAC-INFRAT= Pacific Infrastructure Risk Advisory and Transfer Support Service, O&M= operation and maintenance.

Source: Asian Development Bank.

A third aspect is the clear added values of the programme approach. This changes how investments are conceived, financed, and governed, through multiple layers. At the systemic level, this ensures a move from fragmented projects to integrated systems change, and so embedding climate risk into fiscal systems, sector planning and infrastructure design. At the economic and operational level, this reduces transaction costs, enables standardization (e.g. criteria, templates, typologies) and leverages economies of scale and regional platforms. At the financial level, this mobilizes new instruments and blended finance. It also links public finance and private sector investments. Next, at the institutional level, the programme approach allows the building of permanent capacity and the establishment of regional coordination and knowledge systems. Finally, in terms of equity, the programme approach facilitates the embedding of GEDSI in finance and infrastructure systems and tends to force equitable participation and benefit tracking.

Within this framework, individual investments—such as climate-resilient road networks in Papua New Guinea or airport infrastructure in Cook Islands—are connected not by geography but by their shared function within critical regional connectivity systems and their grounding in a common analytical and financing architecture. Both types of investments address single points of failure within national and regional transport systems and are prioritized through the same typology-based approach, system-scale risk assessments, and programme-wide investment criteria. The added value of the programmatic approach lies in this ability to treat infrastructure as part of an integrated resilience system: strengthening the reliability of connectivity networks across diverse island contexts.

8.6 RPACA Eligibility and Design Criteria

The RPACA eligibility criteria provide a robust and transparent framework for developing, evaluating, and approving technical assistance and sub-projects under Component 1 and Component 2. The criteria enable RPACA to deliver a programme of technical assistance (component 1), design and pilot of infrastructure de-risking approaches (component 1), and national infrastructure and coastal resilience investment sub-projects (component 2), that align with GCF and DMC requirements and contribute to the Outputs and Outcomes of RPACA.

These criteria will be applied by the ADB RPACA Technical Working Group (TWG) (see Section 19 on Governance Arrangements) to assess sub-project proposals and recommend their approval for RPACA funding eligibility. To ensure an efficient and streamlined approval process, the TWG will review and endorse proposals at a strategic level, focusing on alignment with the RPACA eligibility and design criteria, without requiring detailed technical approval of individual activities. The scope of technical assistance and sub-projects will be discussed and agreed with the TWG at a high level, with detailed design, appraisal, and implementation undertaken by ADB in accordance with available regional assessments (e.g., PRFI mapping), established TA policies, procedures, and delegated authorities. The application of these criteria will drive a transformational change in national and ADB infrastructure and coastal resilience project development processes and delivery – as described further in the following sections. Project documentation will include evidence to demonstrate how each of the criteria are met.

8.6.1 GCF Investment Criteria

The starting point for determining eligibility is the GCF investment Criteria as presented in Table 14.

Table 14: GCF Investment Criteria and Coverage

GCF Investment Criteria	Coverage Areas
Impact Potential	• Mitigation impact • Adaptation impact
Paradigm Shift Potential	• Potential for scaling-up and replication and its overall contribution to global low-carbon development pathways, consistent with a temperature increase of less than 2 °C • Potential for knowledge and learning • Contribution to the creation of an enabling environment • Contribution to the regulatory framework and policies • Overall contribution to climate-resilient development pathways consistent with a country's climate change adaptation strategies and plans
Sustainable Development Potential	• Environmental co-benefits • Social co-benefits • Economic co-benefits • Gender-sensitive development impact
Needs of the Recipient	• Vulnerability of the country • Vulnerable groups and gender aspects • Economic and social development level of the country and the affected population • Absence of alternative sources of financing • Need for strengthening institutions and implementation capacity
Country Ownership	• Existence of a national climate strategy • Coherence with existing policies • Capacity of implementing entities, intermediaries or executing entities to deliver • Engagement with civil society organizations and other relevant stakeholders
Efficiency and Effectiveness	• Cost-effectiveness and efficiency regarding financial and non-financial aspects • Amount of co-financing • Programme/project financial viability and other financial indicators • Industry best practices

Source: Asian Development Bank.

The GCF thematic brief for climate resilient infrastructure also provides guidance for GCF investments in infrastructure (Table 15). In line with this guidance, RPACA prioritises sub-projects that demonstrate system-level impact and long-term adaptation outcomes. Projects that are limited to asset-level climate proofing, without broader system benefits or scalability will not be eligible.

Table 15: GCF Investment Criteria and their Interpretation for RPACA

Core Principle	Purpose	Key Contribution to Resilience
Infrastructure systems approach	Assess interdependencies across sectors	Reduces cascading failures and strengthens community resilience
Climate risk assessments	Use current and future climate data	Improves planning and investment prioritisation
Mitigation and adaptation integration	Deliver cross-cutting climate solutions	Reduces emissions while increasing resilience
Nature-based solutions	Leverage ecosystems and ecosystem services	Provides cost-effective, multi-benefit protection –reduction in hard infrastructure where possible
Hydrological and geological studies	Ensure technical and environmental sustainability	Avoids maladaptation and reduces long-term risks
Local institutional capacity	Promote country ownership and execution	Ensures durable, locally led outcomes

Source: Asian Development Bank.

8.6.2 RPACA Eligibility Criteria

To ensure coherence with RPACA's strategic goals, climate outcomes, and financing modalities, technical assistance and investment sub-projects must also meet a clearly defined set of RPACA bespoke eligibility criteria (Table 16). These criteria were developed through stakeholder consultations and the feasibility studies. They are designed to ensure that selected sub-projects:

- Are capable of delivering measurable, scalable climate outcomes;
- Are technically and institutionally feasible;
- Are strategically aligned with national and regional climate objectives;
- Are gender-inclusive and responsive to identified vulnerable groups;
- Catalyze innovation in climate adaptation;
- Enable transformational planning and system-wide resilience; and,
- Strengthen regional knowledge systems and coalitions for replication and upscaling.

Table 16: RPACA Criteria and Requirements

RPACA Eligibility Criteria	Requirements
Programme	• Sub-project will be executed nationally by one of the 14 eligible PIC SIDS. • The value of the funding request is within the agreed (remaining) RPACA funding envelope / allocation for the Country. • The sub-project can be implemented within the RPACA programme timeline.
Scientific evidence base for adaptation is provided	• Sub-project aligns with one or more RPACA adaptation project type (as defined in the RPACA adaptation Typology above). • A system-scale climate risk assessment and vulnerability assessment has been undertaken. A system can be a sector, a community, an island). The assessment will identify context specific risks and vulnerabilities and identify interventions to reduce them (which will be the foundation for project design). To reduce the likelihood of maladaptation and the opportunity for cascading failures the assessment must (i) extend beyond the lifetime of the proposed project; (ii) evaluate robustness under multiple climate scenarios; and (iii) be grounded in quantitative evidence (e.g. modelling). The assessment must also identify differentiated vulnerabilities of women, youth, persons with disabilities, and other under-represented groups. • A climate risk assessment of any proposed assets has also been undertaken to inform the design, technology, and scale of the intervention to ensure is climate proof. (this can be linked to the system-scale CRVA) • Proposed sub-projects must be clearly distinct from business-as-usual development and demonstrate how the design has been adapted to address climate risks. • The sub-project delivers direct and measurable climate adaptation benefits and has outcome level indicators on adaptation/resilience in the DMF.
Enabling environment for resilience is strengthened	• Institutional regulatory and policy environment are evaluated, and weaknesses/gaps are addressed • O&M requirements are clearly defined, and infrastructure management capacity is strengthened where necessary. This specifically covers any additional O&M requirements resulting from possible climate impacts. • Institutional reforms, training and capacity development activities must integrate Gender Assessment and Action Plan commitments to gender equality and social inclusion. • Ensure representative governance, with women and other under-represented groups holding formal seats in project decision making structures.
TA-specific eligibility (applicable to component 1)	• Directly strengthens climate-responsive PFM, adaptation investment planning, climate finance mobilization, financial sector resilience, or adaptation financing mechanisms aligned with RPACA Outcomes 1.1–1.3. • Demonstrates clear demand and commitment from Ministries of Finance, financial sector regulators, or other mandated national authorities, licenced financial institutions and is embedded within national systems and priorities. • Sustainable systems and capacity development, with clear pathways to institutionalization, replication, and long-term use. • Additionality and gap-filling, including evidence that the activity addresses a recognized adaptive capacity barriers, constraint and challenges in the region.

	• Addresses a clearly identified constraint to increasing the quantity, quality, or effectiveness of adaptation investment, finance, or risk management. • Inclusiveness, regional learning, and partnership value, including GEDSI considerations, knowledge sharing, and potential regional benefits. • Complementarity with existing and planned support, inclusiveness, and regional value – avoids duplication with existing initiatives, promotes coordination and knowledge sharing, incorporates.
The project is transformational	• Demonstrated potential for upscaling, replication, and policy integration to support long term adaptation potential beyond the project boundary.
Co-benefits are demonstrated	• Environmental, social and economic co-benefits are identified. • Social co benefits must be gender sensitive and inclusive, ensuring equitable access to services and livelihoods.
GEDSI considerations are incorporated into design	• Gender and social analysis have been undertaken. • Vulnerable groups are identified and the project actively reduces their vulnerabilities. • The project clearly supports improved access to infrastructure and services for all through gender-responsive and universal design standards. • Gender analysis and Gender Action Plans prepared.
Nature based solutions are implemented	• The relevant sub-project(s) under component 2 incorporates nature-based solutions. If not, clear explanation why Nature based Solutions are not appropriate is required.
Environmental and social safeguards are provided to mitigate risks	• Safeguard categorization and compliance with ADB's Environmental and Social Policy. • Social risks are evaluated and risk mitigation measures are designed into the project and project administration manual and action plans. Including: grievance redress mechanisms, gender-based violence, sexual exploitation abuse and harassment, and inclusive stakeholder consultation processes. • Environmental risks are evaluated and risk mitigation measures are designed into the project and project administration manual and action plans.
Stakeholder engagement is demonstrated	• Stakeholder engagement with infrastructure operators during the design process is clearly demonstrated. • Stakeholder engagement with beneficiaries during the design process is clearly demonstrated. • Stakeholder engagement outcomes are incorporated into project design.
Country ownership is demonstrated	• The project is supported by the recipient government and NDA • The project aligns with national climate policies.
Additionality, efficiency, and affordability is demonstrated	• Number of direct and indirect beneficiaries has been estimated. • An economic and financial appraisal has been developed that can demonstrate (i) the economic rationale for intervention (e.g. avoided losses, resilience return on investment), (ii) affordability to beneficiaries, and (iii) cost efficiency.
Grant eligibility	Must meet one of the below: • Recipient country is an ADB Development Member Country within the ADF Grant, OCR Blend or ADF Blend lending category. AND • Clear rationale for the need for grant funding is provided and illustrated in the financial appraisal (for example, debt stress, investment in public good, project is a non-revenue-generating activity, high additional cost of adaptation and resilience). Must align to indicative country and sector floors and ceilings, as follows: • in order to promote an equitable regional distribution of GCF resources, each country may receive between 1.2% and 15% of GCF resources. The floors/ceilings are indicative and may be adjusted in order to optimally align with the other criteria in this Table. • No one sector can receive more than 34% of GCF resources. Flexibility will be maintained for other sectors to ensure RPACA is able to flexibly respond to emerging priorities and opportunities.
Appropriate monitoring and learning frameworks are provided	• Sub-projects must be aligned with the overall RPACA Theory of Change and incorporate the programme's results architecture into their respective design and monitoring frameworks. Specifically, contributions to the programme's GCF core adaptation indicators, enabling environment indicators, and programme-specific outcome and output indicators, as well as the co-benefit indicators. This ensures that data and lessons can be consolidated at the programme level for reporting to GCF.

	• All monitoring data must be sex- and age-disaggregated, enabling analysis of how different social groups are affected by or benefit from the intervention. Gender-sensitive and inclusive indicators should be incorporated into results monitoring. • MEL systems must enable real-time learning and course correction. Projects should have mechanisms in place to review progress, identify bottlenecks, and adapt strategies accordingly during implementation. • Projects must include dedicated activities for the documentation and dissemination of lessons learned success stories, challenges, and innovations. These learnings should be used to inform potential scaling, replication, and policy dialogue, in line with RPACA Theory of Change and ADB's knowledge-driven development mandate.
Additional considerations applicable to Activity 1.2.1.2 (Capitalize MSME adaptation guarantee windows)	
General Criteria	• Financial institutions in Host Countries of Independent State of Papua New Guinea, Independent State of Samoa, Solomon Islands, Kingdom of Tonga, and Republic of Vanuatu are eligible to participate in Activity 1.2.1.2. • Each participating financial institution can receive no more than \$2 million (two million US dollars) for the purposes of capitalizing MSME adaptation guarantee windows. • Such capital can only be committed after Activity 1.2.1.1 confirms demand and determines specific thresholds for each category listed in this table.
Eligibility of PFIs	• Participating financial institutions will be selected through a country-level due diligence process. • Eligible PFIs are expected to be licensed and prudentially regulated financial institutions with demonstrated financial soundness, sound governance, adequate operational capacity and experience in MSME lending.¹¹⁶ • Institutions should satisfy applicable integrity, environmental and social safeguard, and reporting requirements, and demonstrate their ability to originate, monitor and administer eligible adaptation lending portfolios in accordance with the Facility's operational requirements. This can be waived in well-justified cases, as outlined in ADB's policy on Sovereign Financially Intermediated Loans. • Final eligibility criteria and any country-specific financial thresholds will be established during detailed facility design and documented within each country window's operating manual.
Basic Underwriting Criteria	• Eligible adaptation investments are screened by PFI before any credit decision is taken. The PFI will confirm that the proposed loan satisfies the two-layer eligibility test: that the underlying investment qualifies under the Adaptation Investment Eligibility and Assessment Framework (outlined in Table 1 above), and that the loan meets the Portfolio Guarantee Eligibility Requirements outlined in this table at all times. • Credit appraisal, scoring and the final lending decision are then undertaken by the PFI in accordance with its own established credit policies, underwriting standards and risk appetite. The PFI lends from its own balance sheet and retains full responsibility for the credit decision. • The guarantee shares a portion of portfolio credit risk on eligible loans; it does not replace prudent lending standards, does not substitute for the PFI's credit judgement, and does not indemnify lenders against poor underwriting practices. Loans that are eligible but do not meet the PFI's credit criteria are not required to be made. • Risk sharing will be tailored to each eligible country's market, which will be determined through PFI due diligence, assessments including the level of market failure and maturity of MSME adaptation lending in the country, and legal reviews. The facility may adopt pari passu, first loss, or hybrid approaches, depending on assessment findings. Loss sharing structures, detachment points, and maximum facility liability will be calibrated to each country based on available loss-side evidence (non-performing loans stock).
Eligible Borrowers	MSMEs meeting programme definitions and the lending criteria of participating financial institutions. The respective country facility may establish additional requirements relating to enterprise size, business activity, operating history, or geographic focus areas to support programme objectives.

¹¹⁶ The eligibility criteria will follow the guidance provided in ADB's Sovereign Financially Intermediated Loan policy document.

Loan Size Limits	Minimum and maximum loan sizes may be established to ensure the facility targets underserved MSME market segments and achieves an appropriate balance between outreach, diversification and administrative efficiency.
Sector Requirements	The facility may establish sector eligibility or concentration parameters to promote alignment with country adaptation priorities, encourage diversification, and avoid excessive exposure to individual sectors or value chains.
Portfolio Concentration Limits	PFI, at their discretion, may limit exposure to individual borrowers, sectors, geographic areas or other risk categories to support prudent portfolio management and reduce concentration risk.
Guarantee Coverage Rules	The respective national facility will establish guarantee coverage percentages, portfolio caps, loss-sharing arrangements, claims procedures and recovery requirements to balance risk sharing between participating financial institutions and the facility while maintaining appropriate lending incentives.

ADB= Asian Development Bank, ADF= Asian Development Fund, CRVA= climate risk and vulnerability assessment, DMF= design and monitoring framework, GEDSI = gender equality disability and social inclusion, MEL= monitoring, evaluation and learning, NDA= national designated authority, PFM= public financial management, PIC= Pacific Island Countries, OCR= ordinary capital resources, O&M= operation and maintenance, SIDS= small island developing states.

Source: Asian Development Bank.

Through the eligibility criteria, the programme embeds climate risk management into core Public Financial Management System, adaptation investment planning, climate finance mobilization and investment planning processes, rather than treating adaptation as a standalone activity across the region. Through the application of these eligibility criteria, evaluation frameworks, and application processes, RPACA creates a replicable and up-scalable model for identifying and prioritizing adaptation investments.

9 Component 1: Enhancing Pacific Access to Climate Finance

This Section describes the development and implementation of proposed Component 1 which supports access to climate finance.

9.1 Approach

9.1.1 Motivation for Component 1

Component 1 establishes the enabling conditions required for RPACA to deliver transformative, sustained climate resilience across the Pacific. Its central objective is to equip Pacific Island Country MoFs and financial institutions with the capacity and resources to develop, finance, and implement pipelines of good-value adaptation investments, and to continue to sustain these activities over the long term. It does this through strategic, sequenced support across three mutually reinforcing areas: capacity building to address structural gaps in public financial management; technical assistance to support the quality and coherence of adaptation investments and financing strategies; and knowledge management to ensure that lessons generated across the programme are shared across the region. By strengthening the fiscal systems, investment pipelines, and institutional capabilities that underpin climate-resilient investment, Component 1 provides the foundations on which Components 2, 3, and 4 are designed, financed, and delivered.

Component 1 is motivated by a well-documented investment gap. Pacific Island Countries need to invest approximately 6.5-9.0% of GDP in adaptation annually (around US\$1 billion) to confront the rising effects of climate change – but current flows only reach approximately US\$220 million per year.¹¹⁷ This shortfall reflects persistent weaknesses in the institutional and fiscal systems through which projects are developed and finance is raised. An ADB-led, systematic review of adaptation planning finance by regional fiscal authorities (to be published in summer 2026) identifies three specific shortcomings behind the adaptation investment gap – all of which are, to varying extents across the region, made much more intractable by a fundamental lack of development of overarching PFM / PIM systems. The first specific shortcoming is that climate risk is not systematically integrated into fiscal planning: most Pacific governments lack the tools to identify, measure, and disclose their fiscal exposure to climate change, limiting the information available for investment planning and sequencing. Second, adaptation priorities do not translate into investable pipelines: most countries have NDCs and/or NAPs that identify adaptation priorities, but the capacity to appraise, cost, and sequence climate-resilient investments is limited, meaning priorities rarely translate into investment-ready project pipelines that can be submitted to the GCF or other financiers. Third, climate finance access remains donor-driven rather than country-led: Pacific governments rely heavily on grants and standard concessional loans, with financing strategies shaped by what external partners offer rather than what countries prioritise. Limited capacity to design, negotiate, or access a broader range of instruments (e.g., blended finance, green bonds, parametric instruments) means governments are poorly positioned to take ownership of their financing strategies or expand their options if grant flows tighten.

A review of the broader development partner landscape underscores the need for a coordinated, programmatic response. More than twenty institutions are engaged in climate-related PFM support across the region, but there is limited national coordination, sequencing, or shared regional demand. The PFM Regional Coordination Mechanism (PFM-RCM), convened by the Pacific Islands Forum Secretariat, provides the regional architecture through which Component 1's country-level support will connect to regional alignment, ensuring RPACA reinforces, rather than duplicates, existing efforts.

9.1.2 Structure of Component 1

Component 1 operationalises the priority actions identified under the Pacific Climate Finance Access and Mobilisation Strategy (CFAMS). It does so through three mutually supportive Outcomes.

Outcome 1.1 works through Ministries of Finance and national institutions. It builds the human capital, institutional conditions, and PFM systems and tools MoFs need to engage effectively with technical assistance and increase the quantity and quality of adaptation investment: , investing in

¹¹⁷ PIFS. 2022. *Agenda Item 6A: Climate Change Finance*, PIFS (22) FEMM.6a.

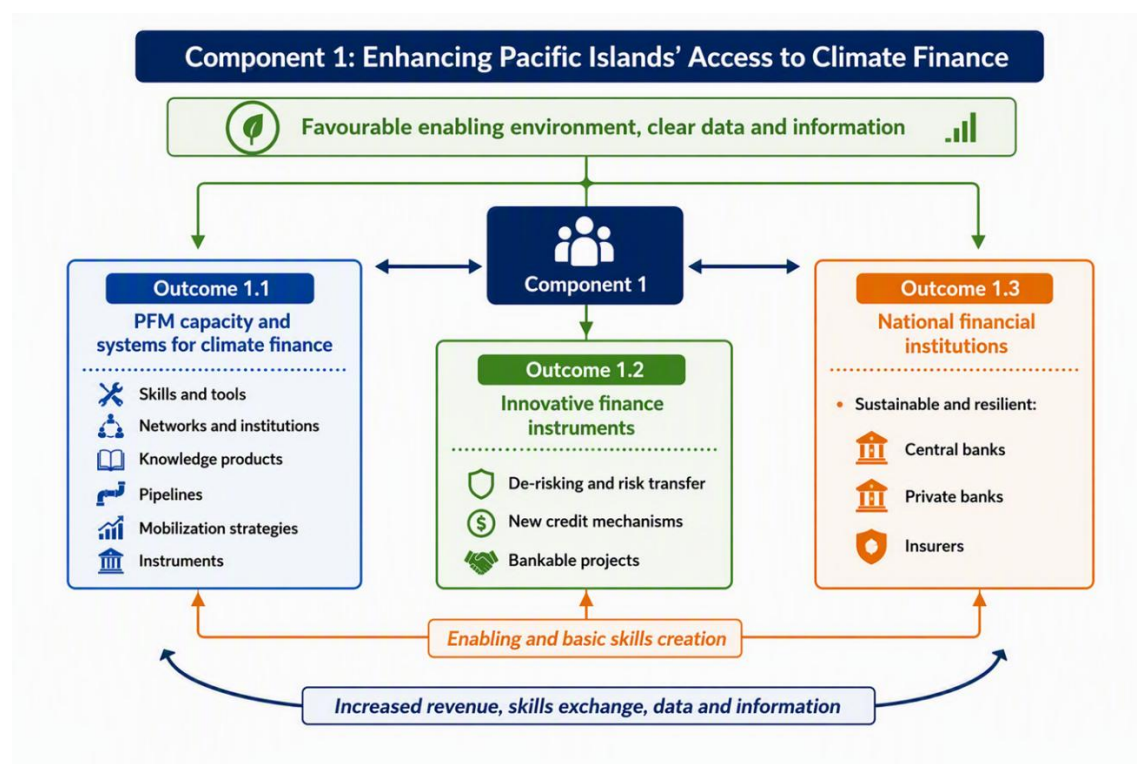
skills development and upskilling across Government staff, and integrating risk analytics into fiscal planning, developing a risk-sensitive adaptation pipeline integrating risk analytics into fiscal planning, strengthening the appraisal and prioritization of adaptation investments, and expanding countries' access to diversified climate finance instruments, mechanisms, and sources. It also strengthens peer learning networks, knowledge management systems, and regional coordination mechanisms needed to scale investment in adaptation. This upgrading of the public sector also enables future private sector development. Outcome 1.1 also strengthens peer learning networks, knowledge management systems, and regional coordination mechanisms needed to scale investment in adaptation.

Outcome 1.2 works through financial instruments and mechanisms. Through four sub-projects, it supports the development, piloting, and scaling of innovative financial instruments and mechanisms applicable across the region, targeting adaptation. As MSMEs are the backbone of the Pacific economies, this notably includes a blended finance platform for MSME adaptation lending. Outcome 1.2 further establishes the Pacific Infrastructure Risk Advisory and Transfer (PAC-INFRAT) advisory mechanism, and the feasibility and market testing of further instruments.

Outcome 1.3 works through national financial institutions. It strengthens national financial institutions, including central banks, financial regulators, commercial and development banks, insurance companies to integrate climate risk into supervision, regulation, and lending practices in a sustained way. It complements Outcome 1.1 with its ultimate focus to facilitate private investment. It strengthens national financial institutions, including central banks, financial regulators, commercial and development banks, insurance companies to integrate climate risk into supervision, regulation, and lending practices in a sustained way.

Together, these Outcomes address both the public sector systems through which governments plan and finance adaptation, and the broader financial system through which private capital can be mobilised at scale (Figure 6).

Figure 6: Outcomes under Component 1



PFM= public financial management.

Source: Asian Development Bank

9.1.3 Delivery Model

Outcome 1.1 will be delivered through country-level programmes defined across multiple years, with the scope and sequencing of support in each country defined, building on work existing detailed diagnostic work by the ADB. Where existing ADB technical assistance engagements are relevant, Component 1 will leverage these, ensuring better value for money and coherent alignment with ongoing country support. These will be supplemented by central coordination, led by the Pacific Fiscal Resilience Platform to ensure that common tools and lessons are identified and applied across the region.

Outcomes 1.2 and 1.3 are targeted at a smaller number of countries best positioned to benefit from innovative finance market development and financial sector strengthening respectively. Outcome 1.2 will be delivered through a phased market-building approach, addressing demand-side barriers through MSME capacity building and pipeline development, supply-side constraints through credit enhancement and refinancing facilities, and infrastructure investment risk through the PAC-INFRAT facility. Outcome 1.3 will combine regional framework development with country-level technical advisory services to support individual central banks and financial institutions to implement those frameworks within their own regulatory contexts.

9.1.4 Support to Ministries of Finance: Outcome 1.1

Outcome 1.1 are designed to address a specific and well-evidenced set of constraints within Pacific Ministries of Finance. The adaptation investment gap described above reflects gaps in two interconnected layers of PFM. The first is foundational: the core budget processes, expenditure management systems, fiduciary controls, and fiscal risk frameworks that underpin all government financial activity. The second is the climate PFM layer that depends on these foundations: the systems through which governments identify climate risks, plan and appraise adaptation investments, and build the financing strategies needed to attract and sequence capital. Outcome 1.1 constitutes RPACA's programmatic response to both layers, beginning with the foundational human capital and institutional conditions that must be in place before technical assistance can be leveraged, building up to specific PFM reforms needed to generate investable adaptation pipelines and diversified, country-led financing strategies.

9.1.5 Foundational Gaps in PFM Systems

Adaptation investment and climate integration challenges in the Pacific largely reflect weaknesses in core PFM systems themselves. Foundational PFM functions like audit capacity, procurement systems, and financial control frameworks determine to what extent countries can access and manage climate finance.¹¹⁸ Because these core functions comprise the basis for climate-informed PFM, if they are underdeveloped or constrained, investments in climate integration will be limited. For example, where budget allocation decisions are not routinely anchored in economic analysis, improved climate modelling will not feed into fiscal decisions.

PEFA assessments across Pacific Island Countries consistently report slow progress on core PFM reform, reflecting the small size and limited capacity of many administrations, variable political support for reform, and persistent vulnerability to natural disasters.¹¹⁹ Across the region, foundational functions like budget planning and preparation, expenditure tracking, fiscal risk management, audit, procurement, and financial controls remain underdeveloped in many countries, and the pace of reform has been slow relative to the scale of the challenge. PFM systems in Pacific Island Country contexts are often very different from the more comprehensive and well-resourced systems operating in larger, wealthier countries. Small ministerial staff and high staff turnover limit the potential for sustainable gains from standard capacity building approaches, and creative approaches to meeting capacity gaps are frequently required.¹²⁰ IMF PIMA diagnostics similarly find consistent deficiencies in project appraisal, investment selection, and asset management across the region, with coordination between

¹¹⁸ IMF.2021. [Unlocking Access to Climate Finance for Pacific Island Countries](#).

¹¹⁹ IMF. 2020. [Review of Public Financial Management Reform Strategy for Pacific Island Countries, 2010-2020](#).

¹²⁰ Public Expenditure and Financial Accountability (PEFA). 2013. [Pacific Islands: PFM Design under Capacity Constraints](#).

entities, maintenance of public infrastructure, and monitoring of public assets among the most persistent weaknesses.

9.1.6 Implications for Climate-Responsive PFM

These foundational constraints directly shape the extent to which climate PFM functions can take hold. A forthcoming review of climate-responsive PFM capacity across all 14 Pacific ADB developing member countries finds a region making uneven progress in its fiscal response to climate risk.¹²¹ The review assesses performance across three functions – climate-related fiscal risk assessment, climate risk management, and climate resource mobilisation – and finds that strengths in identifying climate-related risks and raising finance from public sources are offset by persistent gaps in translating risk information into fiscal decisions and investable project pipelines.

- **Climate fiscal risk assessment:** Most Pacific governments have taken steps to identify climate and disaster risks: eight countries identify climate-related fiscal risks, while two of these have MoF-owned, consolidated lists. However, risk identification is predominantly qualitative, and its connection to fiscal decision-making remains limited. Nine countries rely on external partners for macroeconomic modelling of climate impacts, and eleven for stress-testing. Where quantitative analysis exists, it tends to be project-level rather than system-wide, focused on physical impacts rather than fiscal consequences. Additionally, externally produced assessments do not build critical skills that are lacking across Pacific MoFs, and uptake of externally produced evidence remains low, as evidenced by the persistent disconnect between the volume of external diagnostics produced and their limited uptake in budget circulars, medium-term fiscal strategies, or investment appraisal processes. Most countries lack a formal mandate requiring climate risk analysis to be produced regularly, and coordination is spread across MoFs and line ministries.
- **Pipeline building:** The most consequential gap is in public investment management. Most countries have NDCs and NAPs that identify adaptation priorities, but the capacity to appraise, cost, and sequence climate-resilient investments is limited across almost all DMCs, meaning priorities rarely translate into investment-ready pipelines that the GCF or other financiers require. This cannot be separated from the broader PIM weaknesses identified above: where appraisal frameworks exist, they typically reflect donor requirements on specific projects rather than MoF-owned standards applied routinely. The lack of operational budget tagging frameworks (operational only in Fiji and Niue,) is a further barrier to tracking the efficacy of adaptation spending and reflecting this in future programmes.
- **Climate resource mobilization:** Pacific countries are broadly engaged with the international climate finance landscape, but the resulting portfolio, which is heavily weighted toward grants and standard concessional loans, reflects the instruments most accessible rather than a strategic assessment of country needs. Seven countries have climate financing strategies. Most MoFs are still building the capacity to engage strategically with the full range of available instruments (blended finance, parametric insurance, green bonds, national climate funds) that can aggregate revenues from multiple sources. and risk-layering strategies, where articulated, have generally not been operationalised in practice. Post-shock financing tends to be ad hoc rather than governed by pre-agreed frameworks, leaving national economies exposed to repeated climate shocks that erode development gains and drive debt vulnerability.

9.1.7 The Case for a Programmatic Response

The institutional landscape for climate and disaster-responsive PFM support in the Pacific is substantial but fragmented. An institutional mapping carried out under the Pacific Fiscal Resilience Initiative (PFRI) identifies more than 21 regional and international institutions providing funding and technical assistance across climate fiscal risk assessment, risk management, resource mobilization, and governance and capacity support (Table 17). Multilateral development banks provide policy-based loans, DRF instruments, and direct budget support. UN agencies focus on climate finance

¹²¹ Scores reflect assessed capability against good practice defined for the Pacific context, not global best practice benchmarks, meaning the gaps identified are gaps against what is realistic and appropriate for small island administrations, not against standards designed for larger, more resourced systems.

readiness, budget tagging, and readiness programming. Bilateral donors fund regional coordination through mechanisms including PFTAC, PRIF, and Gov4Res. CROP agencies provide sectoral technical inputs on data, disaster preparedness, and environmental policy. Climate funds and capacity development programs provide embedded advisers, audit support, and training.

Table 17: PFRI Institutional Mapping of Climate Responsive PFM Support to Pacific Island Countries

Institution	Climate Fiscal Risk Assessment	Climate Fiscal Risk Management	Climate Finance Mobilization	Governance & Capacity Resources
SPREP	• Collate climate hazards data • Pacific Climate Change Centre data management • Regional climate projections • Pacific Ecosystem-based Adaptation to Climate Change	• Climate change mainstreaming guidance • National climate information systems	• NAP project readiness • National programme development • GCF accreditation support • Pacific Climate Finance Readiness Programme • Access to multilateral climate finance (grants) • Pacific Climate Change Centre training	• Pacific Climate Change Centre • Regional training programmes • Knowledge management platform • Climate finance training modules that integrate gender-responsive budgeting and equity tagging, ensuring Ministries of Finance can track climate expenditure impacts on women, youth, persons with disabilities and socially excluded groups.
SPC	• Pacific Data Hub - climate & socioeconomic data • Disaster risk assessments • Vulnerability assessments that include sex-, age- and disability-disaggregated data to make differentiated risks visible in fiscal planning. • Integrated Risk Governance Programme	• Disaster preparedness systems • Early warning systems • Climate information services	• Regional readiness programming • Regional programme development • Pacific Resilience Partnership coordination • Access to multilateral climate finance • Pacific Community Centre for Renewable Energy and Energy Efficiency	• Applied Geoscience and Technology Division • Statistics for Development Division • Regional technical assistance • Data management capacity
PIFS	• Regional coordination of fiscal data • Climate-responsive PFM database • Stakeholder mapping	• Pacific Fiscal Resilience Initiative • Regional PFM Technical Working Group • Regional PFM coordination mechanisms • Climate-responsive budget frameworks • Regional fiscal reporting standards	• Regional advocacy for climate finance • Coordination with development partners • Regional finance mechanisms and advocacy, including establishment of Pacific Resilience Facility and Treaty	• Regional policy coordination • Forum Economic Officials Meeting • Technical working groups • Regional strategic frameworks such as CFAMS that imbed GEDSI indicators, ensuring equity outcomes are tracked alongside fiscal resilience.

Institution	Climate Fiscal Risk Assessment	Climate Fiscal Risk Management	Climate Finance Mobilization	Governance & Capacity Resources
IMF/PFTAC	• Climate risk in Article IV Consultations • Macroeconomic climate impact analysis • Debt sustainability analysis with climate • Pacific Financial Technical Assistance Centre assessments	• Climate PEFA • Climate PIMA • Climate Macro-Assessment Programme • Embedded PFM advisors • Climate-responsive budgeting TA • Fiscal frameworks with climate • Medium-term expenditure frameworks	• Fiscal space analysis for climate • Climate fiscal policy advice • Contingent liability management	• Technical assistance programme • PFM capacity building • Regional training workshops • Policy advisory services that include modules on gender-responsive fiscal analysis and equity-focused monitoring, so Ministries of Finance can integrate GEDSI into fiscal reforms.
World Bank	• Climate and Disaster Risk Assessments • Country Climate and Development Reports • Macro-fiscal climate modeling • Pacific Catastrophe Risk Assessment	• Disaster Risk Finance & Insurance • Pacific Catastrophe Risk Assessment & Financing Initiative • Climate-responsive PFM support • Contingency financing mechanisms • Pacific Resilience Programme	• International Development Association climate finance • Climate Investment Funds • Green bonds and innovative finance • Pacific Islands Regional Oceanscape Programme • Blended finance mechanisms • Mobilisation support that targets women-led MSMEs and community-based organisations, dismantling barriers to accessing adaptation finance.	• Pacific Observatory • Knowledge products • Technical assistance • Regional dialogue platforms
ADB	• Climate risk screening tools • Country Partnership Strategies with climate • Pacific Climate Change & Disaster Risk Finance Assessment • Pacific Economic Outlook	• Pacific Disaster Resilience Programme • Climate budget tagging systems • PFM reform and DRF TA • Climate-responsive investment planning • Climate budget tagging explicitly tracks allocations to vulnerable groups, embedding equity in fiscal resilience.	• Asian Development Fund climate allocation • Climate finance tracking • Private sector climate finance • Pacific Private Sector Development Initiative • Grant financing for adaptation, P-PREPARE	• Pacific Liaison and Coordination Office • TA programs • Regional cooperation • Pacific Department technical support

Institution	Climate Fiscal Risk Assessment	Climate Fiscal Risk Management	Climate Finance Mobilization	Governance & Capacity Resources
UNDP	• Climate risk information systems • Vulnerability assessments • Integrated National Financing Frameworks • SDG integration with climate	• Climate change mainstreaming • Climate expenditure tracking • Climate public expenditure & institutional reviews • Integrated planning frameworks	• GCF Readiness Programme • NAP Global Network • NDC Partnership support • Climate Promise Initiative • Climate finance readiness • Project concept development • Access to vertical funds	• Pacific Office coordination • Capacity development programs • South-South cooperation • Knowledge sharing platforms
UNEP	• Climate adaptation assessments • Ecosystem-based risk assessments • UNEP FI climate risk tools • Emissions Gap Reports	• National adaptation planning support • Ecosystem-based adaptation frameworks	• Adaptation Fund (as implementing entity) • GCF accreditation support • GEF projects • Ecosystem-based adaptation finance • Private sector engagement	• Climate Technology Centre & Network • Regional Seas Programme • Environmental law and governance • UNEP-FI Pacific engagement
UNESCAP	• Climate economic modeling • Regional economic outlooks with climate • Infrastructure risk assessments • Transport and energy sector analysis	• Climate-responsive planning frameworks • SDG financing strategies • Infrastructure resilience planning	• Financing for Development frameworks • Regional cooperation mechanisms • Infrastructure financing analysis • PPP frameworks for climate infrastructure	• Pacific Operations Centre (Suva) • Regional advisory services • SDG monitoring • Statistical capacity building
CFAN / CCFAH	• National climate finance needs assessments • Climate finance landscape mapping	• Climate finance tracking systems • Budget integration support	• National climate finance advisors (embedded in Environment Ministries) • Project concept development • Access to bilateral & multilateral finance • Readiness support • Proposal development	• In-country advisory services • Direct technical support • Capacity building for government staff
PRF	• Community-level risk assessments • Localized climate vulnerability data	• Sub-national fiscal mechanisms • Community resilience planning	• Sub-national & community finance • Blended finance mechanisms • Risk mitigation instruments • Community-level grants & loans • Local adaptation finance	• Community capacity building • Local governance support • Knowledge exchange networks

Institution	Climate Fiscal Risk Assessment	Climate Fiscal Risk Management	Climate Finance Mobilization	Governance & Capacity Resources
ADFIP	• Climate risk assessment for lending • Portfolio climate exposure analysis	• Climate-responsive lending frameworks • De-risking mechanisms	• National Development Banks coordination • Financial flows (loans & guarantees) • Private sector climate finance • MSME green financing • Regional DFI collaboration	• Regional DFI network • Knowledge sharing • Standards harmonization • Peer learning platforms
GGGI	• Green growth diagnostics • Sectoral climate vulnerability assessments	• Green fiscal policy support • Climate-responsive planning	• Climate Finance Advisors placement • Fiscal resilience capabilities building • Green growth investment planning • NDC implementation support • Bankable project development	• In-country technical support • Capacity development • Green growth knowledge products
GCF	• Climate rationale assessments • Investment frameworks • Climate risk vulnerability assessments (NAPs)	• Country programming support • Readiness Strategic Planning assessments • Embedded Liaison Officers	• Direct access facility (accredited entities) • Project / programme funding (grants, loans, guarantees) • Simplified Approval Process for SIDS / LDCs • Readiness & Preparatory Support Programme / Project Preparation Facility • Private Sector Facility • Co-financing mobilisation	• Accreditation support • Regional Dialogues • Knowledge management • South-South / Peer-Peer learning • Institutional Strengthening for NDAs and DAEs • Embedded Liaison Officers in Government / NDA Offices
Adaptation Fund	• Climate risk screening • Adaptation project assessments	• National implementing entity frameworks • Enhanced Direct Access	• Direct access modality • Enhanced Direct Access pilot • Small-scale adaptation projects • Readiness grants • Innovation grants • Country Allocation full project grants	• Accreditation process support • Learning grants • Technical support • NIE peer-peer learning and support
UNCDF	• Local fiscal gap analysis • Sub-national climate finance flows mapping	• Local climate fiscal frameworks • Municipal finance systems	• Pacific Island Climate Adaptation Programme • Local climate finance mechanisms • PPPs for climate action • Local government climate investments • Performance-based grants	• Local government capacity • Municipal finance training • Local economic development

Institution	Climate Fiscal Risk Assessment	Climate Fiscal Risk Management	Climate Finance Mobilization	Governance & Capacity Resources
UN Women	• Gender-responsive climate risk assessment • Women's vulnerability analysis	• Gender-responsive budgeting • Women's economic empowerment in climate action	• Gender-responsive climate finance • Women's access to climate funds • Gender-climate project development	• Gender mainstreaming training • Women's leadership in climate • Regional gender networks
FAO	• Agriculture climate vulnerability • Food security risk assessments • Fisheries climate impacts	• Climate-smart agriculture planning • Blue economy frameworks	• Climate-smart agriculture finance • Fisheries adaptation funding • Rural livelihood resilience projects	• Pacific Multi-Country Office • Technical assistance • Farmer field schools • Knowledge products
WFP	• Food security climate scenarios • Emergency preparedness assessments • Shock-responsive analysis	• Shock-responsive social protection • Early warning-early action systems • Forecast-based financing	• Social protection climate finance • Disaster risk reduction funding • Anticipatory action financing	• Pacific regional coordination • Emergency preparedness • Cash-based transfers capacity
UN-Habitat	• Urban climate vulnerability assessments • Informal settlement risk mapping	• Climate-responsive urban planning • Municipal climate budgeting	• Urban climate finance mechanisms • Municipal green bonds • Slum upgrading climate finance	• City resilience networks • Urban planning capacity • Local government support
USP	• Climate research & analysis • Pacific data collection	• Climate policy frameworks • Regional coordination research	• Climate finance policy research	• Centre for Sustainable Futures climate degree programs • Potential climate PFM certificate • Regional capacity building hub • Research and policy analysis
PCCC	• Climate data management • Regional climate information	• Training needs assessments • Climate mainstreaming curriculum	• Climate finance training materials	• Regional training facility • Climate finance & PFM training • Technical workshops • Certification programmes
CIF			• Investment Plans • Access to finance instruments - concessional loans, grants	
GEF			• Access to grant based financed • Country Programming • Project Development	• CBIT training /capacity building programme on MRVI

ADB= Asian Development Bank, ADFIP= Association of Development Financing Institutions in the Pacific, CBIT= Capacity-building Initiative for Transparency, CCFAH= Commonwealth Climate Finance Access Hub, CFAMS=

Pacific Climate Finance Access and Mobilisation Strategy, CFAN= Climate Finance Access Network, CIF= Climate Investment Funds, DAE= Direct Access Entity, DFI= development finance institution, FAO= Food and Agriculture Organisation, GCF= Green Climate Fund, GEDSI= gender equality disability and social inclusion, GEF= Global Environment Facility, GGGI= Global Green Growth Institute, IMF= International Monetary Fund, LDC= least developed countries, MRVI= Measurement, Reporting, Verification and Inventory, MSME= micro small medium enterprise, NAP= National Adaptation Plan, NDC= Nationally Determined Contribution, NIE= National Implementing Entity, PCCC= Pacific Climate Change Centre, PCRAFI= Pacific Catastrophe Risk Assessment and Financing Initiative, PEFA= Public Expenditure and Financial Accountability, PFM= public financial management PIFS= Pacific Islands Forum Secretariat, PIMA= Climate Public Investment Management Assessment, PFTAC= Pacific Financial Technical Assistance Centre, PFM= public financial management, P-PREPARE= Pacific Pre-Arranged Resources for Enhancing Preparedness and Resilience Trust Fund, PRF Pacific Resilience Facility=, SPC= Pacific Community, SDG= Sustainable Development Goals, SIDS= small island developing states, SPREP= Secretariat of the Pacific Regional Environment Programme, TA= technical assistance, UNCDF= United Nations Capital Development Fund, UNDP= United Nations Development Programme, UNEP= United Nations Environment Programme, UNEP FI= United Nations Environment Programme Finance Initiative, UNESCAP= United Nations Economic and Social Commission for Asia and the Pacific, WFP= World Food Programme,

Despite the breadth of this engagement, there is significant overlap in mandates across providers, limited coordination, and no single institution is mandated to coordinate across the landscape. Consultations led by the ADB Pacific Fiscal Risk Initiative confirm that Pacific MoFs engage with multiple partners on similar topics with limited synthesis, sequencing, or shared demand register. Fragmentation also has equity consequences: inconsistent integration of gender-responsive budgeting and equity tagging leaves vulnerable groups invisible in fiscal resilience planning. The PFM-RCM, convened by PIFS and PFTAC and linked to Finance and Economic Ministers processes, provides the regional governance architecture to anchor coordination across this landscape, but has not yet been fully leveraged. The result of this fragmented support is PFM which continues to be reactive and donor led.

In this context, what is required is a programmatic approach that addresses fundamental institutional binding constraints, spans the full range of MoF functions, is calibrated to specific country needs, builds on existing engagement, and is sustained over a timeframe sufficient for institutional change to take hold. RPACA addresses this directly, and goes beyond existing support in one further respect: by systematically embedding GEDSI across all functions, ensuring vulnerability assessments use disaggregated data, fiscal risk management incorporates gender-responsive budgeting, finance mobilization targets women-led MSMEs and community organisations, and MoF staff are trained in equity-focused fiscal analysis. Many existing risk assessments and fiscal frameworks remain gender-neutral in design, overlooking differentiated vulnerabilities, and budget tagging and expenditure tracking often fail to capture impacts on women, youth, persons with disabilities, and socially excluded groups. RPACA fills this gap directly. Outcome 1.1 constitutes a sequenced programme of support, including foundational human capital and institutional conditions, and building to specific PFM reforms (anchored under the PFM-RCM and aligned with CFAMS priorities). Where platforms and programmes already exist and are fit for purpose, RPACA will align with rather than duplicate them, including PFTAC's core PFM capacity development, ADB's PIM reform and DRF diagnostic work, and readiness programs supported by UNDP and the EU. What RPACA adds is the sustained, cross-functional, and country-calibrated engagement that existing support has not yet provided.

9.2 Outcome 1.1. Climate- and Disaster-Responsive PFM Capacity of Pacific Island Countries' Ministries of Finance and National Institutions Strengthened

9.2.1 Background and Problem Analysis

As set out in detail above, Pacific Ministries of Finance face persistent capacity gaps that preclude them from supporting investment in adaptation. High staff turnover, a chronic skills deficit, underdeveloped underlying PFM systems, and the failure of short-term engagement models to build durable in-house expertise have left most MoFs reliant on external partners for functions that could be domestically driven. Without investment in foundational skills and institutional capacity, supported by regional peer learning, the development of technical PFM functions and capabilities cannot take hold, meaning the adaptation investment gap will likely persist regardless of the financing available.

Beyond resource limitations, three key PFM constraints explain why available climate finance is not reaching Pacific governments at the scale required: climate risk is not integrated into fiscal planning; adaptation priorities do not translate into investable pipelines; and financing strategies remain donor-driven rather than country-led. These constraints cannot be addressed through individual diagnostics or discrete training programs: they require sustained, cross-functional technical assistance calibrated to where each country sits in its reform progression (which this Outcome is designed to provide).

9.2.2 Outcome Description

Outcome 1.1 addresses this by tackling the fundamental shortages in human capital and institutional conditions that must be in place before the technical assistance delivered under this Outcome (and across the broader programme of support) can be effectively absorbed and applied. It does this through sustained, accredited investment in three mutually reinforcing areas: long-term skills development embedded in Pacific institutions (rather than delivered by time-limited external advisers); peer learning networks and knowledge management systems that build regional institutional memory; and regional coordination mechanisms needed to ensure that capacity development is sequenced against shared demand rather than fragmented across partners.

Regional cooperation is central to this model. Pacific countries have demonstrated that acting collectively can generate the credibility, pooling of expertise, and bargaining power that no individual country could achieve alone. RPACA builds on this, using regional approaches to achieve efficiencies in skills development and knowledge management that would be unattainable at the individual country level. Delivery is differentiated by country context: larger countries host in-country programs, while smaller PICs are served through modular, online, or secondment-based arrangements. The regional coordination infrastructure established under Output 1.1.2 (governance mechanisms, peer learning networks, and a Pacific Regional Community of Practice) is designed to translate this collective potential into sustained, country-led capacity over time.

A network of regional and national institutions provides the delivery infrastructure through which this Outcome will be implemented. At the regional level, the University of the South Pacific's Centre for Sustainable Futures¹²² offers an anchor point for integrating climate and disaster-responsive PFM and investment planning into accredited postgraduate offerings, with the reach and credibility to serve smaller PICs that cannot sustain in-country programs. In Papua New Guinea, the Somare Institute of Leadership and Governance (SILAG), the University of PNG, the University of Natural Resources and Environment, and the Department of Higher Education, Research Science and Technology together provide a national delivery and accreditation infrastructure that RPACA, in partnership with SOAS, will support to co-design a module-based postgraduate programme. Across the region, delivery models will be differentiated by country context: larger countries will host in-country programs, while smaller PICs will be served through modular, online, block-delivery, or secondment-based arrangements, with targeted outreach to ensure equitable access for women and underrepresented groups. This multi-tiered approach combining technical and vocational education and training (TVET) upskilling for mid-career civil servants, professional certification, and postgraduate scholarships for new cohorts, is designed to address both the immediate skills deficit and the longer-term retention challenge.

The approach is calibrated to country context on the basis of existing diagnostic work led by the ADB and the capacity needs assessments conducted under Activity 1.1.1.1, which will also establish the baseline for a key outcome-level indicator: the percentage of MoF staff in participating PICs applying climate- and disaster-responsive PFM skills in their official duties, with a target of at least 50% by end of Year 10, of whom at least 50% are women. Countries at earlier stages of core PFM development will receive support oriented toward foundational capabilities; countries with more developed systems can engage on more advanced climate PFM functions. GEDSI is embedded throughout: capacity building strategies prioritise women, persons with disabilities, and underrepresented Pacific communities; curricula integrate gender-responsive fiscal analysis and equity-focused monitoring; and peer learning networks curate and share inclusive fiscal practices across the region.

¹²² University of the South Pacific (USP). [Centre for Sustainable Futures](#).

In addition to skills enhancement, this Outcome also provides regional technical assistance through development of common tools and frameworks at the regional level, which are deployed and tailored at country level, working through ADB's existing operational relationships with MoFs and GCF NDAs across the Pacific. It delivers three integrated but modular outputs corresponding directly to the three PFRI diagnostic functions: fiscal risk analytics embedded in government planning systems (Output 1.1.3); programmatic pipelines of adaptation investment (Output 1.1.4); and expanded access to diversified climate finance instruments (Output 1.1.5).

This support operates programmatically rather than project-by-project. Country-level programs are sequenced against the PFRI diagnostic findings, ensuring that near-term priorities reflect each country's starting point rather than a uniform regional template. Regional efficiencies (in the form of shared methodologies, common frameworks, and coordinated partner engagement) are captured through the PFM-RCM governance architecture, while activities will achieve leverage wherever possible by being delivered in combination with existing ADB PFM TA programmes. GEDSI is embedded throughout: fiscal risk assessments include gender-disaggregated data and equity indicators; pipeline appraisal criteria prioritise investments that reduce vulnerabilities for women, youth, persons with disabilities, and marginalised communities; and financing instruments are designed with access safeguards for women-led MSMEs and community organisations.

Regional and international experience demonstrates that targeted PFM support of this kind can deliver results. In the Pacific, Tuvalu and Samoa show that fit-for-context approaches are achievable even under severe capacity constraints: Tuvalu institutionalized annual climate-fiscal risk disclosure through a ministerial mandate; Samoa developed a simplified MoF-owned model linking climate shocks to fiscal aggregates. Solomon Islands has embedded climate risk screening in its PIM guidelines and established a dedicated Climate Finance and Resilience Unit within the MoF. On resource mobilization, Fiji has expanded its financing toolkit through sovereign green and blue bonds, while Palau has established dedicated reserve mechanisms linked to climate and disaster shocks. Beyond the Pacific, Armenia mapped institutional gaps, established a Fiscal Risk Council, and began translating NAP commitments into sector-level investment pipelines (with ADB support); Rwanda has embedded climate budget tagging within existing PFM systems; and Indonesia's Green Sukuk programme demonstrated that sovereign green bond issuance is achievable in developing country contexts with the right MoF institutional framework in place. These examples inform both the design of the PFRP and the sequencing of country-level support under Outputs 1.1.3-1.1.5.

Progress under Outputs 1.1.3-1.1.5 will be tracked through three output-level indicators: the number of countries adopting risk analytics into planning (target: 10 by end of programme); bankable pipelines developed (target: 10); and innovative finance mechanisms designed (target: 5). Across all activities, the component should track not only training outputs, such as numbers of participants and qualifications attained, but also institutional outcomes. These include adoption of climate-responsive PFM tools and reforms, use of climate-related diagnostics to inform budget and investment decisions, and increased volume and share of climate and disaster-risk finance managed through country systems.

Outcome 1.1 support is structured in two tiers. Foundational support under Outputs 1.1.1-1.1.3 (capacity development, regional coordination, and climate-fiscal risk assessment tools) is offered to all 14 PICs. A smaller number of countries with a more established foundation for climate-responsive PFM (higher implementation readiness) would receive full support across Outputs 1.1.1-1.1.5, adding climate risk management and public investment planning (1.1.4) and climate resource mobilization (1.1.5) so that all three functions are strengthened together. Drawing on the RPACA core eligibility and design criteria (section 8), ongoing PFRI regional mapping of PFM practices, the preliminary candidates for this fuller package are Fiji, Samoa, Tuvalu, Solomon Islands, PNG and Palau, each of which has already developed MoF-led approaches to climate-responsive PFM. Final selection of countries will be confirmed at inception through a structured readiness assessment applying five criteria:

- an established, MoF-led basis for climate-responsive PFM across all three PFM functions (risk assessment, risk management, resource mobilization), assessed using the country diagnostic results from the PFRI review;
- government demand and ownership, evidenced through direct MoF consultation and documented commitment such as a formal expression of interest or the reflection of climate-responsive PFM in national fiscal planning;
- absorptive and implementation capacity, assessed against each country's track record of delivering comparable PFM or climate-finance reforms within programme timeframes;
- the size of the adaptation investment gap relative to the economy, drawing on the fiscal-risk exposure estimates in the PFRI regional report;
- and complementarity with existing and planned support, confirmed through a mapping of current climate-PFM engagements to avoid duplication and enable co-financing.
- These criteria will be applied through a documented readiness matrix scoring each DMC against the five dimensions, providing a basis for confirming or adjusting the preliminary shortlist at inception. The intention is not to exclude other PICs, but rather to build on existing momentum and generate practical lessons, tools, and demonstration effects that can accelerate uptake and learning across the region.

9.2.3 Outputs and Activities

Outcome 1.1 is delivered through five Outputs. Output 1.1.1 builds the skills and institutional capacity needed for climate- and disaster-responsive PFM through five activities: capacity needs assessments for all 14 PICs (Activity 1.1.1.1); certified professional development programmes in climate-responsive PFM and investment planning (Activity 1.1.1.2); postgraduate qualifications and structured internship programmes anchored in regional universities (Activity 1.1.1.3); a peer learning network (Activity 1.1.1.4); and a knowledge portal integrated with existing regional platforms (Activities 1.1.1.5). Output 1.1.2 establishes the regional institutional infrastructure (through governance mechanisms, knowledge products, and a Pacific Regional Community of Practice) to sustain and coordinate this capacity beyond the programme period. Outputs 1.1.3 through 1.1.5 each correspond to one of the three PFRI diagnostic functions. Output 1.1.3 strengthens government capacity to identify, measure, and disclose climate-related fiscal risks, and to embed climate considerations into budget and planning frameworks (Activities 1.1.3.1 and 1.1.3.2). Output 1.1.4 integrates climate risk management into public investment planning, supporting development of prioritised, programmatic pipelines of bankable adaptation investments aligned with national fiscal frameworks (Activity 1.1.4.1). Output 1.1.5 designs, pilots, and deploys innovative adaptation finance instruments across public, private, and blended finance, expanding the range of instruments accessible to Pacific MoFs beyond grants and standard concessional loans (Activity 1.1.5.1).

9.2.4 Complementarity Between ADB and Future SPREP Knowledge and Learning Activities

Under Outcome 1.1, ADB's knowledge and learning activities are intentionally limited to supporting the effective design, implementation and adaptive management of Components 1. The focus is on generating implementation-driven technical knowledge from RPACA investments, including lessons on innovative climate finance, climate-responsive public financial management, resilient infrastructure, coastal adaptation, and the integration of climate risk into investment planning and engineering standards. These activities are designed to strengthen project delivery, support adaptive management, meet ADB and GCF monitoring and safeguard requirements, and avoid maladaptation through continuous learning during implementation. The outputs - such as technical briefs, operational guidance, policy notes, toolkits and targeted technical exchanges- are intended primarily for implementing agencies, Ministries of Finance, infrastructure agencies and other institutions directly involved in Components 1. ADB will not establish or operate regional knowledge platforms or broader programme-wide knowledge management systems.

These activities are complementary to the future SPREP-led Component 4 (to be designed), which is expected to provide programme-wide knowledge management, regional learning and dissemination across all RPACA components. While ADB will generate evidence and implementation experience from Components 1 (and component 2), SPREP will build on these outputs through the Pacific Climate Change Centre and other established regional mechanisms by synthesising knowledge,

facilitating cross-country learning, supporting regional capacity development, and disseminating lessons across Pacific SIDS. This creates a clear division of responsibilities (and limited resources) in which ADB focuses on upstream knowledge generation and investment-specific learning, while SPREP leads downstream knowledge integration, regional coordination and broader adaptation learning. Formal knowledge-sharing arrangements between the two components will ensure that implementation experience generated by ADB contributes directly to programme-wide learning under SPREP's Component 4, providing a coherent RPACA knowledge ecosystem while avoiding duplication of functions and strengthening existing regional institutions.

9.2.5 Output 1.1.1 Skills and Capacity to Address Climate-, Disaster-, and Gender-Responsive PFM are Enhanced, Retained, and Applied

9.2.5.1 Objective of Output 1.1.1

To build a sustainable approach to upskilling Ministries of Finance and other relevant public sector institutions, retaining staff longer term and embedding localized skills and development within institutions to enable climate- and disaster-responsive public financial management and investment planning. The certified professional development programme under Activity 1.1.1.2 is the primary vehicle for achieving the output indicator of at least 40 MoF staff demonstrating improved knowledge and skills by end of Year 10, of whom at least 50% are women. All programs will prioritise women, persons with disabilities, and underrepresented Pacific communities, ensuring equitable access to scholarships, internships, and professional development opportunities.

Activities will be delivered through a two-phase approach:

- Phase 1 (Year 1): Capacity Needs Assessment (CNA) across 14 PICs, programme design, portal build, peer network set-up
- Phase 2 (Years 2-3): Scaled delivery (regional cohorts, scholarships, internships, peer convenings, portal live)

9.2.5.2 Activity 1.1.1.1 Update Skills Needs Assessments on Climate-, Disaster-, and Gender-Responsive PFM and Investment Planning

The Capacity Needs Assessment (CNA) is a diagnostic exercise conducted with each MOF and other relevant central ministries and agencies. It will inform the delivery of each component of the capacity development programme through a systematic evaluation of the current level of institutional capacity relevant to climate and disaster-responsive PFM and investment planning. The CNA will also establish the baseline for the outcome-level indicator (the percentage of MoF staff applying climate-responsive PFM skills in official duties) against which progress will be tracked throughout the programme. The CNA will explicitly assess GEDSI integration in fiscal systems, identifying gaps in gender-responsive budgeting, equity tagging, and inclusion of vulnerable groups in fiscal risk planning. It is noted that the bottom-up costing for this output is constrained to a USD 4 million cumulative envelope, and not all needs identified through the CNAs will be addressable through RPACA alone; the CNA process will therefore also identify complementary support from other partners.

The CNA will be conducted within the MOF and other key ministries, in collaboration with ADB experts and local / regional university partners, to ensure the capacity programs are tailored to the specific needs, combining structured training with diagnostic and institutional capacity-building components. Specifically, it seeks to:

- Assess existing technical and institutional capacities;
- Identify priority themes and knowledge/capacity gaps;
- Determine training needs and tailor content accordingly.

9.2.5.3 Activity 1.1.1.1 Deliverables

1. Capacity gap assessment for each PIC detailing skills gaps and needs for undergraduate, postgraduate and mid-career civil servants and recommendations for course / programme design. Each assessment will include recommendations for embedding GEDSI into curricula, career pathways, and institutional reforms.

2. Baseline values for the outcome indicator (percentage of MoF staff applying climate-responsive PFM skills) for each participating country

9.2.5.4 Activity 1.1.1.2 Develop Certified Professional Development Programs

This activity will entail the co-design and implementation of a certified professional development programme in enhancing climate and disaster-responsive PFM and investment planning. The design will include flexible approaches to allow officials to advance from single module to a professional certificate according to individual circumstances. The programme will target young professionals, mid-career and senior civil servants, and priority groups including women, persons with disabilities, and underrepresented Pacific communities. Curricula will embed GEDSI modules, ensuring participants gain practical skills in gender-responsive fiscal analysis, equity-focused monitoring, and inclusive investment planning.

Curricula will be structured around functional streams aligned with Ministry of Finance roles, for example climate-responsive budgeting and expenditure management, climate fiscal risk and disaster risk finance, and resilient public investment management, and developed through a train-the-trainer approach with locally based institutions. Regional universities and institutions will be engaged to provide quality assurance and certification. The programme is the primary vehicle for the output indicator of at least 40 MoF staff demonstrating improved knowledge and skills by end of Year 10.

9.2.5.5 Activity 1.1.1.2. Deliverables

1. Detailed design for professional certificate programme
2. Indicative roll-out and financing plan for course delivery, including tuition, scholarships, partner contributions and in-kind government support.
3. Train-the-trainer materials
4. Sustainability plan for programme roll-out
5. Case-based teaching materials and study tours drawing on Pacific experiences, including climate budget tagging pilots, PEFA Climate follow-up, DRF strategies, and climate finance readiness processes
6. GEDSI competency framework integrated into certification standards

9.2.5.6 Activity 1.1.1.3 Establish Postgraduate Qualification and Internship Programmes

While Activity 1.1.1.2 focuses on short-course professional development for current staff, this activity supports attainment of postgraduate qualifications and structured entry pipelines through internships and mentorship for recent and current undergraduates. The activity will involve the co-design and implementation of a postgraduate qualification and a skills enhancement internship / mentorship programme, in partnership with regional and national universities to establish and strengthen a localised cohort of new graduates and existing staff within the civil service. The design will include flexible approaches such as stackable credentials (advancing from a certificate to a diploma to a master's). A total of two postgraduate scholarships per cohort and seven internships per cohort will be provided through the life of the RPACA programme. Scholarship criteria will prioritise applicants committed to advancing GEDSI in fiscal resilience, with return-of-service expectations linked to inclusive reforms.

This activity 1.1.1.3 addresses a structural gap that short-course professional development (Activity 1.1.1.2) cannot: the Pacific currently has no accredited postgraduate pathway in climate- and disaster-responsive PFM and investment planning, and Ministries of Finance consequently lack a structured entry pipeline of new graduates with these skills. The scholarships and internships are designed to build a localized cohort of regional expertise on this topic, directly responding to the chronic skills deficit and retention challenge identified in the problem analysis.

The principal investment under this activity is not the individual scholarships but the institutional infrastructure they seed: the co-design of an accredited postgraduate qualification with regional and national universities (the University of the South Pacific's Centre for Sustainable Futures at the regional level, and SILAG, UPNG and partners in PNG, with SOAS support), curricula, train-the-trainer materials, and stackable credential pathways (certificate–diploma–master's). These are public

goods that remain embedded in regional institutions and continue to be delivered after the grant period, addressing the concern regarding efficient use of funds. The scholarships are a catalytic instrument to establish the first cohorts, demonstrate demand, and de-risk the programme for university partners; return-of-service expectations retain graduates within the civil service.

Beyond the RPACA period, ADB will sustain this work by linking the qualification and internship pipeline to its ongoing and pipeline operations on human and social development in the Pacific, consistent with the emerging Pacific Approach 2026–2030 priority on strengthened partnerships for capacity development. This ensures graduates, curricula and delivery institutions are absorbed into a continuing programme of support rather than a time-bound intervention. The activity's deliverables already include a sustainability plan and impact report, and these will explicitly set out the handover and financing pathway through ADB's human and social development portfolio.

The assessments under Activity 1.1.1.1 cover all 14 PICs and will inform country priorities and scholarship and internship allocation; delivery is deliberately differentiated so that smaller PICs unable to sustain in-country programs are served through the regional anchor (USP) and modular, online, block-delivery or secondment-based arrangements. Transparent, published selection criteria - prioritizing women, persons with disabilities and underrepresented Pacific communities — will guard against any country or field of study being unintentionally disadvantaged.

Internship placements will allow for rotations across relevant departments, including budgeting, investment planning, audit, treasury and climate finance functions. Each placement will be linked to clearly defined tasks aligned with host institutions' climate-responsive PFM reform priorities and will include GEDSI-sensitive tasks such as integrating gender indicators into budget tagging pilots or equity safeguards into DRFI strategies.

9.2.5.7 Activity 1.1.1.3. Deliverables

1. Design of programme to undertake postgraduate scholarships, skills enhancement and internship and mentorship programme including 3-6-month internship placements within national government institutions
2. Scholarship and selection criteria prioritizing applicants in roles linked to climate- and disaster-responsive PFM reforms, including return-of-service expectations where appropriate
3. Training programme and materials, including train-the-trainer resources
4. Impact report and sustainability plan for programme roll-out
5. Equity-focused internship placements documented, with evidence of GEDSI integration into host institutions' fiscal reform priorities

9.2.5.8 Activity 1.1.1.3 Sustainability

The postgraduate qualification and internship programmes are designed as catalytic investments that establish enduring institutional capacity rather than ongoing grant-dependent activities. The scholarships are embedded within a broader capacity development strategy to strengthen national Ministries of Finance and related institutions in climate-responsive public financial management, investment planning and adaptation finance. Scholarship recipients will be nominated by participating institutions in the region and, through return-of-service expectations where appropriate, will apply their skills within government, creating a sustained cohort of regional expertise.

More importantly, the principal legacy of the activity is the establishment of an accredited postgraduate qualification, curricula, stackable credentials, train-the-trainer materials, and internship pathways co-developed with regional and national universities (including the University of the South Pacific and national university partners). These institutional assets will remain with partner universities and continue to be delivered beyond the RPACA implementation period. ADB will also seek to integrate the qualification, internship pipeline and associated capacity-building activities into its ongoing Pacific human and social development and public financial management operations, providing opportunities for continued support after the grant period.

9.2.5.9 Activity 1.1.1.4 Establish a Peer Learning Network

Activity 1.1.1.4 is a people-to-people mechanism: structured peer exchange among Ministry of Finance practitioners, deliberately anchored in live regional policy processes (FEOM, FEMM, and climate finance and DRF dialogues) so that learning transfers directly into active reforms. Its value lies in tacit, practitioner-level knowledge - how a climate budget tagging pilot was implemented, how a DRF strategy was negotiated - which cannot be codified in written resources and is transferred through convening, exchange and replication.

The combined allocation of US\$1.09 million covers a 10-year programme across 14 geographically dispersed PICs - approximately US\$110,000 per year, or under US\$8,000 per country per year - covering regional convenings and travel (which carry a significant cost premium in the Pacific), content and tool development, portal design and integration, and maintenance.

The peer learning network will include GEDSI-focused exchanges, showcasing inclusive fiscal practices, gender-responsive budgeting pilots, and equity-responsive reforms adopted across PICs.

9.2.5.10 Activity 1.1.1.4. Deliverables

1. Peer-to-peer learning network
2. Tools and knowledge products
3. Evidence of policy tools, practices or reforms adopted or adapted by participants following peer-learning exchanges
4. Documentation of GEDSI-responsive reforms shared and replicated through the network

Box 8: Complementarity over Output 1.1.1 Activities Leads to Gap Filling and High Cost-Efficiencies

Activities 1.1.1.2 and 1.1.1.3 target distinct populations — 1.1.1.2 upskills current mid-career staff through short courses, while 1.1.1.3 builds the entry pipeline of new graduates — and merging them would obscure this dual objective. They are, however, designed as a single continuum: the stackable credentials architecture allowing participants to progress from the professional certificate (1.1.1.2) into the postgraduate qualification (1.1.1.3).

The two activities are not duplicative; they are distinct and mutually reinforcing delivery mechanisms directed at the same outcome — building and retaining regional capacity on climate- and disaster-responsive PFM — and they address different dimensions of the capacity problem identified in the analysis underpinning Outcome 1.1.

The training activities (1.1.1.2 and 1.1.1.3) build individual skills; Activities 1.1.1.4 and 1.1.1.5 are the mechanisms that convert those individual skills into regional institutional memory. This directly addresses the core problem identified in the background analysis — high staff turnover and the failure of short-term engagement models to build durable in-house expertise. Codified knowledge (the portal) mitigates the loss of expertise when trained staff move on, while peer exchange (the network) sustains application of skills in official duties, which is precisely what the outcome-level indicator measures (percentage of MoF staff *applying* climate-responsive PFM skills, not merely trained). Without these two activities, the training investment under 1.1.1.2 and 1.1.1.3 would depreciate rapidly in the Pacific's high-turnover context.

Activity 1.1.1.5 is a knowledge infrastructure: a federated portal that aggregates and organizes existing but currently fragmented Pacific resources (PCCC, the Pacific Climate Change Portal, Pacific Disaster Net, and partner-developed PFM tools) under a common taxonomy relevant to Ministries of Finance, with self-paced modules providing always-on access. This is particularly critical for smaller PICs whose officials cannot regularly participate in regional convenings.

1.1.1.4 and 1.1.1.5 are designed as a loop rather than parallel efforts: the portal codifies and disseminates the tools, case studies and reform experiences generated through the peer network, while the network drives uptake and application of portal content.

Both activities have been deliberately designed for cost-efficiency by working through existing platforms rather than creating new structures: the peer network operates through an existing platform such as the PCCC or RCM-PFM, and the portal is hosted on or integrated with existing regional platforms (PIFS, SPREP or other partners). The network will be linked to established regional meetings and processes including FEOM, FEMM, and relevant climate finance and DRF dialogues, so that peer learning supports active policy processes rather

than operating as a standalone network. The portal deliverables also include a governance and maintenance plan identifying its long-term institutional home and resourcing beyond the programme period, ensuring the expenditure creates a durable regional asset rather than a recurring cost.

DRF= disaster risk finance, FEMM= Forum Economic Ministers Meeting, FEOM= Forum Economic Officials' Meeting, MoF= Ministry of Finance, PCCC= Pacific Climate Change Centre, PICs= Pacific Island Countries, PIFS= Pacific Island Forum, Secretariat, PFM= public financial management, RCM= regional coordination mechanism, SPREP= Secretariat of the Pacific Regional Environment Programme.

Source: Asian Development Bank

9.2.5.11 Activity 1.1.1.5 Develop and Launch a Climate- and Disaster-Responsive PFM Knowledge Portal

Through existing platforms (PIFS, SPREP or other partners) a federated climate-responsive PFM knowledge hub, hosted on or integrated with existing regional platforms, will offer self-paced modules and resources for Ministries of Finance and other agencies. The hub will aggregate and organize existing Pacific resources, including PCCC, the Pacific Climate Change Portal, Pacific Disaster Net, and partner-developed PFM and climate finance tools, under a common taxonomy relevant to Ministries of Finance. The portal will curate GEDSI case studies, tools for gender-responsive budgeting, and resources on inclusive fiscal risk management.

9.2.5.12 Activity 1.1.1.5 Deliverables

1. Knowledge portal integrated with existing platforms
2. Resources and materials including case studies on best practices, application of tools, online training modules and knowledge products
3. Governance and maintenance plan identifying the long-term institutional home and resourcing arrangements for the hub beyond the RPACA programme period
4. GEDSI knowledge resources embedded in the portal, including disaggregated data sets, inclusive fiscal tools, and equity-focused training modules

9.2.5.13 Activity 1.1.1.5 Potential Partners

This Output will scale up activities implemented under ADB's Pacific Fiscal Resilience Initiative, applying the Capacity Assessment and Co-design process that is currently being developed for Papua New Guinea. The following partners could be engaged through established partnerships and collaborations with ADB:

- National and regional universities: UPNG, USP
- Regional CROP agencies: PIFS, SPREP-PCCR and SPC
- International Partners: Universities (SOAS, ANU), IFIs (IMF / PFTAC)
- Formal Coordination Mechanisms: RCM-PFM

Roles and comparative advantages of partners should be clearly defined, with regional bodies focusing on coordination and standards, universities on accredited delivery, and IFIs and technical agencies on specialist content, co-financing and alignment with wider reform and financing operations. Partners should also commit to embedding GEDSI in their roles — for example, universities ensuring curricula include gender-responsive fiscal analysis, regional bodies tracking equity outcomes in coordination platforms, and IFIs aligning technical content with inclusive budgeting and social equity safeguards.

9.2.6 Output 1.1.1 Indicative Costing

Table 18: Output 1.1.1 Indicative Costing

Item	Cost (US\$)
1.1.1.1 Update skills needs assessments on climate-, disaster-, and gender-responsive PFM and investment planning.	591,482
1.1.1.2 Develop certified professional development programmes.	1,181,482
1.1.1.3 Establish post-graduate qualification and internship programmes.	889,482

1.1.1.4 Establish a peer learning network.	501,482
1.1.1.5 Develop and launch a Climate- and Disaster-Responsive PFM Knowledge Portal.	591,482
Estimated TOTAL	3,700,000

PFM= public financial management.

Source: Asian Development Bank.

Given the regional ambition and multi-country delivery model, the indicative costs shown in Table 18 are likely to be catalytic rather than sufficient for full implementation at scale. The detailed design should therefore identify options for phased roll-out, co-financing, and in-kind support from participating institutions and partners. Costing frameworks should also include earmarked resources for GEDSI integration, such as scholarships for women and under-represented groups, accessibility measures for persons with disabilities, and equity-focused monitoring and evaluation. This ensures that financing is not only catalytic but also inclusive.

9.2.7 Output 1.1.1. Contribution to Gender Equality and Social Inclusion

Output 1.1.1 contributes directly to RPACA's theory of change by addressing systemic institutional and capacity gaps that constrain Pacific Island Countries' fiscal resilience to climate change. By embedding long-term skills development within Ministries of Finance and anchoring programmes in regional universities and training institutes, RPACA ensures that climate-responsive PFM reforms are locally owned, durable, and scalable.

All programmes under this outcome will prioritise participation of women, persons with disabilities, and under-represented Pacific communities, ensuring equitable access to scholarships, internships, and professional development opportunities. Capacity Needs Assessments will identify gaps in gender-responsive budgeting, equity tagging, and inclusion of vulnerable groups in fiscal risk planning. Certified professional development programmes and postgraduate qualifications will embed GEDSI modules, equipping civil servants with practical skills in inclusive fiscal analysis, equity-focused monitoring, and socially responsive investment planning. Internship placements will include GEDSI-sensitive tasks, such as integrating gender indicators into budget tagging pilots or equity safeguards into DRFI strategies, ensuring participants gain hands-on experience in inclusive reforms.

Peer learning networks and the knowledge portal will curate GEDSI case studies, tools, and resources, enabling Ministries of Finance to share and replicate inclusive fiscal practices across the region. Monitoring and evaluation frameworks will track not only participation rates but also institutional outcomes, including adoption of gender-responsive PFM tools, integration of equity indicators into fiscal reforms, and measurable increases in climate finance reaching women, youth, persons with disabilities, and socially excluded groups.

By embedding GEDSI across all activities, RPACA ensures that fiscal resilience is not only technically sound but also socially inclusive, dismantling structural barriers and empowering vulnerable groups to benefit equitably from climate finance. This strengthens the enabling environment for Components 2–4, ensuring that infrastructure investments, sectoral reforms, and regional coordination are underpinned by robust, inclusive fiscal systems. In doing so, Output 1.1.1 operationalises RPACA's paradigm shift: moving from fragmented, short-term technical assistance to a systemic, multi-tiered approach that empowers Pacific countries to chart their own climate-resilient and equitable development pathways.

9.2.8 Output 1.1.2 Regional Climate Finance and Adaptation Planning Coordination with Gender Equality and Inclusion Mainstreamed and Enhanced

9.2.8.1 Objective of Output 1.1.2

Coordination and collaboration across the region is strong and built upon many existing mechanisms, for example PIFS, SPREP, SPC etc. Weaknesses in current collaboration mechanisms tend to be more at the operational and technical levels, whereas stronger at the political level. Further, there are no existing mechanisms with a focus, at the technical level, on climate finance and climate resilient infrastructure. This Output, through initially guiding and technically steering the broad range of RPACA

partners and activities, and through the production and development of a series of targeted knowledge and policy products, will build a strong community of practice across these innovative domains. Activities initially under this Output aim to support project roll out and implementation and grow into an enduring support and collaboration mechanism, coordinating technical and policy responses to the climate change challenge. This collaboration mechanism will be housed within existing facilities in the region. Although the optimal form of this collaboration mechanism is yet to be determined, a strong possibility is a semi-formal community of practice on climate infrastructure finance (CIFCOP). It is anticipated to function as a non-binding, practice-based forum for sustained collaboration on adaptation financing, addressing sea level rise, infrastructure resilience, climate-smart agriculture, and integrated water management, operating in full respect of national sensitivities. CIFCOP will be explicitly inclusive, ensuring representation of women, persons with disabilities, youth, and marginalised communities in governance and knowledge exchange. The key strategy is that the CIFCOP will be created and built through practice: from the outset, it will be charged with implementing, supervising, and overseeing specific tasks, acquiring the skill sets, experience, and credibility needed to develop into a sustainable, self-sufficient mechanism over time.

Progress will be tracked against three indicators from the programme results framework: establishment and operationalisation of the RPACA steering committee and advisory panel; development of at least five regional knowledge products and policy briefs on climate transformation by end of programme; and establishment of the Pacific regional community of practice.

9.2.8.2 Activity 1.1.2.1 Advise and Steer RPACA Roll-Out and Implementation Through Steering Committee and Advisory Panel

Convene consultations with the national governments and key regional stakeholders to co-design the structure, functions, and governance of RPACA Steering Committee (RSC) and its Advisory Panel (RAP). The RSC and RAP will include GEDSI expertise and representation to ensure equity is embedded in oversight. RSC and RAP meetings will be organised back-to-back with other regional consultations to reduce costs by at least 50%.

9.2.8.3 Activity 1.1.2.2 Prepare and Issue Regional Knowledge Products and Policy briefs

Under the oversight of the RSC and technical guidance of the RAP, this activity will support knowledge development across all four RPACA components and subsequent dissemination of knowledge products to stakeholders. The focus will be on knowledge related to the transformational nature of RPACA, including: transformation of the approach to implementing infrastructure projects; regional approaches to advancing resilience; long-term, programmatic approaches based on adaptive commitment; graduation from single-issue activities to strategic adaptation pathways; nature-based, community-led, and vulnerability-focused approaches; and full integration of private sector contributions. The target of five knowledge products and policy briefs by end of programme maps directly to the output indicator in the programme results framework.

9.2.8.4 Activity 1.1.2.3 Establish a Self-Sustaining, Pacific, Climate Infrastructure Finance Community of Practice

Based on the partnerships developed and the experience acquired through the two preceding activities, forms and modalities to establish a permanent, durable, self-sufficient knowledge platform will be explored and developed. A feasibility study will be developed through a thorough analysis of related existing knowledge institutions, entities, a full assessment of needs and resources, elaboration of a workplan, and a business and financing strategy. Membership criteria and governance frameworks will ensure balanced representation across genders, age groups, and abilities, and equity outcomes will be tracked in the workplan. From its inception, CIFCOP will support implementation of practical activities- including investment planning, knowledge exchange, peer review and technical collaboration- building a community of practice based on demonstrated value rather than periodic meetings. In terms of sustainability, CIFCOP will be designed to be hosted or facilitated through an existing regional institution (e.g., SPREP-Pacific Climate Change Centre, SPC), regional university (USP, UPNG) or partnership (e.g., PCCR) rather than established as a standalone entity, reducing long-term administrative costs and leveraging existing regional governance arrangements.

The CIFOP will intentionally be designed as a low-cost coordination mechanism that can continue through contributions from participating institutions, integration with existing regional programmes, and future support from development partners where appropriate. The focus on climate infrastructure finance reflects gaps, barriers and priorities consistently identified by Pacific governments, financial institutions and regional organisations, increasing the likelihood of continued engagement beyond the RPACA grant period. During a fuller design stage (Activity 1.1.2.3), the feasibility assessment will also explore and implement a long-term sustainability plan to determine the most appropriate institutional home, governance arrangements and financing model for CIFCOP following completion of RPACA.

9.2.9 Output 1.1.2 Indicative Costing

Table 19: Output 1.1.2 Indicative Costing

Item	Cost (US\$)
Activity 1.1.2.1 Advise and steer RPACA roll-out and implementation (<i>Steering Committee and Advisory Panel</i>)	800,000
Activity 1.1.2.2 Prepare and issue regional knowledge products and policy briefs	1,200,000
Activity 1.1.2.3 Establish a self-sustaining, Pacific, climate infrastructure finance community of practice (CIFCOP)	250,000
TOTAL	2,250,000

Notes: Six themes supported with, for example, 4-5 months international expert, 10–12-month national expert (from 3 participating countries), workshops, training, communications; subsequent to a feasibility study and successful development of a business and financing strategy and hosted in an existing entity.

Source: Asian Development Bank

9.2.10 Output 1.1.2 Contribution to Gender Equality and Social Inclusion

Output 1.1.2 will not only build technical capacity for climate finance and PFM reforms, but also embed gender equality, disability inclusion, and social equity into the institutional strengthening process. Capacity building strategies will prioritise participation of women, youth, persons with disabilities, and under-represented Pacific communities, ensuring equitable access to scholarships, internships, and professional development. Outputs will integrate GEDSI into fiscal reforms, such as gender-responsive budgeting, equity-focused risk assessments, and inclusive investment planning, so that strengthened systems dismantle structural barriers and deliver resilience benefits equitably. By embedding GEDSI across all activities, Output 1.1.2 ensures that the paradigm shift in climate-responsive PFM is both technically sound and socially inclusive, maximising resilience gains for all communities.

9.2.11 Output 1.1.3 Climate-Related Fiscal Risk Analytics and Budget Integration Tools Developed

9.2.11.1 Objective of Output 1.1.3

To build government capacity to identify, measure, and disclose climate-related fiscal risks, and to embed climate considerations into national budgetary and planning frameworks. Risk analytics will include gender-disaggregated data and equity indicators, ensuring fiscal disclosures capture differentiated vulnerabilities across social groups.

9.2.11.2 Activity 1.1.3.1 Develop Gender-Responsive Climate Fiscal Risk Analytics

Develop and institutionalize analytical tools to assess, quantify, and disclose climate-related fiscal risks -- including impacts on public finances, debt sustainability, and contingent liabilities -- and translate existing hazard assessments (from PCRAFI, SPREP, and SPC) into standardized economic cost estimates usable by MoF staff. This includes developing a standardized climate fiscal risk assessment methodology for Pacific SIDS (mapping existing climate-related fiscal liabilities, modelling fiscal impacts under climate scenarios, and identifying the highest-priority adaptation investments).

9.2.11.3 Activity 1.1.3.1 Deliverables

1. Country-level fiscal risk reports with sector-specific findings and disclosure summaries suitable for inclusion in budget documents

2. Regional climate economic analysis toolkit (methodology guide, templates, and worked country examples)

9.2.11.4 Activity 1.1.3.2 Develop and Integrate Gender-Responsive Budget Tools and Processes

Develop clear inter-ministerial coordination mechanisms and reporting protocols to ensure that climate risk information feeds systematically into budget management and investment planning. This includes: (i) protocols for risk information to flow from line ministries into MoF budget processes; (ii) mechanisms for MoFs to coordinate with line ministries; and (iii) revised MTFF templates and budget circular guidance. Templates and guidance will require ministries to report on GEDSI impacts of climate risks and adaptation investments, embedding equity into fiscal planning. Coordination with PFTAC and World Bank PFM reform programs will avoid duplication and ensure activities are appropriately sequenced.

9.2.11.5 Activity 1.1.3.2 Deliverables

1. Inter-ministerial coordination mechanism design documents
2. Revised MTFF templates and budget circular guidance notes

9.2.12 Output 1.1.3 Indicative Costing

Table 20: Output 1.1.3 Indicative Costing

Item	Cost (US\$)
Activity 1.1.3.1: Climate fiscal risk analytics and economic analysis toolkit	700,000
Activity 1.1.3.2: Budget integration tools and processes	300,000
TOTAL	1,000,000

Source: Asian Development Bank.

9.2.13 Output 1.1.4: Climate Adaptation Investment Planning Framework for Appraising and Prioritizing Climate Adaptation Investments Established

9.2.13.1 Objective of Output 1.1.4

To integrate climate risk management into public investment planning and appraisal systems to develop a prioritized, programmatic pipeline of bankable adaptation investments aligned with national development and fiscal frameworks. Pipeline appraisal criteria will include social equity outcomes, prioritising investments that reduce vulnerabilities for women, youth, persons with disabilities, and marginalised communities.

9.2.13.2 Activity 1.1.4.1 Develop and institutionalize Climate Adaptation Investment Planning frameworks.

Provide technical assistance to establish or strengthen inter-ministerial climate finance coordination mechanisms, including: (i) establishing a dedicated climate finance unit or focal point within MoF; (ii) terms of reference for inter-ministerial climate investment committees; (iii) coordination protocols between the GCF NDA and line ministries; and (iv) creating structured dialogue platforms between government pipeline owners and private sector investors to review the pipeline, discuss bankability constraints, and identify co-financing opportunities; provide project preparation support to advance pipeline projects to commercial feasibility (would include: pre-feasibility studies, financial structuring advice, ESG screening, and development of GCF concept notes and funding proposals). Climate-aligned PIM/PFM support will encompass the full project cycle, including project appraisal, budget allocation, procurement, audit/MEL, and asset management functions, as well as local contractor participation standards and incentives where relevant. Dialogue platforms will address gender-responsive financing structures and equity safeguards, ensuring private sector engagement contributes to inclusive resilience and procurement standards will explicitly incentivise participation of women-led firms, local SMEs, and community-based organisations in adaptation investments.

9.2.13.3 Activity 1.1.4.1 Deliverables

1. Inter-ministerial climate finance coordination mechanism design documents (terms of reference, membership, operating protocols, NDA-MoF coordination protocols)

2. National adaptation investment plans with prioritized, costed, and sequenced project pipelines, each with identified financing sources
3. Climate investment roundtable design package (terms of reference, agenda format, participant guide, facilitator notes)
Pre-feasibility reports and financial structuring notes for priority pipeline projects; GCF concept notes and/or funding proposal drafts for projects advanced through the preparation process.

9.2.14 Output 1.1.4 Indicative Costing

Table 21: Output 1.1.4 Indicative Costing

Item	Cost (US\$)
Activity 1.1.4.1: Climate-informed public investment planning and adaptation pipelines (Climate Adaptation Investment Planning)	1,150,000
TOTAL	1,150,000

Source: Asian Development Bank.

9.2.15 Output 1.1.5 Innovative Climate Finance Instruments and Enabling Frameworks Designed

9.2.15.1 Objective of Output 1.1.5

Pacific Island Countries face a persistent gap between identified climate financing needs and the availability of appropriate financing mechanisms. Climate-related financing continues to rely heavily on grants, standard concessional loans, and project-based funding, which are insufficient to meet the scale and urgency of adaptation needs and which limit equitable access for women-led enterprises, youth entrepreneurs, and disability-inclusive organisations. A broader set of instruments including sovereign mechanisms such as debt-for-climate (or nature) swaps and specialised adaptation trust funds, risk-pooling mechanisms such as parametric insurance, and market-based approaches including thematic bonds and blended finance could be accessed and sequenced, but each requires significant upfront exploration, feasibility work, and tailoring to determine its suitability and to move from concept to implementable solution in Pacific contexts.

This Output responds to that gap by providing technical assistance to design, and where appropriate pilot, innovative adaptation finance instruments across public, private, and blended finance, so as to mobilise scaled-up, inclusive, and sustainable financing for climate adaptation. Support is country-driven and demand-led: rather than advancing a predefined set of instruments, it helps governments progress selected, prioritised mechanisms from expressed demand or early-stage concept through feasibility assessment and structuring to implementable design. All instruments will be designed to ensure equitable access, with safeguards and participation mechanisms that enable women, youth, persons with disabilities, and community-based organisations to benefit from new financing flows.

9.2.15.2 Activity 1.1.5.1 Develop National Financial Instruments

This activity provides technical support to PICs to explore, assess, design, and develop innovative financing mechanisms for climate adaptation, spanning the full arc from early-stage exploration to bespoke national-level instrument development. It responds to expressed country priorities and readiness rather than delivering a uniform set of instruments.

Instrument types include, but are not limited to: sovereign financing mechanisms such as adaptation trust funds and strengthened governance of national trust funds; debt-for-climate / nature swaps; risk financing and insurance solutions, including parametric insurance and regional risk-pooling arrangements; capital market instruments such as thematic (e.g. green or blue) sovereign bond issuances; carbon finance and market mechanisms; strengthened domestic resource mobilisation, including green taxes and levies; and nature-based and ecosystem financing approaches, including payments for ecosystem services and blue carbon.

Support focuses on analytical and design work required to move from concept to implementation: initial scoping and alignment with national priorities (e.g. NAPs and fiscal frameworks); feasibility

assessment across technical, institutional, and regulatory dimensions; preliminary financial and fiscal analysis; stakeholder consultation and market sounding; transaction structuring and design; and identification of implementation pathways, including governance arrangements and next steps. Equity analysis is embedded throughout, with consultation of women's organisations, disability networks, and youth groups to ensure mechanisms address barriers faced by women, youth, and persons with disabilities.

9.2.15.3 Activity 1.1.5.1 Deliverables

1. Framework design documents, fund governance documents, needs assessments and positioning notes, and/or concept proposals for submission to the UNFCCC Fund for Responding to Loss and Damage
2. A pipeline of screened, feasibility-tested financing concepts with clear recommendations on viability and pathways to implementation, disseminated to support regional learning across all countries.

9.2.16 Output 1.1.5 Indicative Costing

Table 22: Output 1.1.5 Indicative Costing

Item	Cost (US\$)
Activity 1.1.5.1: National-level development of new instruments (e.g., carbon trading, new trust funds, L&D)	1,950,000
TOTAL	1,950,00

L&D= loss and damage.

Source: Asian Development Bank.

9.2.17 Contribution to the RPACA Theory of Change

Outputs 1.1.3-1.1.5 are based on previous capacity assessments and institutional analyses. They will build targeted capacity for PFM in key public institutions. They will lead to products, tools and platforms, as well as related governance and policy changes. These outputs and their component activities will have a focus on PFM in order to mobilise and utilize climate finance. By doing so, they will remove financial and institutional barriers to strengthening community resilience, maximizing benefits, and achieving sustainable development. They will create Outputs that will sustainably enhance the access of Pacific Island countries to climate finance.

9.2.18 Contribution to Gender Equality and Social Inclusion

Outputs 1.1.3-1.1.5 will embed GEDSI across fiscal risk analytics, investment pipeline development, and access to diversified finance instruments. Climate fiscal risk assessments will include gender-disaggregated data and equity indicators, ensuring differentiated vulnerabilities are visible in fiscal planning. Adaptation pipelines will apply social equity criteria, prioritising investments that reduce risks for women, youth, persons with disabilities, and marginalised communities. Procurement and financing standards will incentivise participation of women-led firms, local SMEs, and community organisations, while joint public-private platforms will integrate gender-responsive financing structures and equity safeguards. Monitoring and evaluation will track not only fiscal resilience but also equitable access to finance and participation outcomes. By embedding GEDSI throughout, Outputs 1.1.3-1.1.5 ensure that strengthened fiscal systems deliver resilience benefits inclusively, advancing RPACA's paradigm shift toward climate-responsive and socially equitable public financial management.

9.3 Outcome 1.2 Climate-Resilient and Inclusive Financing for MSMEs and Infrastructure is Expanded/Scaled-up through Innovative and Scalable Financial Instruments by Pacific Financial Institutions

9.3.1 Output 1.2.1: Regional Blended Finance Approach for MSME Adaptation Lending Established

9.3.1.1 Problems, Barriers and Opportunities

Pacific SIDS face adaptation financing needs far exceeding current flows, with requirements estimated at 6.5%–9.0% of GDP (≈US\$1 billion annually) compared to ~US\$220 million in annual financing, resulting in a persistent and material financing gap¹¹⁷. This reflects both a public sector delivery constraint but also a private sector intermediation failure.

MSMEs are the backbone of Pacific economies, accounting for a large share of firms, employment, and economic activity across the region. They tend to operate predominantly in climate-exposed sectors such as agriculture, fisheries, and tourism, which are highly vulnerable to climate change impacts.¹²³ Supporting climate adaptation finance of the Pacific SIDS MSME sectors has the potential to strengthen resilience in a way that is economically broad-based, particularly where MSMEs underpin livelihoods. This may also ease persistent financing constraints where private sector economic activity is concentrated. However, there are significant binding constraints in the region which limit the scaling of MSME adaptation finance:

- (i) Limited availability of a bankable pipeline of MSME adaption projects¹²⁴,
- (ii) High perceived and actual credit risk of Pacific SIDS MSMEs¹²⁴.

These constraints are evident across the current landscape of climate finance initiatives in Pacific SIDS and are more acute for women-led MSMEs¹²⁵, which face additional structural barriers to finance and weaker access to support services.

While existing MSME finance support programs demonstrate demand across sectors and value chains, adaptation-related investments remain underdeveloped as a financing segment. Adaptation does not yet function as a clearly defined or recognized asset class. MSMEs face difficulties in identifying, structuring, and financing adaptation investments, as these activities are often not recognized as investable projects by either the enterprise or financial institutions. MSMEs are mostly unaware how to structure adaptation projects and financial institutions lack familiarity with the associated business models, eligibility criteria, risk profiles, and revenue pathways. This results in a “missing market” for MSME adaptation activities, where demand exists but is not translated into bankable opportunities.

Risk appetite constraints are a critical barrier. MSMEs are often perceived as high risk due to limited collateral and “thin file” characteristics, while adaptation investments introduce additional uncertainty due to limited data, unfamiliar business models, and concentrated exposures in small markets. Additionally, adaption investments in this market segment will often have limited collateral values for lenders (although they generate climate resilience benefits), further raising the perceived risk profile of investments. In addition, market-based risk transfer solutions remain underdeveloped, and technical capacity gaps limit effective risk assessment. Table 23 summarizes both demand and supply side barriers to financing MSMEs, including the barriers specific to financing in adaptation activities.

Table 23: Demand- and Supply-Side Constraints to Scaling Adaptation Finance in Pacific MSME Markets

¹²³ PIFS. 2025 *Pacific Regional Private Sector Strategy 2025–2030*.

¹²⁴ Spring et al. 2026, A Study of Private Sector Engagement in Climate Change Mitigation and Adaptation Activities within Pacific Small Island Developing States, *Climatic Change*, Springer Nature.

¹²⁵ Commonwealth Secretariat. 2025. *Addressing Barriers to Accessing Trade Finance by Women-owned Businesses in the Pacific Islands*.

	Demand-Side Barriers (MSMEs / Borrowers)	Supply-Side Barriers (FIs)
Adaptation Specific	Low awareness of adaptation financing opportunities	Lack of familiarity with adaptation business models/ Limited methodologies to identify, classify and verify adaptation investments
	Adaptation investments have weak or indirect revenue generation	Limited pipeline identification and origination capability
	Adaptation investments generate resilience benefits but offer limited collateral value for lenders	Uncertainty regarding credit performance of adaptation investments
	Unclear market definition for adaptation finance	Tenor mismatch (longer term funding sources needed for adaptation projects)
	Limited ability to structure bankable project proposals	
Broader MSME Finance Challenges	Thin financial records and proposal quality	Capacity gaps in MSME risk assessment and origination
	Limited availability of acceptable collateral, particularly where customary land ownership constrains asset pledging.	Generally high perceived and actual credit risk
	Women-led MSMEs face additional structural barriers	Underdeveloped risk transfer solutions
		Funding and liquidity constraints (in some jurisdictions)
		Limited availability of refinancing mechanism to enable scaling

FIs= financial institutions, MSME= micro small medium enterprise. Source: Asian Development Bank.

Despite these barriers, a significant opportunity exists to establish adaptation finance as a new and scalable lending segment within Pacific financial systems. Demand for adaptation investment already exists across climate-exposed MSME sectors, including agriculture, fisheries, tourism and small-scale infrastructure, where businesses are increasingly seeking to strengthen resilience to climate and disaster risks. At the same time, Pacific countries have existing financial institutions, MSME support programs, business development service providers and adaptation planning processes that can be leveraged to support market development rather than requiring entirely new delivery structures. For this feasibility study, non-exhaustive consultations and initial assessments identified four priority countries across Pacific SIDs with strong potential for MSME adaptation investment, as shown in Table 24.

Table 24: Pertinent Conditions in Five Candidate PIC countries

Country	Key Adaptation Finance Opportunities	Priority MSME Sectors	Illustrative Adaptation Investments	Financial Sector Characteristics	Implications for De-Risking and Risk Transfer Solutions
Papua New Guinea	Large unmet demand for resilience investments; significant rural MSME base; strong agricultural dependence	Agriculture, fisheries, agri-processing, transport and logistics	Climate-resilient agriculture, irrigation, post-harvest storage, resilient supply chains	Largest banking sector in Pacific SIDS; relatively deeper financial sector but significant rural access gaps	Large-scale pipeline potential; focus on aggregation and outreach; moderate credit guarantee utilisation expected
Vanuatu	Frequent climate and disaster shocks; strong MSME role in economic activity	Tourism, agriculture, fisheries, construction	Resilient tourism facilities, water management systems, climate-smart agriculture	Banking sector relatively concentrated; experience with disaster recovery lending	Opportunity to integrate adaptation finance into existing resilience and recovery financing mechanisms
Samoa	Strong tourism and coastal adaptation	Tourism, agriculture,	Cyclone-resilient business upgrades,	Relatively mature banking sector; existing	Opportunity for rapid piloting and demonstration of

	needs; growing interest in MSME resilience	fisheries, retail services	resilient tourism infrastructure, water security investments	MSME support programmes; strong policy engagement	adaptation lending products
Tonga	High climate vulnerability and disaster exposure; need for resilient livelihoods	Agriculture, fisheries, tourism, small-scale commerce	Cyclone-resistant assets, resilient fisheries infrastructure, business continuity investments	Small financial sector with limited risk appetite; collateral constraints common	Greater need for guarantee support and project preparation assistance
Solomon Islands	High exposure to cyclones, flooding, sea-level rise and coastal erosion; substantial unmet demand among dispersed rural and outer-island businesses	Agriculture and agri-processing, fisheries, tourism, transport and small-scale retail	Climate-smart agriculture, resilient storage and cold-chain facilities, water-harvesting systems, resilient fisheries and tourism assets	Small, bank-dominated financial sector; private-sector credit remains limited, with significant rural access, collateral and risk-assessment constraints	Strong need for credit guarantees, concessional refinancing and project-preparation support; aggregate investments through value chains and cooperatives

MSME= micro small medium enterprise.

Source: Asian Development Bank.

The principal market failure is therefore not the absence of adaptation investment needs, but the absence of mechanisms to systematically identify, prepare, assess and finance adaptation investments at scale. This creates an opportunity to transform adaptation finance from a series of isolated projects into a recognized and repeatable lending segment. By combining adaptation investment origination and project preparation support with targeted risk-sharing mechanisms, Output 1.2.1 can help establish the foundations of sustainable adaptation finance markets, crowd in private sector capital, and generate demonstration effects that support replication and scaling across Pacific SIDS.

Support for MSME finance in the region is not novel, the analysis below provides a non-exhaustive overview of existing or upcoming projects and facilities that ADB is currently supporting relevant to MSME adaptation finance across the 4 prioritized countries. These initiatives demonstrate where demand has already been identified for related MSME financing and where enabling infrastructure, including risk-sharing facilities, guarantee schemes, and/or insurance instruments are being deployed by DFIs. However, these initiatives do not yet consider adaptation finance as a structured and repeatable lending segment. Output 1.2.1 is designed to fill this gap, building on existing national MSME finance programs and complementing rather than duplicating what is already in place.

Table 25: Identification of Current ADB Supported Projects and Facilities Relevant to MSME Adaptation Finance for Pacific SIDS (Non-Exhaustive)

Country	Existing Project/Facility	Description
Tonga	Women Entrepreneurs Leveraging Innovative Finance in Tonga ^a	Grant financing to expand business opportunities for women-led MSMEs, including post-shock recovery and resilience building, indirectly supporting adaptation capacity through income stabilization and enterprise continuity
Vanuatu	Women's Entrepreneurship, Livelihoods, Enhanced Inclusive Finance, and Adaptive Development Project ^b	Grant financing supporting women entrepreneurs, combining microfinance strengthening, a partial credit guarantee facility, business development services, and climate resilience support including parametric insurance.
Samoa	Scaling Access to Finance for Entrepreneurial Resilience Project – Samoa ^c	Proposed ADB-supported initiative focused on improving access to finance for MSMEs, particularly women-led enterprises, through targeted financial instruments, capacity building, and gender-responsive delivery mechanisms.

Papua New Guinea	Design, Development and Operationalization of a Green Guarantee Facility ^d	AFD grant funded financial instruments designed to unlock capital for climate-resilient and sustainable projects for MSMEs. ADB regional TA provides support to the Green Finance Centre, these facilities aim to reduce financial risks and lower capital costs for green investments.
Solomon Islands	Financial Access and Resilience Sector Development Programme	A Credit Guarantee Scheme was established by the Solomon Islands Government through the Ministry of Commerce, Industry and Labour Immigration , and the Ministry of Finance and Treasury . The scheme is administered by the Central Bank of Solomon Islands in partnership with local FIs.

ADB= Asian Development Bank, FIs= financial institutions, MSME= micro small medium enterprise, SIDS= small island developing states.

^a ADB. 2025. *Report and Recommendations of the President to the Board of Directors: Proposed Grant for Women Entrepreneurs Leveraging Innovative Finance in Tonga Project*.

^b Asian Development Bank. 2026. *Vanuatu: Women's Entrepreneurship, Livelihoods, Enhanced Inclusive Finance, and Adaptive Development Project* Concept Note. (Proposed as of July 2026).

^c Asian Development Bank. 2025. *Scaling Access to Finance for Entrepreneurial Resilience Pacific: Increasing MSME Resilience in the Pacific Islands, ADB Technical Assistance Programme*.

^d Bank of Papua New Guinea. 2025. Announcement of Landmark Financial Instruments, Port Moresby. Source: Asian Development Bank.

9.3.1.2 Objectives of Output 1.2.1

The objectives of Output 1.2.1 include establishing adaptation finance as a viable MSME lending segment in jurisdictions with relatively high potential for MSME development (i.e. alongside existing MSME financing programs) with a focus on women-led and women-benefiting enterprises.

The capacity of MSMEs to apply for and incentives for financial institutions to originate and finance adaptation-aligned MSME investments will be strengthened through improvements in: (i) the availability and quality of bankable pipelines, (ii) understanding and management of adaptation-related risk-return profiles.

Blended finance approaches to support market creation will be operationalised, combining non-financial interventions (pipeline development and technical assistance) with targeted risk sharing financial instruments, as a foundation and demonstration effect for mobilization of additional private capital.

More specifically, this activity is expected to:

- Increase the pipeline of identifiable and financeable adaptation investments.
- Improve the ability of participating financial institutions to identify, assess and originate adaptation lending opportunities.
- Strengthen integration between national adaptation priorities, MSME development initiatives and financial sector financing.
- Reduce information asymmetries and transaction costs associated with adaptation lending.
- Improve consistency in the identification, monitoring and reporting of adaptation investments.
- Support effective deployment of the portfolio guarantee mechanism under Activity 1.2.1.2.

9.3.1.3 Description and Strategy of Output 1.2.1

Output 1.2.1 aims to operationalize and disseminate a standardized regional implementation framework for expanding MSME adaptation finance across Pacific Small Island Developing States (Pacific SIDS). Output 1.2.1 has a two-pronged strategy to significantly reduce the key demand and supply side barriers respectively, i.e: (i) the limited pipeline of identifiable and financeable adaptation investments; and (ii) the limited willingness of financial institutions to finance those investments because of their perceived and actual credit risk.

Table 26: Activities under Output 1.2.1

Activity	Purpose
Activity 1.2.1.1 – Originate and develop a pipeline of	Establishes the Adaptation Investment Eligibility and Assessment Framework and supports the identification, preparation, aggregation and origination of

MSME Enterprise adaptation investments	bankable MSME adaptation investments, and provide guarantee window technical and administrative support.
Activity 1.2.1.2 Capitalize MSME Adaptation Portfolio Guarantee Windows	Provides a portfolio credit guarantee mechanism that shares lending risk and supports participating financial institutions to expand lending for eligible adaptation investments.

MSME= micro small medium enterprise.

Source: Asian Development Bank.

As detailed in the following paragraphs, the project strategy includes addressing demand side barriers in parallel to addressing supply side barriers, whilst ensuring that the two sets of activities are fully coherent and mutually supportive. This will be first implemented in 5 countries whilst simultaneously creating the foundation for potential expansion into countries.

Addressing demand side barriers: from adaptation need to a financeable proposition The central demand-side problem is not an absence of adaptation needs but the absence of recognised, structured, investable propositions. Many MSME adaptation activities are not seen as adaptation finance opportunities by either the enterprise or the lender, and MSME proposals frequently fall short of what PFIs require: thin financial records, weak cash-flow and revenue projections, limited market analysis, and no articulated climate or resilience rationale. The result is that demand exists but is not converted into bankable opportunities.

On this side, RPACA supports the moving adaptation investments into the financeable set. This includes identifying adaptation investment opportunities within PFIs' existing client bases and across climate-exposed value chains in agriculture, fisheries, tourism, retail and related sectors; helping MSMEs structure and present those opportunities in a form a lender can assess, including the cash-flow logic and the adaptation rationale that qualifies them under the Eligibility and Assessment Framework; and integrating adaptation investment screening into the advisory and enterprise-development services MSMEs already use, so that origination support becomes a routine part of the existing ecosystem rather than a one-off intervention. Where individual investments are small and standardised, the team supports their aggregation into volumes that PFIs can process efficiently.

A practical division of labour governs who supports which borrowers. PFIs typically extend capacity-building to their own existing clients at their own cost; the facilitation team and consultant-supported BDS providers concentrate on reaching new, underserved and harder-to-bank borrowers, including women-owned and women-led enterprises, which face additional structural barriers to finance. The intended end state of the demand-side work is a pipeline of identifiable, financeable adaptation investments that have been screened for eligibility and are ready to be presented for financing and, in turn, for guarantee coverage under Activity 1.2.1.2.

Supply side: from unfamiliar risk to a viable lending line. On the supply side, the binding constraint is that PFIs have limited experience identifying adaptation investments within their portfolios, limited methodologies to classify and verify them, and limited basis on which to price the associated risk. Adaptation lending is unfamiliar, the loss data is thin, and the investments often carry resilience benefits but limited collateral value, all of which raises the perceived risk profile and constrains lending.

The facilitation team addresses this by building adaptation lending into the way PFIs already work. This includes embedding the Eligibility and Assessment Framework and its screening tools into PFI origination, appraisal and credit processes; developing practical adaptation lending tools and, where appropriate, adaptation-aligned loan products; training credit and lending staff to recognise, screen and appraise adaptation investments; and supporting PFIs to adapt their management information, monitoring and reporting systems so that an adaptation portfolio, and once guaranteed the guaranteed portfolio, can be tracked and reported against the facility's requirements. The underlying objective is to build the institutional confidence to treat adaptation as a viable and repeatable lending segment rather than a series of exceptions.

The supply-side work is paired with the guarantee mechanism under Activity 1.2.1.2, which carries the risk-side of the same problem. Capacity-building gives PFIs the ability to lend; the guarantee

improves the risk-return profile so that they are willing to. Together they allow a PFI to build a track record in a new segment, season its portfolio, and progressively price and lend on a more commercial basis as experience accumulates.

How the two sides work together: The two tracks meet in a recurring operating loop. The facilitation team builds the frameworks, screening tools and capacity; PFIs originate eligible adaptation loans and submit them as a developing pipeline; the team supports appraisal where needed, joins PFI staff on field visits to borrowers, and monitors how the resulting loans perform. That performance experience is fed back into the regional learning and MRV layer, which uses it to refine the investment archetypes, prioritisation and screening methodologies over time, so the pipeline becomes progressively better-targeted and the assessment tools sharper. The same loop generates the country-level evidence (confirmed demand, a screened pipeline, ready PFIs) that releases guarantee capital under Activity 1.2.1.2.

The two activities are designed to operate sequentially and reinforce one another. Activity 1.2.1.1 develops a pipeline of identifiable, investment-ready adaptation projects and strengthens the capacity of participating financial institutions to originate adaptation lending. Activity 1.2.1.2 then improves the risk-return profile of those loans through a portfolio credit guarantee, enabling participating financial institutions to finance eligible adaptation investments from their own balance sheets. Guarantee capital is therefore deployed only where technical assistance has demonstrated sufficient demand, an eligible investment pipeline and institutional readiness.

Application across country windows Because the demand-side and supply-side mechanics are common, the model applies across any participating country window without being rewritten for each market. What varies by country is calibration, not architecture: the priority sectors and adaptation archetypes, the mix and readiness of participating institutions, the depth of the existing BDS ecosystem, and the pace at which the pipeline can be built. In every window the work is delivered through and alongside the country's existing MSME finance and resilience facilities, complementing rather than duplicating what is already in place, and using the adaptation eligibility, climate screening and portfolio-monitoring elements of the framework to add the adaptation dimension those facilities do not yet provide.

Delivery model: working through existing channels and ecosystems the activity will strengthen existing market ecosystems that support MSME development, climate adaptation and financial intermediation. The activity will work through and alongside existing MSME support programs, business development service providers, financial institutions, industry associations, government agencies and adaptation initiatives to improve the identification, preparation and financing of adaptation investments. This approach will leverage existing relationships, delivery channels and institutional capabilities while strengthening the long-term sustainability of adaptation finance markets. Pipeline development is delivered principally by a country facilitation team, made up of international advisory consultants working alongside local business development service (BDS) providers and market specialists, rather than by a new standing institution. The team does the bulk of the hands-on work: building the screening tools, surfacing and structuring investments, training staff, and supporting appraisal and reporting.

RPACA inputs will provide technical support and capacity building. This will include building the methodologies, developing the capacity and provides origination support. These activities will initially be intensively supported but capabilities will be transferred to, and retained by, the local institutions.

RPACA will reduce PFI lending risk whilst maintaining PFI autonomy and responsibility. The PFIs retain the credit decision and lend from their own balance sheets; and MSMEs are reached largely through the intermediaries that already serve them.

9.3.1.4 Activity 1.2.1.1 Create an Operational Framework for MSME Adaptation Investment Origination and Pipeline Development

This activity will create a standardized, regional, integrated framework and common regional methodology for identifying, assessing and reporting adaptation investments while allowing country-level prioritization based on national adaptation needs and market conditions. The framework will

define what constitutes an eligible adaptation investment, provide practical investment archetypes and screening methodologies, establish approaches for assessing additionality and market barriers, and support consistent monitoring and reporting of adaptation outcomes.

The framework will be applied in 3-4 countries through country-level market facilitation activities designed to strengthen adaptation investment origination within existing lending and enterprise development ecosystems. Support may include integration of adaptation investment screening into existing MSME advisory programmes, development of adaptation lending tools for participating financial institutions, engagement with business development service providers and market intermediaries, and collaboration with government agencies responsible for MSME development, climate adaptation and economic planning

The framework will be developed, in 3-4 countries, at the country level, structured around existing national MSME guarantee and credit enhancement arrangements, and leveraging existing governance, administration and guarantee management systems. The framework will lead to a ring-fencing adaptation guarantee capital (to be deployed under Activity 1.2.1.2), dedicated operating guidelines and adaptation-specific eligibility requirements. This approach strengthens existing national financing mechanisms rather.

The key elements of this framework are described below, including:

- Country windows;
- Eligibility criteria and assessment tools;
- Country adaptation investment priority profiles;
- Structured Investment origination process.

9.3.1.5 Country Windows

Based on the feasibility assessment undertaken to date, Papua New Guinea, Samoa, Tonga, Solomon Islands and Vanuatu have been identified as the priority country windows. These countries were selected because they demonstrate: (i) significant demand for MSME adaptation finance; (ii) existing MSME finance and credit enhancement arrangements that provide practical implementation platforms; (iii) participating financial institutions with sufficient operational capacity to support adaptation lending; and (iv) opportunities to leverage ongoing investments by the Asian Development Bank and other development partners.

These initial windows are intended to demonstrate the implementation model, generate operational experience and establish evidence for future scaling. The programme includes a dedicated Demand-Driven Expansion allocation that allows existing country windows to be expanded where subsequent assessments confirm sufficient demand, institutional readiness and appropriate implementation arrangements. This phased approach ensures that RPACA resources are directed to countries where they can achieve the greatest catalytic impact while maintaining flexibility to respond to evolving priorities across the Pacific.

9.3.1.6 Eligibility Criteria and Assessment Tools

Beyond market suitability, two key eligibility principles will be applied. First, investments should either be designed to increase climate resilience, or demonstrate the potential to do so with targeted modifications, ensuring that the activities support genuine adaptation outcomes rather than business-as-usual lending. Adaptation eligible investments will need to be defined at the participating country level by the programme, and may span a broad range of sectors where MSMEs operate and where climate risks are most acute;

- In agriculture, this includes climate-resilient crop varieties, water harvesting systems, agroforestry, and soil conservation practices.
- In fisheries, eligible investments may support sustainable aquaculture, cold storage to reduce post-harvest losses, and equipment upgrades that reduce exposure to increasingly unpredictable weather.
- In tourism, investments in cyclone-proofing of accommodation, coastal erosion protection, and nature-based solutions to protect reef and beach assets are relevant examples.

- In retail and food processing, solar-powered refrigeration and supply chain diversification to reduce climate-related disruption offer clear adaptation rationales.
- In construction, financing for climate-resilient building materials and retrofitting of existing structures to meet higher resilience standards are eligible.
- Across all sectors, investments in renewable energy, particularly solar PV and off-grid systems, that reduce dependence on imported fossil fuels and strengthen energy security for climate vulnerable MSME operations are also eligible.

This breadth reflects the cross-sectoral nature of climate vulnerability in Pacific SIDs, where adaptation needs are not confined to any single industry.

Second, investments must have an explicit gender dimension, prioritizing enterprises that are owned or led by women, that predominantly employ or serve women, or that demonstrably improve women's access to finance and economic opportunity. This reflects the structural barriers faced by women-led MSMEs in Pacific SIDs, including limited collateral, discriminatory lending practices, and concentration in informal and climate-exposed sectors.

Tools will be developed to provide a consistent basis for identifying, assessing and monitoring adaptation investments supported. This may include more detailed eligibility criteria, screening methodologies and investment archetypes that reflect the adaptation priorities and contexts of the respective Pacific Island Countries. The tools will support MSMEs, participating financial institutions and facility managers to determine whether proposed investments contribute to climate resilience and adaptation outcomes, while ensuring consistency in project selection, monitoring and reporting. See Table 27 for a description of how these tools will work. They will also serve as the basis for determining eligibility for support under the portfolio guarantee mechanism, helping to ensure that concessional resources are directed towards genuine adaptation investments and enabling aggregation of adaptation finance results across participating countries and institutions.

Table 27: Illustrating How the Tools Developed will Address Challenges to Adaptation Investment

Key Concerns	Current Challenge	How the Adaptation Investment Eligibility and Assessment Framework Responds
1. What is an Adaptation Investment?	There is no common understanding among MSMEs, financial institutions or programme stakeholders of what constitutes an adaptation investment. Many adaptation activities are not recognised as adaptation finance opportunities.	Establishes common adaptation principles, eligibility criteria and investment categories that define which investments qualify for support under the facility.
2. How do Financial Institutions Identify and Assess Adaptation Investments?	Participating financial institutions have limited experience identifying adaptation opportunities and assessing adaptation outcomes within lending processes.	Provides practical investment archetypes, screening methodologies and assessment tools that enable consistent identification and appraisal of adaptation investments.
3. How to Ensure Facility Resources Support Genuine Adaptation Outcomes?	Without a transparent assessment approach, it is difficult to determine whether supported loans contribute to climate resilience and adaptation objectives.	Provides a consistent basis for project selection, monitoring and reporting, and determines eligibility for support under the portfolio guarantee programme.

MSME= micro small medium enterprise

Source: Asian Development Bank.

9.3.1.7 Structure of the investment origination process

In each country, a pipeline of profiles for priority country adaptation investments will be developed. These profiles will draw upon National Adaptation Plans, Nationally Determined Contributions, sector adaptation strategies and other relevant national priorities to identify priority climate risks, sectors and adaptation investment opportunities. The resulting profiles will inform country-specific investment

archetypes and implementation priorities while maintaining consistency with the overarching framework.

Table 28: Proposed Structure of Investment Eligibility Framework

Framework Steps	Purpose	Illustrative Contents	Application within Facility	Level of Application
1. Adaptation Principles	Establish the overarching adaptation objectives of the facility window.	Resilience building, vulnerability reduction, adaptive capacity enhancement, climate risk management, protection of livelihoods and assets, gender equality and social inclusion.	Provides the strategic foundation for all facility-supported activities and investment decisions.	Regional Standard
2. Adaptation Investment Taxonomy and Country Prioritization	Define what qualifies as an adaptation investment and identify priority investment areas within each participating country.	Adaptation eligibility criteria, adaptation intent, climate rationale, resilience outcomes, investment categories (e.g. water security, climate-resilient agriculture, fisheries resilience, resilient tourism, ecosystem-based adaptation), country adaptation priorities informed by NAPs, NDCs and climate risk assessments.	Determines investment eligibility while guiding country-level prioritisation and pipeline development.	Regional Framework with Country-Specific Prioritisation
3. Adaptation Investment Archetypes	Provide practical examples of eligible adaptation investments.	Drought-resilient irrigation systems, cyclone-resistant business upgrades, resilient cold storage facilities, flood protection measures, resilient supply chains, climate-smart aquaculture, resilient tourism infrastructure.	Supports MSMEs, financial institutions and facility managers in identifying, developing and assessing eligible investments.	Regional Archetype Library with Country Adaptation
4. Screening and Assessment Methodology	Enable consistent assessment of adaptation investments	Screening questions, eligibility checklists, adaptation assessment templates, climate risk assessments, resilience scoring approaches, gender considerations.	Used during project origination, appraisal and approval processes.	Regional Standard
5. Additionality and Market Barrier Assessment	Demonstrate why window support is required and ensure concessional resources are catalytic.	Financing barriers, collateral constraints, tenor mismatches, affordability challenges, first-mover risks, limited adaptation lending experience, market failures and FI risk appetite limitations.	Used to determine whether investments qualify for guarantee support and to demonstrate GCF additionality.	Regional Methodology with Country-Specific Assessment
6. Monitoring, Reporting and Verification	Track adaptation investments and resilience outcomes.	Output and outcome indicators, resilience metrics, reporting templates, gender-disaggregated indicators, verification procedures and portfolio reporting requirements.	Supports facility management, country reporting and GCF monitoring requirements.	Regional Standard

7. Guarantee Eligibility and Portfolio Risk Management Requirements	Define eligibility for guarantee coverage and establish portfolio risk management parameters.	Eligible borrowers, participating financial institutions, guarantee coverage ratios, concentration limits, exposure caps, claims procedures, portfolio monitoring requirements, risk-sharing arrangements.	Governs operation of country-level guarantee facilities and determines which adaptation loans may be included in guaranteed portfolios.	Regional Parameters with Country-Level Calibration
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GCF= Green Climate Fund, NAP= National Adaptation Fund, NDC= Nationally Determined Contribution, MSME= micro small medium enterprise.

Source: Asian Development Bank.

9.3.1.8 RPACA Support Modality

RPACA support will be provided through a regional design, coordination and learning unit. This unit develops the methodologies, results systems and outreach that underpin and connect the country windows. These functions are delivered as regional public goods. The unit's functions will include:

Framework Development. To design and produce the Operational Framework for MSME Adaptation Investment Origination and Pipeline Development. This is developed once, at regional level – decreasing costs and increasing the consistency needed to aggregate adaptation results and to apply guarantee-eligibility decisions on a comparable basis across windows.

Country adaptation investment priority profiles. The upstream analytical work that turns the regional framework into country-ready inputs: market and financial-sector diagnostics, climate-risk and vulnerability screening, and the Country Adaptation Investment Prioritization Profiles that identify each market's priority sectors, climate risks and adaptation investment archetypes. These diagnostics also inform which windows are sequenced first and confirm that a window will complement rather than duplicate existing facilities.

MRV, Learning and Evaluation. The programme-level systems that track results and convert experience into improvement: the aggregation of adaptation, lending and gender-disaggregated outcomes across windows into consolidated reporting for GCF and programme governance, and the periodic evaluation that informs the mid-term review and scale-up decisions. It also runs the adaptive-learning loop at regional scale, taking lending performance and pipeline experience from the windows and using it to refine the framework's archetypes, prioritisation and screening methodologies over time. Operating MRV and evaluation centrally ensures results are measured consistently and that lessons generated in one country are available to all.

Communications and Stakeholder Engagement. The programme's outreach and knowledge function: engagement with regional bodies, development finance institutions and national authorities to sustain coordination and non-duplication, and the packaging and dissemination of tools, results and demonstration effects as regional public goods.

9.3.1.9 Activity 1.2.1.2 Capitalize MSME Adaptation Portfolio Guarantee Windows

This activity will establish country-level MSME Adaptation Portfolio Credit Guarantee Programs to support the financing of eligible adaptation investments mainly originated under Activity 1.2.1.1. The guarantee programs will address one of the principal barriers to adaptation finance in Pacific Island Countries: the elevated perceived and actual credit risk associated with financing adaptation investments, particularly for MSMEs with limited collateral, thin credit files, limited borrowing histories, or operating in sectors where adaptation lending remains relatively unfamiliar to participating financial institutions.

The guarantee mechanism will be designed to improve the risk-return profile of adaptation lending portfolios and enable participating financial institutions to expand lending to adaptation investments that would otherwise be constrained by credit risk considerations. By sharing a portion of portfolio losses, the guarantee mechanism will support the development of adaptation lending as a viable and

scalable business line while mobilizing additional private sector capital towards climate resilience objectives.

For the credit-guarantee component, a binding constraint among participating financial institutions is expected to be risk appetite. Eligible PFIs will originate and fund adaptation-aligned MSME loans from their own balance sheets but may ration or decline these loans because of perceived credit risk, limited collateral, thin borrower credit histories, limited adaptation lending experience and uncertainty regarding the performance of adaptation investments.

The guarantee programs are expected to:

- Increase the availability of finance for eligible MSME adaptation investments.
- Enable participating financial institutions to expand lending to underserved borrowers, including women-owned and women-led enterprises.
- Reduce excessive collateral requirements and address credit rationing associated with adaptation investments.
- Support financial institutions in entering new adaptation lending segments and developing adaptation-focused lending portfolios.
- Improve portfolio diversification and reduce downside lending risk.
- Mobilise additional private capital by improving risk-adjusted returns for participating financial institutions.
- Facilitate the transition of adaptation lending from a pilot activity to a sustainable and commercially viable market segment.

Key features of the guarantee mechanism include:

- Layered portfolio guarantees on eligible adaptation lending portfolios: the Programme will provide a first-loss guarantee layer combined with a pari-passu risk-sharing layer, with coverage terminating at a predefined portfolio loss cap. This innovative structure is appropriate in market-creation settings where financial institutions have limited experience, data, or risk appetite for a new lending segment. By reducing initial portfolio risk while maintaining lender participation in losses, the Programme seeks to catalyze adaptation lending and establish a viable new lending market, rather than simply transferring credit risk from participating financial institutions.
- Contingent capital, not disbursed funds: Programme proceeds are committed to a ring-fenced Guarantee Reserve, held centrally and drawn only when a guaranteed loan suffers a realized loss; recoveries are shared with the participating financial institution and the Programme's share returns to the Reserve to revolve.
- Two-layer eligibility: guarantee cover applies only to loans that satisfy the Adaptation Investment Eligibility and Assessment Framework (Activity 1.2.1.1) and the Portfolio Guarantee Eligibility Requirements established under Activity 1.2.1.2, and that demonstrate financing additionality.
- Country-tailored risk-sharing: attachment and detachment points and coverage calibrated to each market's maturity, borrower conditions, adaptation priorities and financial-sector characteristics, within a common framework.
- Prudent portfolio management: eligible-borrower and loan-size rules, sector eligibility, and portfolio-concentration and exposure limits to ensure diversification and contain risk.
- Inclusion focus: incentives and dedicated sub-windows for underserved segments, especially women-owned and women-led MSMEs.
- Market-conforming pricing: no or low fee at inception to support market creation, with a premium introduced from the mid-term review, keeping the guarantee a credit-risk tool rather than a price subsidy.
- Common standards, country-level delivery: indicative standards and governance set consistently across participating countries, with each country window administered by its own Facility Manager, hosted by the national central or reserve bank, and activated and sized to confirmed readiness and demand.

- TA-first sequencing: guarantee capital is committed only where pipeline development, project preparation and capacity-building under Activity 1.2.1.1 have confirmed eligibility, demand and institutional readiness, and where market barriers and credit-risk constraints remain the primary impediment to financing.
- Leverage and mobilisation: as contingent capital, each dollar of guarantee capacity stands behind several dollars of PFI lending, mobilising private capital that the Programme tracks alongside adaptation outcomes and portfolio performance through its monitoring and reporting systems.

Guarantee structures, coverage ratios, pricing arrangements and eligibility requirements will be tailored at country level within a common framework, allowing programs to respond to differing levels of market maturity, climate risk, financial-sector development and adaptation investment demand.

9.3.1.10 Access Eligibility to the Guarantee Window

In order to be eligible to access the Adaptation guarantee window, all loans seeking coverage will be required to meet two sets of eligibility criteria: (i) the adaptation eligibility criteria elaborated under Activity 1.2.1.1 (see Table 27 and Table 28), and; (ii) portfolio guarantee eligibility requirements. These latter are to be developed under 1.2. 1.2 and details are provided below in Table 29 .

The adaptation investment criteria determine that the investment is a qualifying MSME adaptation investment, and the Portfolio Guarantee eligibility requirements determine that the adaptation loan can receive guarantee coverage.

Table 29: Indicative Portfolio Guarantee Eligibility Requirements

Category	Requirements	Indicators
Eligibility of PFIs	Participating financial institutions will be selected through a country-level due diligence process undertaken by the Facility Manager and implementing partner. Eligible PFIs are expected to be licensed and prudentially regulated financial institutions with demonstrated financial soundness, sound governance, adequate operational capacity and experience in MSME lending. Institutions must also satisfy applicable integrity, environmental and social safeguard, and reporting requirements, and demonstrate their ability to originate, monitor and administer eligible adaptation lending portfolios in accordance with the Facility's operational requirements. Final eligibility criteria and any country-specific financial thresholds will be established during detailed facility design and documented within each country window's operating manual.	• Regulatory compliance: Licensed and in good standing with the national financial regulator. • Financial soundness: Due diligence completed with satisfactory outcome. • Operational capacity: Dedicated MSME lending team and portfolio management systems in place. • Environmental and social capacity: ESMS established and operational. • Integrity: Passed integrity, AML/CFT and sanctions due diligence. • Reporting capability: Able to provide portfolio, adaptation and gender reporting consistent with facility requirements.
Basic Underwriting Criteria	Eligible adaptation investments are screened by PFI before any credit decision is taken. The PFI first confirms that the proposed loan satisfies the two-layer eligibility test: that the underlying investment qualifies under the Adaptation Investment Eligibility and Assessment Framework (Activity 1.2.1.1), and that the loan meets the Portfolio Guarantee Eligibility Requirements established under Activity 1.2.1.2. Only loans that pass this eligibility screen proceed to credit assessment. Credit appraisal, scoring and the final lending decision are then undertaken by	• Underwriting using the lender's established credit policies; • Demonstrated repayment capacity based on projected cash flows; • Comply with prudent debt service requirements; • Verification that loan proceeds finance eligible adaptation investments; • Satisfy applicable environmental and social safeguards;

	the PFI in accordance with its own established credit policies, underwriting standards and risk appetite. The PFI lends from its own balance sheet and retains full responsibility for the credit decision. The guarantee shares a portion of portfolio credit risk on eligible loans; it does not replace prudent lending standards, does not substitute for the PFI's credit judgement, and does not indemnify lenders against poor underwriting practices. Loans that are eligible but do not meet the PFI's credit criteria are not required to be made.	• Subject to ongoing portfolio monitoring and reporting.
Eligible Borrowers	MSMEs meeting programme definitions and the lending criteria of participating financial institutions. The respective country facility may establish additional requirements relating to enterprise size, business activity, operating history, or geographic focus areas to support programme objectives.	• Share of guaranteed loans to eligible MSMEs • Share to women-led / women-benefiting enterprises • Share to first-time / underserved borrowers (additionality)
Loan Size Limits	Minimum and maximum loan sizes may be established to ensure the facility targets underserved MSME market segments and achieves an appropriate balance between outreach, diversification and administrative efficiency.	• Share of loans within the size band (ref. ceiling ~US\$125,000) • Average / median guaranteed loan size • Number of MSMEs and loans reached
Sector Requirements	The facility may establish sector eligibility or concentration parameters to promote alignment with country adaptation priorities, encourage diversification, and avoid excessive exposure to individual sectors or value chains.	• Share of portfolio cleared under the Adaptation Eligibility Framework • Maximum single-sector / value-chain share, within limit
Portfolio Concentration Limits	Limits may be established on exposure to individual borrowers, sectors, geographic areas or other risk categories to support prudent portfolio management and reduce concentration risk.	• Largest single-borrower exposure, within limit • Top-10 borrower / sector concentration ratios • Limit breaches per period (with remediation)
Guarantee Coverage Rules	The respective national facility will establish guarantee coverage percentages, portfolio caps, loss-sharing arrangements, claims procedures and recovery requirements to balance risk sharing between participating financial institutions and the facility while maintaining appropriate lending incentives.	• Cumulative claims vs 15% detachment / 12% max-liability ceiling • Portfolio default/claims rate vs base-case and stress proxies • Guarantee utilisation rate

AML/CFT= Anti-Money Laundering and Combating the Financing of Terrorism, ESMS= environment and social management system, MSME= micro small medium enterprise, PFI= public financial institution.

Source: Asian Development Bank.

Note: The above criteria represent the proposed programme-level design framework and remain subject to further due diligence, consultation and confirmation. Before implementation, specific eligibility criteria will be calibrated according to each RPACA member's national financial sector and market conditions, respective MSME financing needs, institutional arrangements, and the design and operating requirements of any existing national guarantee facility or mechanism. Existing facilities will be used and adapted where appropriate, with additional requirements introduced where necessary to meet RPACA objectives and applicable ADB policies, requirements and procedures. Final eligibility criteria, risk parameters and operational arrangements will be agreed at country level and reflected in the relevant facility documentation.

9.3.1.11 Credit Guarantee Programme Operational Approach

The RPACA MSME Adaptation Portfolio Credit Guarantee Programme is designed as a country-level implementation model that builds upon existing national MSME guarantee and credit enhancement arrangements. Rather than establishing new guarantee institutions, RPACA will utilise existing national governance, legal, administrative and operational arrangements that have already been

established under ADB-supported MSME finance programmes, while introducing a dedicated adaptation finance window with its own ring-fenced guarantee capital, operating rules and eligibility requirements.

Under this approach, each participating country will establish a Country Adaptation Guarantee Window within, or administered alongside, an existing national guarantee facility or equivalent institutional arrangement. Although institutional arrangements differ between countries, each adaptation window operates under the common framework while remaining legally and financially separate from existing guarantee portfolios.

The adaptation guarantee windows share several common operational characteristics:

- Ring-fenced guarantee capital. RPACA guarantee proceeds are maintained separately from existing MSME guarantee resources and may only be used to support eligible adaptation lending undertaken under the Facility. Existing guarantee portfolios remain unaffected.
- Separate operating guidelines. Each adaptation window operates under dedicated operating manuals covering adaptation eligibility, guarantee eligibility, underwriting requirements, claims administration, portfolio monitoring and reporting. These requirements supplement rather than replace the existing operational procedures of the host facility.
- Common governance, administration and fiduciary arrangements. Existing facility management arrangements, governance committees, legal documentation, financial management systems, claims administration processes and reporting systems are utilised wherever possible, reducing implementation costs and accelerating deployment.
- Country-specific implementation. While governance structures differ between countries, the establishes common regional standards for adaptation eligibility, guarantee design, monitoring and reporting, allowing consistent implementation across different institutional arrangements.

Participating Financial Institutions continue to originate and service loans from their own balance sheets in accordance with their normal credit policies. The guarantee does not replace prudent underwriting or transfer lending decisions to the Facility Manager. Rather, it provides partial portfolio credit protection for eligible adaptation loans that satisfy both the Adaptation Investment Eligibility and Assessment Framework and the Portfolio Guarantee Eligibility Requirements. Table 30 illustrates the common operating architecture adopted across proposed country windows.

Table 30: Integration of the RPACA Adaptation Guarantee Window with Existing ADB-Supported Credit Guarantee Facilities

Country	Existing Facilities Supported by ADB	How the Adaptation Window will be Implemented	What RPACA Adds ^a
Samoa	SAFER MSME credit enhancement Facility	Establish a ring-fenced Adaptation Guarantee Window within or alongside the existing facility, leveraging existing governance, administration, participating financial institution agreements and operational processes.	• Dedicated adaptation guarantee capital • Operating guidelines • Adaptation eligibility criteria • climate screening • Portfolio monitoring and reporting
Tonga	RSF administered through the National Reserve Bank of Tonga.	Establish a ring-fenced Adaptation Guarantee Window within the existing RSF, retaining existing governance, facility management, guarantee administration and claims management arrangements.	
Vanuatu	Reserve Bank of Vanuatu-hosted Partial Credit Guarantee structure.	Establish a ring-fenced Adaptation Guarantee Window within the existing guarantee platform, utilising existing governance, administration and guarantee management arrangements.	
Papua New Guinea	Green Guarantee Facility administered through the Bank of Papua New Guinea and the Green Finance Centre.	Establish a ring-fenced Adaptation Guarantee Window alongside the existing Green Guarantee Facility, leveraging existing governance, institutional arrangements, guarantee administration systems and participating financial institution relationships.	
Solomon Islands	Credit Guarantee Scheme	Establish a ring-fenced Adaptation Guarantee Window within the existing guarantee platform,	

	administered by the Central Bank of Solomon Islands	utilising existing governance, administration and guarantee management arrangements.	
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MSME= micro small medium enterprise, RSF= Risk Sharing Facility, SAFER = Scaling Access to Finance for Entrepreneurial Resilience Project

^a Established through the MSME Adaptation Finance Facility Model

Source: Asian Development Bank

This architecture offers several advantages over establishing new standalone guarantee institutions:

- substantially reduces implementation time by leveraging existing institutional capacity;
- minimises administrative and operating costs through shared governance and facility management;
- preserves established relationships with participating financial institutions;
- ensures consistency with existing national MSME finance programmes;
- allows adaptation finance to be introduced as a dedicated lending segment without disrupting existing MSME portfolios;
- provides a scalable model that can be replicated in additional Pacific Island Countries as demand and institutional readiness emerge.

Each country window will be administered through an existing national institutional arrangement capable of managing portfolio credit guarantees. The host institution will be responsible for holding and administering the ring-fenced Guarantee Reserve, entering into guarantee agreements with Participating Financial Institutions (PFIs), monitoring guaranteed portfolios, and adjudicating and settling guarantee claims in accordance with the Facility's operating guidelines. Consistent with existing MSME guarantee arrangements across the Pacific, this role is expected to be performed by the national central or reserve bank, either directly or in its capacity as fiscal agent, leveraging existing governance, financial management and guarantee administration systems. Day-to-day operations will be undertaken by the designated facility manager, under the oversight of an appropriate governance committee and in accordance with the standardized operating framework. Indicative country-specific implementation arrangements are summarised in the Table 31.

Table 31: Indicative Institutional Arrangements for Country-Level Adaptation Guarantee Windows

Country	Facility manager / host	PFIs / counterparties (indicative)
Samoa	Central Bank of Samoa as host/fiscal agent; day-to-day administration by facility manager.	Development Bank of Samoa, Samoa Commercial Bank, BSP, ANZ and/or other eligible FIs, subject to ADB route and due diligence.
Tonga	National Reserve Bank of Tonga as fiscal agent/host, per the RSF model.	Tonga Development Bank, ANZ Tonga, BSP Tonga, MBf Bank and other eligible licensed banks, subject to eligibility and integrity due diligence.
Vanuatu	Reserve Bank of Vanuatu as host, per the PCG model.	National Bank of Vanuatu, commercial banks, regulated MFIs and relevant financial-sector counterparts. Vanwods and other MFIs.
Papua New Guinea	Bank of PNG via a trust-fund structure, per the GGF (with the Green Finance Centre).	Kina Bank, MiBank, Women's Micro Bank, possibly BSP/ANZ later, and other institutions identified through GGF due diligence and coordination with GFC/BoPNG.
Solomon Islands	Central Bank of Solomon Islands	Development Bank of Solomon Islands, Credit Corporation Solomon Islands, ANZ, BSP, and Pan Oceanic Bank.

ANZ= Australia and New Zealand Banking, BoPNG= Bank of Papua New Guinea, BSP= Bank of South Pacific, Fis= financial institutions, GGF= Green Guarantee Facility, MBf= Malaysia Borneo Finance, MFIs= Multinational financial institutions, PCG= partial credit guarantee, PNG= Papua New Guinea, Source: Asian Development Bank.

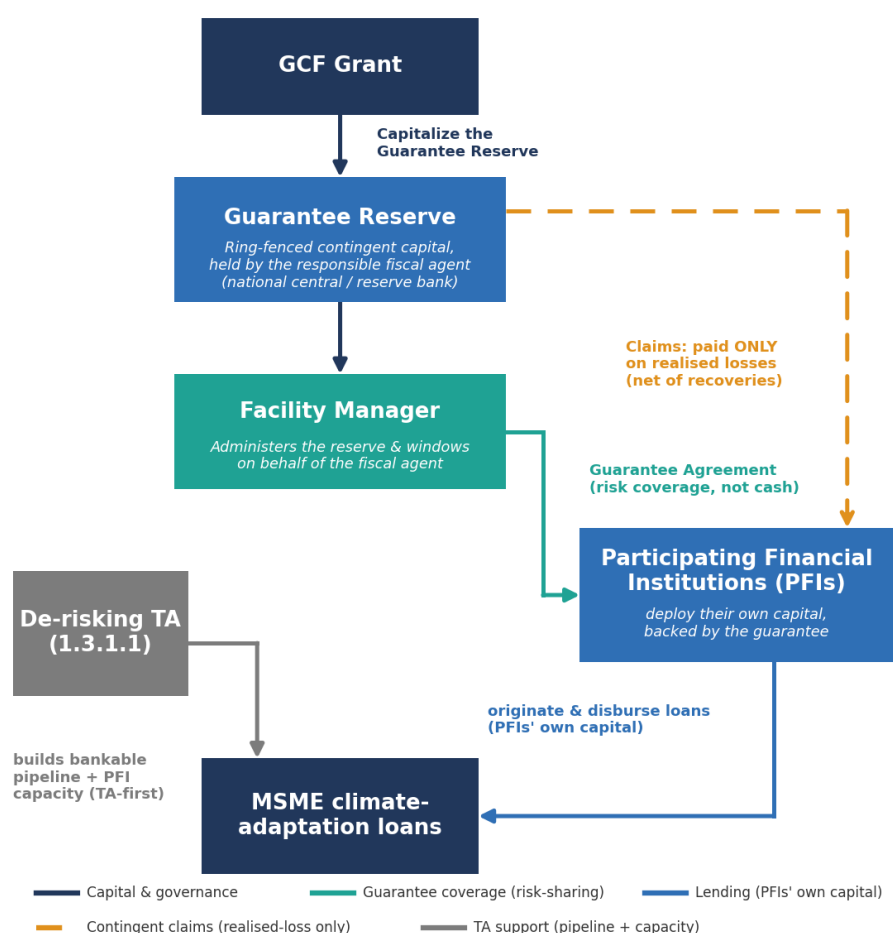
The list above is indicative only. Final selection of PFIs will be subject to due diligence, country-level market assessment, legal and fiduciary review, institutional capacity, financial soundness, willingness

to comply with facility rules, and the ability to originate, monitor, and report eligible adaptation-aligned MSME loans.

9.3.1.12 Flow of Funds

RPACA grant proceeds are used to capitalize a ring-fenced guarantee reserve. this capital is not disbursed to financial institutions: it is retained and managed centrally and is drawn upon only if and when a guaranteed loan suffers a realised loss. The Reserve is held by the responsible fiscal agent (respective national reserve bank), with the Facility Manager administering it, setting and enforcing regional standards, and contracting directly with Participating Financial Institutions (PFIs).

Figure 7: Credit Guarantee Facility Architecture — GCF Proceeds Committed as Ring-Fenced Contingent Capital.



Source: Asian Development Bank.

The five relationships shown in Figure 7 above operate as follows:

- **Capitalisation.** GCF grant proceeds capitalise the ring-fenced National Guarantee Reserve, which is held by the responsible fiscal agent (typically the national central or reserve bank), separately from any operating account and dedicated solely to meeting guarantee obligations.
- **Guarantee coverage (not cash).** The Facility Manager, administering the reserve on behalf of the fiscal agent, enters Guarantee Agreements with each PFI, providing first-loss, pari-passu or hybrid credit cover on eligible adaptation loans up to an agreed coverage percentage and within a portfolio cap. This is a contractual risk-sharing commitment. No cash passes to the PFI at this stage.
- **Lending and mobilisation.** PFIs originate and disburse adaptation-aligned MSME loans from their own balance sheets. Because the guarantee improves the risk-return profile of those loans, PFIs extend credit they would otherwise ration or decline.

- Contingent claims. GCF grant capital is drawn only upon a realised loss on a guaranteed loan. The PFI's claim is settled from the Reserve up to the coverage percentage, subject to the portfolio cap and net of recoveries, with the Facility and the PFI sharing any subsequent recoveries *pari passu*.
- TA-first sequencing. The De-risking TA builds the bankable pipeline and strengthens PFI capacity upstream, so that guarantee capital is deployed only where eligibility, demand, and institutional readiness have been demonstrated.

9.3.1.13 Guarantee Structure and Design

This section sets out how the guarantee is structured, in the order a reader needs it: first the loss-sharing choice and the recommended structure; then the parameters that specify it, with a worked example; then how the design is calibrated to each country window; and finally, the pricing and expected-loss assumptions. All values are illustrative ranges, to be realized in the feasibility study through PFI due diligence, country market assessment, legal review and expected-loss analysis, and consistent with GCF policy guidance. The guiding principle is that the guarantee must be large enough to change PFI lending behaviour, but not so generous that it weakens credit discipline.

Loss-sharing structure: first-loss, *pari passu*, and the recommended hybrid

The first design choice is how losses are shared between the Facility and the PFI. This is tuned to the level of market failure and the maturity of MSME adaptation lending in each country. Three archetypes are relevant as set out in Table 32:

- *Pari passu*. The Facility and the PFI share every eligible loss in a fixed proportion (e.g. 50/50). Because the PFI is exposed to every default, underwriting discipline stays strong; but risk reduction is only moderate and may be insufficient where adaptation lending is new, loss data is thin and PFI risk appetite is weak.
- First-loss. The Facility absorbs the initial losses of a defined portfolio up to a cap before the PFI is exposed. This transfers more risk and is powerful for market creation where PFIs are entering unfamiliar segments; but it can create moral hazard if lenders are insulated from early losses, and uses donor capital less efficiently unless tightly capped.
- Hybrid (recommended). The Facility combines both archetypes in a single layered structure operating at the portfolio level: a first-loss layer stacked beneath a *pari-passu* band. This captures the market-creation pull of first-loss exactly where it matters, the early losses, while preserving *pari-passu* discipline as losses climb.

Table 32: Facility Structure and Design Options

Structure	Risk transfer	Underwriting discipline	Mobilization	Best-fit use case
Pari passu	Moderate	Strong	Medium	Markets where PFIs already have MSME lending capacity but need partial risk-sharing
First-loss	High	Weaker unless tightly controlled	High, but lower capital efficiency	Early market creation where adaptation lending is new and loss data is limited
Hybrid	Moderate–high	Moderate–strong	Medium–high	Windows requiring both market creation and prudent credit discipline

MSME= micro small medium enterprise, PFI= public financial institution.

Source: Asian Development Bank.

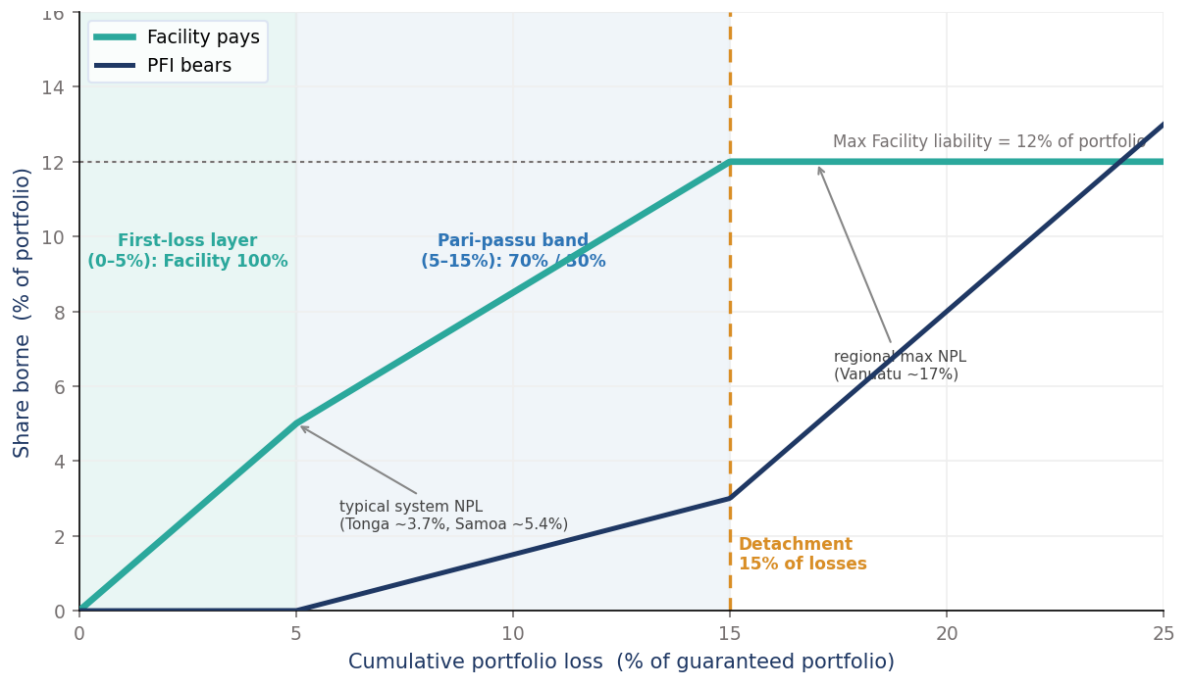
The recommendation structure is that losses on a country window's guaranteed portfolio are shared in two layers that operate simultaneously:

- First-loss layer (0–5% of portfolio losses) — Facility 100%. The Facility fully absorbs cumulative losses up to 5% of the guaranteed portfolio: the normal-course losses that most deter a lender from an unfamiliar segment.

- Pari-passu band (5–15% of portfolio losses) — 70% / 30%. Above the first-loss layer, further losses are shared 70/30, so the PFI bears 30% of every loss in this band and keeps underwriting discipline.
- Detachment at 15%. Once cumulative portfolio losses reach 15%, the Facility pays nothing more and the PFI bears the tail.

The Facility's maximum liability is therefore **12% of the guaranteed portfolio**, 5% in the first-loss layer plus $70\% \times 10\%$ in the pari-passu band, and this is the figure against which the Guarantee Reserve is sized. Figure 8 shows how the two layers share losses as a portfolio deteriorates.

Figure 8: Recommended Structure — A First-Loss Layer (0–5%) and a Pari-Passu Band (5–15%), Detaching at 15%



NPL= non-performing-loan, PFI= public financial institution.
Source: Asian Development Bank.

Calibration of the layers, where 5% and 15% come from. Both points are benchmarked to the only hard loss-side evidence available for these markets: system non-performing-loan (NPL) ratios from the IMF and World Bank, which span roughly 4–17% across the candidate countries. The first-loss layer (0–5%) is set around the normal-course NPL level of the healthier markets (Samoa ~5.4%¹²⁶, Tonga ~3.7%¹²⁷), so the Facility fully absorbs losses up to the level a PFI would expect in ordinary conditions, the slice that deters entry. The 15% detachment point is set just below the highest system NPL observed in the candidate markets (Vanuatu ~17%, disaster-driven), so the Facility shares losses across the full stress range up to the regional maximum, leaving only the extreme tail with the PFI.

A deliberately conservative anchor. NPL is a stock of non-performing loans, not a realized-loss rate. Actual losses are lower once recoveries and provisioning are taken into account. Anchoring the layers to NPL levels therefore over-provides coverage relative to expected losses, which is appropriate for a market-creation instrument and for setting a prudent maximum liability. The 5% and

¹²⁶ World Bank (2024), *Samoa Finance Sector Development and Resilience Project (P181456): Appraisal Project Information Document (PID)*, Report No. PIDIA00458, 14 August 2024; Central Bank of Samoa (2024), *Quarterly Bulletin, March 2024*, Table A-17, “Financial Soundness Indicators.”

¹²⁷ World Bank (2021), *Non-Performing Loans in East Asia and the Pacific: Practices and Lessons in Times of COVID-19*; International Monetary Fund (2023), *Vanuatu: 2023 Article IV Consultation—Press Release; Staff Report; and Statement by the Executive Director for Vanuatu*, IMF Country Report No. 23/115.

15% points are illustrative regional defaults and may be tuned per country in the feasibility study (for example a wider band where NPLs are structurally higher). The parameters that give effect to this structure are specified in Section 6.2 and illustrated there numerically.

9.3.1.14 Indicative Guarantee Parameters

The parameters in Table 33 specify the recommended structure from the previous section. They set out the two loss-sharing layers (first-loss and pari-passu) and the detachment point, the loan-eligibility and enrolment rules, the claim and recovery mechanics, and the pricing and capital treatment.

Table 33: Indicative Guarantee Parameters

Parameter	Indicative Value	Description
Loss-Sharing Structure (Portfolio Level)		
First-Loss Layer	0–5% of portfolio losses – Facility pays 100%	The Facility fully absorbs cumulative portfolio losses up to 5% of the guaranteed portfolio. This is the slice that most deters a lender from entering an unfamiliar segment, so covering it in full provides the market-creation pull.
Pari-Passu Band	5–15% of portfolio losses – Facility 70% / PFI 30%	Above the first-loss layer, further losses are shared 70/30. The PFI carries part of every loss in this band, which restores underwriting discipline as losses climb.
Detachment Point	15% of cumulative portfolio losses	Above this level the Facility pays nothing further and the PFI bears the tail. The 15% is benchmarked to the regional system-NPL range.
Maximum Facility Liability	12% of the guaranteed portfolio	= 5% (first-loss layer) + 70% × 10% (pari-passu band). This is GCF's defined maximum exposure on a portfolio and the basis on which the Guarantee Reserve is sized.
Loan Eligibility and Enrolment		
Eligible Loan Size	Per-country thresholds (indicative reference ceiling ~US\$125,000)	Caps single-name exposure and keeps the Facility focused on MSMEs; the threshold also determines the enrolment route (next row).
Tenor	3–7 years	Matched to the payback period of adaptation investments (e.g. resilient equipment, retrofits, cold storage).
Enrolment Route	Two routes, split by loan size	Smaller, standardised loans below the size threshold are enrolled automatically under a single portfolio agreement once they meet the eligibility rules, fast and low-cost for high-volume MSME lending. Larger loans above the threshold are submitted to the Facility individually for case-by-case approval before cover attaches.
Claims and Recovery		
Claim Trigger	Realised loss only	The Facility pays only once a loan has defaulted and the loss has crystallised (after a defined arrears period and enforcement) — not on arrears alone.
Claim Settlement	Per the layer reached by cumulative portfolio losses	While cumulative portfolio losses sit within the first-loss layer the Facility reimburses 100% of the realised loss; within the pari-passu band it reimburses 70%; once losses reach the 15% detachment point it pays nothing further.

Recovery Sharing	Pari passu (70/30) in the shared band	Amounts recovered after a claim in the pari-passu band are split 70/30 in the same proportion the loss was borne; the Facility's share returns to the Reserve and is available for further claims (see worked example).
Pricing and Capital Treatment		
Guarantee Pricing	Market-conforming; no / low fee at inception, premium from mid-term review	Keeps the instrument a credit-risk tool rather than a price subsidy (consistent with GCF policy) and builds toward sustainable pricing as the market matures.
Capital Nature	Contingent capital: committed, drawn only on a valid claim	GCF funds are reserved, not disbursed; this is the source of the leverage discussed below.

GCF= Green Climate Fund, MSME= micro small medium enterprise, NPL= non-performing-loan

Source: Asian Development Bank.

Worked example (US\$10 million guaranteed portfolio). As loans default, cumulative portfolio losses move up through the two layers. The Facility's payments at four illustrative loss levels are presented in Table 34.

Table 34: Illustrative Loss-Sharing and Claim Scenarios

Cumulative portfolio loss	Layer reached	Facility pays	PFI bears
US\$0.5m (5%)	First-loss layer filled	US\$0.5m (100%)	US\$0.0m
US\$1.0m (10%)	Into the pari-passu band	US\$0.85m	US\$0.15m
US\$1.5m (15%)	Detachment reached	US\$1.2m (maximum)	US\$0.3m
US\$3.0m (30%)	Beyond detachment	US\$1.2m (capped)	US\$1.8m

PFI= public financial institution.

Source: Asian Development Bank.

The Facility pays 100% of the first US\$0.5 million of losses (the 0–5% layer), then 70% of losses in the US\$0.5–1.5 million band (the 5–15% pari-passu band). Its payments reach their US\$1.2 million maximum, 12% of the portfolio, exactly as cumulative losses hit US\$1.5 million (15%); beyond that the Facility is detached and the PFI bears all further losses.

How a single claim is treated, and recoveries. Each defaulted loan is reimbursed at the rate of the layer the portfolio has reached when the claim is settled: 100% while cumulative losses are still within the first-loss layer, then 70% within the pari-passu band, and nothing once the 15% detachment point is passed. Amounts recovered after a claim in the pari-passu band are shared pari passu (70/30) in the proportion the loss was borne, and the Facility's share returns to the Reserve to back further claims.

9.3.1.15 Country-Specific Credit Guarantee Design Implications

Indicative parameters are stated, but each country window is calibrated to local market maturity, institutional capacity, and the constraints identified through the TA Facility. The short names in Table 35 (SAFER, RSF, PCG, GGF) refer to the existing MSME support facilities introduced before.

Table 35: Country-Specific Credit Guarantee Design Implications

Country Window	Implication for Guarantee Design
Samoa	Use a partial credit guarantee with a dedicated focus on women-led and women-benefiting MSMEs. Coverage levels to be finalised through feasibility work and PFI due diligence. Where existing MSME credit-enhancement arrangements (e.g. SAFER) are available, the Facility should complement or top up those mechanisms rather than duplicate them.
Tonga	Closest ready reference model. The existing risk-sharing facility covers up to 80% of eligible loans and uses a 5-year tenor; for RPACA these are reference points only, to be re-

	expressed on the Facility's realised-loss coverage basis and supplemented with adaptation eligibility and climate screening.
Vanuatu	Support viable but under-served MSMEs facing collateral constraints, thin credit history, or high climate and disaster exposure. May support collateral-light lending where justified, while preserving prudent underwriting. MFI participation depends on governance, reporting, credit management, consumer protection and regulatory readiness.
Papua New Guinea	Draws on the existing GGF for portfolio-versus-individual guarantees, eligibility thresholds, staged claims and recovery sharing, while complementing, not duplicating or refinancing, existing PNG facilities.

GGF= Green Guarantee Facility, MSME= micro small medium enterprise, PFI= public financial institution, PNG= Papua New Guinea, SAFER= Scaling Access to Finance for Entrepreneurial Resilience.

Source: Asian Development Bank.

9.3.1.16 Pricing, Expected Loss and Default Rate Assumptions

Pricing follows the market-conforming principle: little or no fee at inception to support market creation, with a premium introduced from the mid-term review as portfolios season and PFIs gain confidence. This keeps the guarantee a credit-risk instrument rather than a price subsidy and builds toward financial sustainability.

Where the default proxy enters the calculation. Expected loss on a guaranteed portfolio is, in simplified terms, $EL = \text{probability of default (PD)} \times \text{loss given default (LGD)} \times \text{exposure}$. The expected default proxy is the PD input. The Facility then applies its layered structure to those losses, covering 100% within the first-loss layer (0–5%) and 70% within the pari-passu band (5–15%), capped at the 12% maximum liability, so expected claims are the layered share of expected losses, not a single coverage percentage.

No adaptation-lending default rate yet exists for these markets, so the proxy is country-differentiated and built from two evidence sources: the project-document anchors (Tonga RSF, PNG GGF) and external system-level non-performing-loan (NPL) benchmarks from the IMF and World Bank. NPL ratios are a directional indicator of credit stress, not a loss rate. They are a stock of non-performing loans before provisioning and recoveries, are reported in different years, and are not strictly comparable across countries; MSME and early adaptation portfolios are typically riskier than the system average. Each country's proxy is used in two ways, following the PNG approach: an expected/base case for pricing and sustainability, and a more conservative stress case for sizing the Reserve.

Table 36: NPL Benchmarks

Country	System NPL Benchmark (External)	Document Anchor	Base-Case Proxy	Stress Case
Samoa	~5.4% of gross loans, Dec 2023 (well provisioned) ^a	None (SAFER not published)	~5–8%	~12–15%
Tonga	~3.2–3.7%, 2020–21 ^b	RSF 1.5–3% projected	~3–5%	~10–12%
Vanuatu	~17% (concentrated in one bank; disaster-driven) (footnote b)	None (PCG not published)	~8–12%	~20–25%
PNG	Moderate; declining since 2021; banks well-capitalised ^d	GGF 8% claims / 25% stress	~6–10%	~20–25%

GGF= Green Guarantee Facility, PCG= partial credit guarantee, SAFER= Scaling Access to Finance for Entrepreneurial Resilience

^a Samoa: World Bank (2024), *Samoa Finance Sector Development and Resilience Project (P181456): Appraisal Project Information Document (PID)*, Report No. PIDIA00458, 14 August 2024; Central Bank of Samoa (2024), *Quarterly Bulletin, March 2024*, Table A-17, “Financial Soundness Indicators.”

^b World Bank (2021), *Non-Performing Loans in East Asia and the Pacific: Practices and Lessons in Times of COVID-19*; International Monetary Fund (2023), *Vanuatu: 2023 Article IV Consultation—Press Release; Staff Report; and Statement by the Executive Director for Vanuatu*, IMF Country Report No. 23/115.

^c Papua New Guinea: IMF (2023) Article IV / programme review reports that NPLs have decreased since 2021 and that banks are well-capitalised, profitable and liquid; no single comparable system ratio is cited here.

Source: Asian Development Bank

To be revisited. These are illustrative planning assumptions, not forecasts. Base-case proxies sit near each country's system NPL (adjusted for the screening, TA support and borrower selection the Facility applies), and stress cases are set well above to size the Reserve. Country-specific proxies will be finalised in the feasibility study using MSME-segment and, where possible, PFI-level loss data, and discussed further with the project lead. External benchmarks are drawn from IMF and World Bank sources (footnotes); they are directional only.

9.3.1.17 Leverage and Loss Absorption

Leverage: Leverage is how many dollars of adaptation lending each dollar of guarantee capital stands behind. The 12% cap sets the ceiling: one dollar of capital can fully back about US\$8.30 of lending, because the most the Facility could ever pay on that ($12\% \times \text{US\$8.30} = \text{US\$1.00}$) exactly equals the capital. That ~8x is the structural maximum; operating below it simply keeps a safety cushion, which in young, data-scarce markets is deliberately large. Table 37 below shows what each US\$1 million of capital does at each leverage level.

Table 37: Illustrative Mobilization of MSME Lending

Per US\$1m of Guarantee Capital	2x	4x	6x	~8.3x
Adaptation Lending Mobilised	US\$2.0m	US\$4.0m	US\$6.0m	US\$8.3m
Maximum Facility Exposure (12%)	US\$0.24m	US\$0.48m	US\$0.72m	US\$1.00m
Capital Covers the Worst Case By	4.2x	2.1x	1.4x	1.0x

Source: Asian Development Bank.

Reading the **4x** column: each US\$1 million of capital backs US\$4 million of lending, and the most the Facility could ever pay on that is US\$0.48 million, so the capital covers the absolute worst case more than twice over. Lower leverage means a bigger cushion (left); higher leverage means more lending per dollar but a thinner cushion (right).

Table 38: Illustrative Mobilization of MSME Lending (full budget envelope)

US\$10m Guarantee Envelope	2x	4x	6x	~8.3x
Adaptation Lending Mobilised	US\$20m	US\$40m	US\$60m	US\$83.3m
Maximum Potential Claims at 12%	US\$2.4m	US\$4.8m	US\$7.2m	US\$10m
Envelope Covers Potential Claims by	4.2x	2.1x	1.4x	1.0x

Source: Asian Development Bank.

At the central 4x assumption, a **US\$10 million guarantee is expected to mobilise about US\$40 million of adaptation MSME lending**, while the most the Facility could ever pay across those loan portfolios is US\$4.8 million (12% of the portfolio), so the full envelope covers the absolute worst case more than twice over, and the bulk of it is never drawn, revolving as recoveries are made. The budget is therefore sized as the **loss-absorption capacity needed to stand behind a lending programme several times its size**, at a prudent multiple of maximum liability, rather than a sum to be spent. The objective is not to maximise leverage at any cost, but to strike a prudent balance between mobilisation, additionality, portfolio quality and sustainability; these figures are illustrative and will be refined in detailed design.

Table 39: Target Lending Capacity by Country

Country	Guarantee Capitalization	Indicative Loans at Full Deployment	Peak Lending Mobilized	Average Loan	Average Tenor	Theoretical Turnover	Cumulative Loans	Theoretical Cumulative Lending
Papua New Guinea	\$2,000,000	267	\$8,000,000	\$30,000	5 years	1.6x	427	\$12,800,000
Samoa	\$2,000,000	267	\$8,000,000	\$30,000	5 years	1.6x	427	\$12,800,000
Tonga	\$2,000,000	267	\$8,000,000	\$30,000	5 years	1.6x	427	\$12,800,000

Vanuatu	\$2,000,000	267	\$8,000,000	\$30,000	5 years	1.6×	427	\$12,800,000
Solomon Islands	\$2,000,000	267	\$8,000,000	\$30,000	5 years	1.6×	427	\$12,800,000
Total	\$10,000,000	1,333	\$40,000,000				2,133	\$64,000,000

Note: The guarantee capitalization is assumed to mobilise underlying lending equivalent to four times the capital base. Over the eight-year operational lending period, a five-year average loan tenor produces an indicative portfolio-turnover factor of 1.6, resulting in theoretical cumulative gross lending of \$64 million. It assumes full deployment, continuous recycling, no material erosion of capital from claims, and sufficient demand.

Source: Asian Development Bank.

9.3.1.18 Guarantee Allocation Rationale

The initial guarantee capital allocations have been calibrated to reflect the anticipated lending capacity, market maturity, and implementation readiness of each participating country during this initial phase of the RPACA programme. For Samoa, Tonga, Vanuatu, and Solomon Islands, an initial guarantee capital allocation of USD 2 million per country has been assessed as sufficient to support approximately USD 12 million of cumulative adaptation lending over the ten-year implementation period, based on the programme's prudent mobilisation assumption. This allocation reflects the relatively small size of these economies and financial sectors, the modest scale of existing MSME lending markets, and the expectation that adaptation finance will develop progressively as participating financial institutions build experience, project pipelines mature, and borrower awareness increases. The objective is therefore to provide sufficient guarantee capacity to catalyse market development while avoiding excessive idle capital during the early years of implementation. As demand and portfolio performance become established, the programmes could be positioned for future recapitalisation or expansion from other capital providers should market absorption exceed initial expectations.

Papua New Guinea has been allocated a higher initial guarantee capital allocation than the other participating countries. This is in part to reflect its much, much larger markets, and its potentially substantially greater capacity to absorb and deploy adaptation finance during the early years of implementation. This also reflects the need for scale, at a potentially unique moment, to generate momentum to adaptation lending to MSMEs.

In addition to having the region's largest economy, deepest financial sector, and largest MSME lending market, Papua New Guinea also has the most mature guarantee infrastructure among the participating countries. The existing Green Guarantee Facility has established operational systems, institutional relationships, and implementation experience that are expected to reduce operationalisation requirements and enable the proposed adaptation guarantee window to become operational and scale more rapidly than in other markets.

Recent consultations with the Green Guarantee Facility indicate it is generating a strong pipeline of MSME lending demand, including a proportion of prospective transactions already exhibiting adaptation characteristics. This provides encouraging early evidence that demand for eligible adaptation investments already exists within the market. These transactions, and others, could be supported under the proposed adaptation window. This presents a potentially unique opportunity to step up MSME adaptation lending in PNG. Past experience suggests that sufficient scale is needed to generate the interest and momentum needed to grab such opportunities.

Providing a larger upfront allocation will enable the facility to respond rapidly to this demonstrated demand rather than waiting for future replenishment or reallocation of programme resources. It will also position Papua New Guinea as the lead implementation market, generating operational experience, portfolio performance data, and practical lessons that can inform the progressive scaling of adaptation guarantee windows in Samoa, Tonga, Vanuatu, and Solomon Islands.

This differentiated allocation reflects differences in expected market absorption capacity, implementation readiness, and programme sequencing rather than differences in the guarantee structure, eligibility criteria, or risk appetite across participating countries.

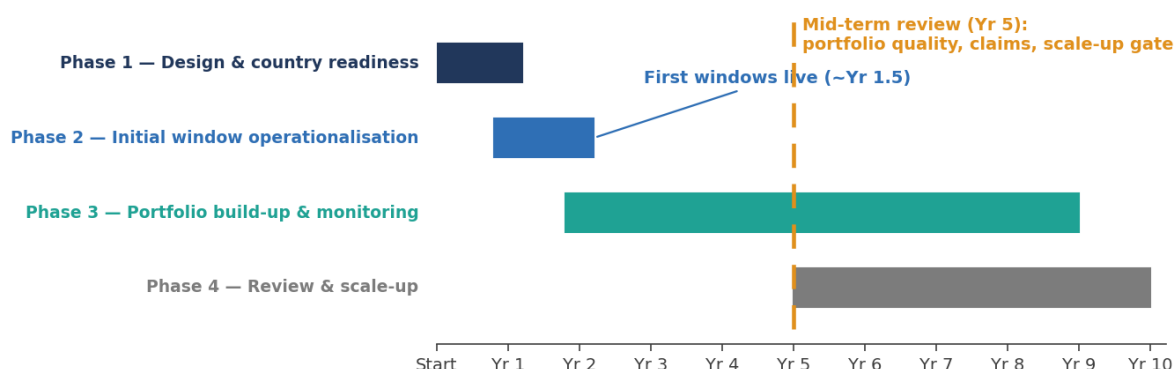
Illustrative, not final. All capital, leverage and default figures are illustrative and indicative. Absorptive capacity and achievable leverage are to be confirmed per country in the feasibility study. Budget allocation between activities and country windows should remain flexible until further consultation and analysis. The design aligns with and complements the existing facilities (Samoa SAFER, Tonga RSF, Vanuatu WE-LEAD) and the PNG Green Guarantee Facility, rather than duplicating them.

9.3.1.19 Deployment Sequence and Timeline

The windows will be deployed in phases. The sequencing is TA-first: the De-risking TA (Activity 1.2.1.1) confirms country readiness, PFI eligibility, the borrower pipeline, adaptation eligibility and non-duplication before guarantee capital is committed to a country window. This protects against committing contingent capital ahead of demonstrated demand and capacity, and lets the expansion headroom be released only where readiness is proven. The phased approach is described below and in Figure 9. Indicative country-specific deployment pathways are presented in Table 40 and costs for 1.2.1 are estimated in Table 41.

- Phase 1: Facility and country readiness assessment. Eligibility, PFI due-diligence, operating procedures, expected-loss assumptions, the claims process, reporting templates and governance arrangements.
- Phase 2: Initial country window operationalization. Establish the first country windows with eligible PFIs, sign Guarantee Agreements, test reporting systems, introduce adaptation-loan eligibility tools, and originate initial portfolios.
- Phase 3: Portfolio build-up and monitoring. PFIs originate eligible loans under the framework while the Facility Manager monitors utilization, arrears, defaults, claims, recoveries, gender targets and adaptation outcomes.
- Phase 4: Review and scale-up. Conduct a mid-term review of utilization, portfolio quality, claim experience, PFI participation, gender and adaptation outcomes, pricing, capital adequacy and sustainability. Consider utilization of demand driven allocation where assessments show demand.

Figure 9: Indicative Phased Deployment Over a ~10-year Facility Horizon



Note: Timing is illustrative and to be confirmed.
Source: Asian Development Bank.

Table 40: Country-Specific Deployment Pathways

Country Window	Indicative Deployment Pathway
Samoa	Deploy through an ADB-supported sovereign project route where feasible, working with national development finance institutions and eligible local FIs. TA should first confirm demand, FI readiness, adaptation eligibility and links to business advisory support, to avoid duplicating existing MSME finance initiatives.

Tonga	Deploy through the existing country-level women-entrepreneur risk-sharing model where feasible, using its facility-management and governance arrangements as references. RPACA would add adaptation eligibility, climate-risk screening and resilience-linked use-of-proceeds requirements.
Vanuatu	Deploy through the emerging ADB-supported women-led MSME finance and resilience platform (WE-LEAD) where feasible. TA should first assess the readiness of microfinance institutions, national banks and commercial banks, including governance, reporting, credit management and regulatory requirements.
Papua New Guinea	Deploy as an initial window, coordinating with the Green Finance Centre / Bank of PNG and complementing, not duplicating, the existing GGF. TA confirms PFI eligibility and the adaptation pipeline.
Solomon Islands	Deploy as an initial window, coordinating with the Central Bank of Solomon Islands and complementing, not duplicating, the existing CGS. TA confirms PFI eligibility and the adaptation pipeline.

ADB= Asian Development Bank, FI= financial institution, GGF= Green Guarantee Facility, MSME= micro small medium enterprise, PNG= Papua New Guinea, TA= technical assistant, WE-LEAD= Women Empowered: Leading, Educating and Developing.
Source: Asian Development Bank.

Timing is indicative. The phased timeline assumes a facility horizon of roughly seven years, aligned with comparable ADB Pacific facilities (first windows operational around year 1–2; a mid-term review around year 3 governing scale-up). Actual dates depend on GCF approval, ADB processing and country readiness, and will be confirmed during detailed design.

Table 41: Cost estimates for 1.2.1

Item	Nature of funds	Cost (US\$)
1.2.1.1 – Originate and develop a pipeline of MSME Adaptation Investments	Grant	
Regional Design, Coordination and Learning		1,450,000
Framework Development and Operationalization		1,000,000
Country Diagnostics and Adaptation Prioritization		300,000
Communications and Stakeholder Engagement		150,000
Country Adaptation Pipeline Development Windows		2,700,000
Papua New Guinea		700,000
Samoa		500,000
Tonga		500,000
Vanuatu		500,000
Solomon Islands		500,000
Country Guarantee Facility Operations and Technical Support		1,500,000
Papua New Guinea		300,000
Samoa		300,000
Tonga		300,000
Vanuatu		300,000
Solomon Islands		300,000
Total		5,650,000
1.2.1.2 – Capitalize MSME Adaptation Portfolio Guarantee Windows	Grant	
Country Guarantee Window Capitalization		
Papua New Guinea		2,000,000
Samoa		2,000,000
Tonga		2,000,000
Vanuatu		2,000,000
Solomon Islands		2,000,000
Total		10,000,000

TOTAL Output 1.2.1		15,650,000
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MSME= micro small medium enterprise.

Source: Asian Development Bank.

9.3.2 Output 1.2.2 Pacific Infrastructure Risk Advisory and Transfer Advisory Support Piloted

9.3.2.1 Problems, Barriers and Opportunities

Pacific SIDS face a persistent infrastructure investment gap driven not only by limited public resources, but by structural constraints that undermine the insurability and bankability of infrastructure assets. High exposure to natural hazards, combined with fragmented risk management practices and weak integration of risk considerations into project design, has resulted in a situation where many infrastructure projects are either underinsured or effectively uninsurable. In practice, this means that contractors are often unable to secure appropriate and affordable insurance coverage, leading to increased project risk, higher costs, or in some cases, failure to proceed with implementation. This challenge is particularly acute for community-scale and socially inclusive infrastructure, where women, youth, and persons with disabilities are often the primary users but rarely considered in risk allocation or insurance design.

A core barrier lies in how infrastructure projects are currently prepared and procured. Risk assessment, risk reduction, and insurance considerations are typically introduced too late in the project lifecycle, limiting the ability to influence design, budgeting, and risk allocation. This is compounded by the absence of standardised, insurance-relevant project information, which increases uncertainty for insurers and drives up transaction costs and pricing. At the same time, local insurance markets across the Pacific have limited underwriting capacity, while global insurers face challenges in accessing reliable data and achieving sufficient scale to justify engagement. The small size and geographic dispersion of projects further reduce market appetite, reinforcing a cycle in which infrastructure remains difficult to insure and finance.¹²⁸

Despite these constraints, there is a clear opportunity to shift the paradigm from infrastructure that is inherently difficult to insure, toward infrastructure that is designed to be insurable from the outset. By integrating risk assessment and resilience measures early in the project lifecycle, standardising project information, and aggregating projects at a regional level, it is possible to improve risk transparency and attract both insurance capacity and private investment. Existing regional institutions and platforms provide a strong foundation for coordination, while innovative approaches such as parametric insurance and pooled risk transfer mechanisms offer practical pathways to address gaps in traditional markets. Together, these elements create an opportunity to use de-risking not only as a protective tool, but as a catalyst for unlocking infrastructure finance at scale in the Pacific.

There is a clear opportunity to leverage existing engagement and committed in-kind support from the international private sector insurance market, coordinated through the Insurance Development Forum (IDF). IDF member insurers and reinsurers have already contributed resources to elaborate the PAC-INFRAT concept and have confirmed their commitment to continue supporting the pilot phase through in-kind technical assistance. This includes market intelligence, technical input to product design, insurance structuring advice, and engagement with underwriting and reinsurance capacity. Early and sustained private sector involvement ensures that the approach is anchored in practical insurance market requirements from the outset, strengthens alignment between project preparation and insurability, and enhances the credibility and scalability of the approach. By pairing GCF concessional finance with committed private sector expertise, the initiative can use public resources catalytically to unlock sustainable market participation rather than substitute for it.

9.3.2.2 Output 1.2.2 Objectives

The objectives of Output 1.2.2 include:

- Design, pilot, and operationalize infrastructure de-risking approaches that improve the insurability and investment readiness of infrastructure projects across Pacific Island Countries. This involves establishing a structured approach to integrating risk assessment,

¹²⁸ Asian Development Bank. 2024. *A Guide To Insurable Infrastructure in the Pacific*.

risk reduction, and risk transfer into the infrastructure lifecycle, ensuring that projects are designed, procured, and implemented in a way that is consistent with insurance market requirements and investor expectations. By doing so, the output seeks to address one of the core bottlenecks to infrastructure delivery in the region, namely the inability to secure appropriate and affordable risk coverage. The pilot will also ensure that risk assessment and insurance solutions incorporate GEDSI considerations, so that infrastructure projects deliver resilience benefits equitably across social groups.

- Demonstrate a viable, scalable Programme model that can be applied across different countries and infrastructure sectors. Through a pilot phase, the activity will test how coordinated support, standardized processes, and aggregation mechanisms can improve risk transparency, reduce transaction costs, and enable more efficient access to insurance markets. Demonstration will include equity metrics, showing how inclusive infrastructure design improves insurability and resilience outcomes for vulnerable communities. This demonstration effect is critical to building confidence among governments, development partners, and private sector actors, and to establishing a repeatable model that can be expanded beyond the initial set of projects.
- Mobilise additional public and private capital into climate-resilient infrastructure by improving the underlying risk-return profile of projects. By reducing uncertainty, clarifying risk allocation, and facilitating access to appropriate insurance solutions, the Programme is expected to crowd in private sector participation while also reducing contingent liabilities for governments. In parallel, it will support the development of more resilient infrastructure systems that are better aligned with climate adaptation priorities, contributing to long-term sustainability and development outcomes across the Pacific.
- Scale and institutionalize the Programme as a sustainable regional platform for infrastructure de-risking across the Pacific. Building on the pillars established, tested, and refined during the pilot phase, the Programme will transition from a time-bound pilot to a permanent, standardized regional platform. This will involve expanding operational infrastructure, formalizing governance and coordination arrangements, and strengthening service delivery capacity to systematically support infrastructure projects across countries and sectors. Clear roles and responsibilities among stakeholders, alignment with existing regional institutions, and standardized operating protocols will ensure efficient operation at scale, consistency in approach, and durable impact beyond individual projects.

9.3.2.3 Description

This output supports the design and pilot implementation of the Pacific Infrastructure Risk Advisory and Transfer (PAC-INFRAT) approaches¹²⁹, to strengthen the integration of insurance, risk transfer and climate risk management within adaptation infrastructure investments supported under Component 2.

PAC-INFRAT will provide targeted technical assistance to selected adaptation infrastructure investments to improve project insurability, strengthen climate risk management, support more effective procurement and risk allocation, and facilitate access to appropriate insurance and risk transfer solutions. The pilot will demonstrate practical methodologies that can be embedded within future infrastructure preparation and delivery by participating governments, ADB and regional partners.

The Programme will deliver support across **three integrated pillars**, designed to embed risk considerations systematically throughout the infrastructure lifecycle:

1. Procurement De-risking

- Standardisation of project data and documentation (e.g. via SOURCE platform)
- Integration of risk assessment and insurance consideration into project preparation and procurement

¹²⁹ Insurance Development Forum (IDF) 2026. *Recommendations to Action: Insurable Infrastructure Solutions in the Pacific*.

- Improved risk allocation between governments, contractors and financiers
- Embedding risk management and insurance costs into project budgets

2. Risk Assessment & Reduction

- Early-stage multi-hazard risk assessments to inform project design
- Integration of resilience and risk reduction measures into design and construction
- Lifecycle risk management from construction to operation
- Access to specialized technical expertise through a pre-qualified roster

3. Risk Transfer (Insurance Solutions)

- Structuring and placement of insurance solutions across local, regional, and global markets
- Use of parametric insurance (via PCRIC) for natural hazards
- Tailored solutions for non-natural hazard risks (e.g. construction, delays, liability)
- Aggregation of projects into portfolios to improve pricing, market access and efficiency

The pilot phase will apply this integrated model to a selected pipeline of infrastructure projects, phased directly with Component 2 infrastructure investments, with the objective of demonstrating:

- Improved insurability
- Reduced project risk
- Enhanced investor confidence
- Practical pathways to scale

If the pilot demonstrates measurable improvements in project insurability, insurance pricing, procurement efficiency and investment readiness, the methodologies developed under PAC-INFRAT may be progressively incorporated into future adaptation infrastructure investments supported by participating governments, ADB, PRIF, and other development partners. Any broader institutionalisation or expansion beyond the pilot would be considered following evaluation of implementation results and confirmation of country demand and partner support.

9.3.2.4 Activity 1.2.2.1 Design and Pilot Infrastructure De-Risking Approaches

This activity will operationalize the PAC-INFRAT Programme through a structured pilot phase¹³⁰, focused on testing, refining, and establishing a scalable and institutionalized approach to the infrastructure de-risking across RPACA component 2 investments. This will involve (1) Market assessment and pipeline selection, (2) Programme Design Finalization, (3) Pilot implementation, (4) Stakeholder Coordination, and (5) Evaluation and Scale-up Roadmap. These sub-activities are described below.

Market Assessment and Pipeline Selection includes:

- Working with participating governments and the RPACA Component 2 implementation team, review PRIF pipeline to identify priority infrastructure investments with significant risk and insurability constraints
- Select a diversified pool of potential pilot projects from the RPACA Component (10 projects across countries and sectors shall be selected from the total Component 2 pipeline)
- Assess project specific insurability gaps, risk exposure, and de-risking needs to inform Programme support

Programme Design Finalization includes the final selection of 2 projects.

Prioritization should consider the project's climate and disaster exposure, readiness and expected commitment date, availability of the technical data required by insurers, potential insurance-market

¹³⁰ This approach is aligned with the IDF proposal mentioned previously.

interest, the additionality and affordability of insurance, country and sector representation, and the potential for replication across the Pacific.

- Confirm governance and hosting arrangements, building on existing regional platforms (e.g. PCRIC and other appropriate regional institutions)
- Define roles and responsibilities of ADB, PIC governments, insurers, brokers and technical providers
- Establish standardized operational protocols, workflow, and eligible criteria for the Programme's core services across the three pillars

Pilot Implementation for the 2 short-listed infrastructure projects from Component 2.

This sequencing will be coordinated with Component 2's expected commitments in 2027, 2028, and 2029. PAC-INFRAT engagement should begin sufficiently early, during project preparation and due diligence, to influence project design, risk allocation, procurement, and insurance requirements. The following sequencing will be required.

Procurement Support :

- Standardise insurance relevant project information and documentation to reduce uncertainty and transaction costs for insurers and contractors
- Integrate risk assessment and insurance requirements into project preparation and procurement, including bidding documents and contracts
- Define and apply clear risk allocation frameworks that appropriately allocate risks among governments, contractors, financiers, and insurers
- Procurement frameworks will require contractors to demonstrate GEDSI-sensitive design features, such as accessibility standards and gender-responsive safeguards.

Risk Assessment & Reduction:

- Conduct early-stage and detailed risk multi-hazard and other risk assessments to inform project design, costing, and implementation decisions
- Recommend and embed targeted risk reduction and resilient measures into project design, construction, and operational planning
- Establish lifecycle risk monitoring processes from construction through operation, aligned with asset management and insurance requirements
- Risk assessments will include gender-disaggregated vulnerability analysis and community consultation, ensuring resilience measures address diverse needs.

Risk Transfer:

- Aggregate projects into portfolios, where feasible, to improve market access, pricing, and efficiency Structure and place appropriate insurance solutions across local, regional, and global markets, including: Parametric insurance for natural hazard risks, and Indemnity insurance for construction, liability, and delay risks
- Facilitate structured engagement with brokers, insurers, and reinsurers to support placement, capacity mobilization, and market learning
- Insurance solutions will be designed to cover community-scale assets and services, ensuring equitable access to risk transfer mechanisms.

Stakeholder Coordination:

- Engage PIC governments, PRIF, PCRIC, insurers, brokers, and MDBs to ensure coordinated delivery and alignment with regional priorities
- Establish formal technical advisory mechanisms to support Programme governance, technical quality, and market alignment
- Build local capacity with government and insurer markets, strengthening long-term ownership and sustainability

- Capacity building will include training on gender-responsive risk management and inclusive insurance product design.

Evaluation and Scale-up Roadmap:

- Assess pilot performance against key metrics including cost efficiency, coverage achieved, and investor and insurance market response)
- Document lessons learned and good practices from pilot implementation to inform refinement of the Programme model
- Develop a clear roadmap for full Programme operationalization and scaling, including governance, resourcing, and regional expansion

9.3.2.5 Activities 1.2.2.1 Costs

Table 42: Activity 1.2.2.1 Costs

Item	Cost (US\$)
Activity 1.2.2.1 – Design and Pilot Infrastructure De-risking Approaches	1,500,000

Source: Asian Development Bank.

9.3.2.6 Gender and Social Inclusion

PAC-INFRAT ensures that resilience benefits are equitably distributed. Risk assessments will include gender-disaggregated data and community consultations; procurement frameworks will require inclusive design standards; and insurance solutions will be tailored to cover community-scale assets serving vulnerable groups. By embedding GEDSI into infrastructure de-risking, Outcome 1.2.2 ensures that fiscal resilience and insurance innovation deliver not only technical and financial outcomes, but also social equity, advancing RPACA's paradigm shift toward inclusive climate-resilient infrastructure systems.

9.4 Outcome 1.3: Financial Sector Authorities and Financial Institutions Adopted Regional and International Aligned Climate Finance Approaches

9.4.1 Outcome Description

Outcome 1.3 strengthens national financial institutions to integrate climate risk and climate investment considerations into financial sector policy, regulation, lending, investment decision-making, and disclosure. It complements Outcomes 1.1 and 1.2 by strengthening the broader financial system, including regulators, development finance institutions and commercial lenders, to support the enabling environment through which private capital can be mobilised for climate adaptation at scale. Together, these outcomes constitute RPACA's integrated response to the full spectrum of institutional barriers limiting climate finance across Pacific Island Countries.

Outcome 1.3 is targeted at the countries best positioned to benefit from financial sector strengthening, reflecting variation in regulatory maturity and domestic financial sector capacity across the 14 DMCs. It combines regional framework development with country-level technical advisory services to support institutions to implement those frameworks within their own regulatory contexts. The approach recognises that PIC financial regulatory authorities have expressed preferences for regional coordination and cooperation on implementing climate and adaptation frameworks.

9.4.2 Output 1.3.1 National Financial Sector Policy, Regulatory and Institutional Capacities are Strengthened in Accordance with Regional and International Frameworks

9.4.2.1 Output 1.3.1 Background and Problem Analysis

Pacific Island Countries (PICs) face some of the world's highest levels of climate vulnerability while operating small, fragmented financial systems with limited institutional capacity. Although adaptation is the overriding climate priority across the Pacific, financial systems remain at an early stage of integrating climate considerations into financial regulation, supervision, investment decisions, lending practices, and financial market development. Institutional constraints across central banks, development banks, commercial banks, insurers and other financial institutions continue to limit the

mobilisation of private capital for climate adaptation, particularly for underserved households and MSMEs.

Over the past several years, considerable progress has been made in establishing the foundations for sustainable finance across the region. International partners including the IMF, World Bank, ADB, GGGI and others have supported important initiatives such as climate finance strategies, supervisory capacity building, sustainable finance policies, green finance taxonomies, ESG guidelines and inclusive green finance frameworks. Papua New Guinea has established one of the region's most advanced sustainable finance programmes, including an Inclusive Green Finance Policy, Green Taxonomy, Green Finance Centre and associated financing mechanisms. Fiji has launched its own national Green Finance Taxonomy, while work is now underway to develop a high-level Pacific Regional Taxonomy for participating central banks.

While these initiatives represent important progress, consultations undertaken during RPACA preparation highlighted that there still existing gaps both at the regional level and national level with respect to climate risk management and alignment with adaption-specific investment.

Financial institutions require practical support to operationalise sustainable finance policies, integrate taxonomy principles into lending and investment decisions, develop adaptation-focused financial products, strengthen climate risk management, and build institutional capability to apply new regulatory expectations.

Regulators similarly require practical implementation tools, proportionate supervisory approaches, and country-level support to embed sustainable finance within existing supervisory processes. Existing regional initiatives have intentionally focused on establishing common principles, leaving substantial demand for country-level contextualisation, institutional readiness, implementation guidance and market development.

The challenge is particularly acute for adaptation finance. Although adaptation represents the highest climate priority for Pacific economies, existing sustainable finance frameworks have primarily focused on mitigation activities, reflecting the greater complexity of developing adaptation classification systems and the significant data requirements associated with adaptation screening. Stakeholder consultations confirmed strong demand for practical guidance that enables financial institutions to identify, classify, originate and finance adaptation investments, while ensuring consistency with emerging regional sustainable finance frameworks.

Institutional capacity constraints further compound these challenges. Many Pacific central banks and financial institutions operate with small specialist teams, limited technical resources and competing supervisory priorities. Development banks and commercial banks likewise face constraints in designing new financial products, assessing climate risks, developing bankable adaptation pipelines and integrating climate considerations into lending operations. These constraints are particularly significant for smaller jurisdictions, where institutions must implement increasingly sophisticated international standards despite limited human and financial resources.

The proposed intervention therefore focuses not only on elaborating on policy frameworks, but also on helping Pacific financial institutions implement, operationalise and scale existing sustainable finance initiatives. By combining regional public goods with targeted institutional support, the programme seeks to bridge the implementation gap between policy development and mobilisation of private adaptation finance.

9.4.2.2 Output 1.3.1 Objective

The objective of Output 1.3.1 is to strengthen the capacity of Pacific financial sector authorities and industry stakeholders to mobilise, regulate and intermediate climate and adaptation finance by supporting the implementation of climate-aligned financial sector frameworks.

The programme will utilize a regional implementation approach through RPACA that develops shared tools, guidance, methodologies and peer-learning programmes, complemented by targeted technical assistance for selected central banks, development banks, commercial banks, insurers and other financial institutions. Rather than duplicating existing policy development initiatives, the programme

will focus on institutional readiness, implementation support, adaptation finance classification, climate risk integration, financial product development, and capacity building needed to translate regional frameworks into operational practice.

Support will be delivered on a demand-driven basis, focusing on institutions and countries where implementation opportunities are greatest and where activities complement ongoing initiatives by GGGI, IMF, World Bank, ADB and other development partners. Throughout the programme, GEDSI considerations will be integrated into financial sector policies, supervisory approaches, adaptation finance classification systems and financial products to ensure that increased climate finance reaches women, youth, persons with disabilities and other vulnerable populations.

9.4.2.3 *Activity 1.3.1.1 Strengthen Climate-Aligned Financial Sector Policy Implementation and Institutional Readiness*

Workstream 1. Financial Sector Diagnostics and Policy Prioritisation. Assess national financial sector readiness and identify policy, regulatory and coordination priorities for implementing climate-aligned financial sector frameworks that strengthen the financial sector's capacity to mobilise and manage adaptation finance.

Indicative activities include:

- Financial sector diagnostics and stakeholder mapping.
- Assessment of national policy, regulatory and institutional readiness.
- Mapping of existing climate initiatives by ADB, IMF, World Bank, GGGI and other development partners.
- Identification of adaption implementation priorities for financial sector authorities.
- Identification of priority areas for technical assistance.

Workstream 2. Climate-Aligned Financial Sector Policy and Regulatory Support. Support central banks and other financial sector authorities to adopt and implement regional and national sustainable finance and adaption principles through financial sector regulatory policy and supervisory frameworks.

Indicative activities include:

- Incorporation of regional sustainable finance policy (i.e. Regional Pacific Climate Change Taxonomy) into national financial sector policy frameworks.
- Development of national sustainable finance taxonomies or classification approaches that support adaption investment.
- Climate-related financial risk policy and supervisory guidance where appropriate.
- Climate disclosure and reporting frameworks, using proportionate approaches.
- Policy guidance on adaptation finance and climate-related financial sector governance.
- Development of climate and adaption finance regulatory guidance notes and supervisory tools.
- Integration of GEDSI considerations into financial sector policy frameworks.

Workstream 3. Industry Strategy, Coordination and Knowledge Exchange. Promote consistent implementation of climate-aligned finance across the financial sector through industry guidance, regional coordination and peer learning.

Indicative activities include:

- Development of banking industry roadmaps/action plans/ implementation guidance and good practice notes.
- Technical workshops delivered through banking associations, development finance networks and insurance associations.
- Regional peer-learning through central bank networks, ADFIP and national banking associations.
- Dialogue facilitation between regulators and industry on implementation challenges.
- Documentation of country experiences and implementation case studies.

- Regional knowledge exchange and dissemination of lessons learned.
- Communities of practice on sustainable finance implementation.

9.4.2.4 Selection of Countries

The precise scope of each work stream support will be determined through the country diagnostics and tailored to each country's institutional maturity, policy priorities and implementation needs.

Initial implementation support is expected to focus on Fiji, Papua New Guinea, Samoa, Solomon Islands, Tonga and Vanuatu. These countries have established central banking institutions, active sustainable finance initiatives and significant opportunities to build upon ongoing support provided by development partners. Additional countries may access support through the demand-driven implementation window where institutional readiness, government demand and implementation opportunities are demonstrated.

9.4.2.5 Implementation Principles

Implementation under this activity will be guided by five principles:

- **Demand-driven:** Technical assistance will respond to priorities identified by participating governments and institutions.
- **Implementation-focused:** The activity will prioritise operationalisation of existing frameworks rather than development of new policy instruments.
- **Complementary:** Activities will be coordinated with GGGI, IMF, World Bank, ADB and other partners to avoid duplication.
- **Proportionate:** Support will be calibrated to the institutional capacity and regulatory maturity of each participating country.
- **Regional with national application:** Regional principles and tools will be implemented through nationally tailored solutions reflecting each country's legal, regulatory and institutional context.

9.4.2.6 Existing Regional Sustainable Finance Initiatives and RPACA Additionality

Table 43 summarises the principal sustainable finance initiatives currently underway across the Pacific region and illustrates how RPACA complements these efforts. Rather than developing new regional frameworks or duplicating existing technical assistance, Output 1.3.1 focuses on supporting countries and financial institutions to implement and operationalise emerging sustainable finance principles within their own regulatory and institutional contexts, addressing the remaining implementation and institutional readiness gaps. As implementation will be demand-driven, detailed country diagnostics and partner mapping will be undertaken during project inception to assess institutional readiness, identify ongoing initiatives, and ensure that RPACA support is fully aligned with national priorities and complements, rather than duplicates, existing and planned interventions by governments and development partners.

Table 43: Existing Sustainable Finance Initiatives and Complementarity with RPACA

Existing Initiative	Role in RPACA
GGGI Greening the Pacific Financial System	Country implementation and operationalisation of regional principles
IMF/PFTAC	Practical implementation of supervisory tools suited to Pacific institutions
AFI	Support national implementation of Inclusive Green Finance commitments
World Bank / IFC	Complement financial sector reform through institutional implementation
UNCDF	Build institutional capacity to deploy resilience finance products
ADFIP	Regional Delivery platform for development bank support
National Banking Associations	National Delivery platform for support to commercial banks

ADFIP= Association of Development Financing Institutions in the Pacific, AFI= Alliance for Financial Inclusion, GGGI= Global Green Growth Institute, IMF= International Monetary Fund, PFTAC= Pacific Financial Technical Assistance Centre, UNCDF= United Nations Capital Development Fund.

Source: Asian Development Bank.

Initial implementation support is expected to focus on Fiji, Papua New Guinea, Samoa, Solomon Islands, Tonga and Vanuatu, reflecting the presence of central banking institutions, existing sustainable finance initiatives, and opportunities to complement ongoing partner programmes. Other Pacific Island Countries will access regional guidance, knowledge products and peer-learning activities, with targeted advisory support provided where appropriate institutional arrangements exist.

9.4.2.7 Indicative Costing

The countries and final topics where to be deployed will depend on additional consultations, indicative costs for each activity (per country) are presented in Table 44.

Table 44: Indicative Costing per Country

Country	Cost (USD)	Rationale
Papua New Guinea	1,000,000	Largest financial sector, central bank already leading sustainable finance reforms, strongest opportunity to operationalise taxonomy, ESG guidance and adaptation finance. Largest number of financial institutions and strongest linkages with Output 1.3.
Fiji	800,000	Second most advanced market; Green Finance Taxonomy already launched; strong commercial and development banking sector; important regional demonstration effect.
Samoa	600,000	Active sustainable finance work and strong implementation opportunities with regulator and banking sector.
Solomon Islands	600,000	Priority central bank under current regional programmes with significant implementation needs.
Tonga	500,000	Smaller financial system but directly linked to RPACA guarantee activities.
Vanuatu	500,000	Similar scale to Tonga with opportunities to integrate regulatory and institutional support.
TOTAL Output 1.4.1	4,500,000	

ESG= environmental and social governance, USD= United States Dollar.

Source: Asian Development Bank

9.4.2.8 Contribution to RPACA Theory of Change

Outcome 1.3 contributes to RPACA's theory of change by embedding climate risk into the mandates of national financial institutions. By strengthening central banks and financial regulators through regional frameworks, shared taxonomies, and in-country advisory support, it ensures that climate considerations are systematically integrated into financial sector oversight. This reduces systemic risk, improves transparency, and mobilizes private capital for adaptation. In doing so, Outcome 1.3 removes institutional barriers to scaling climate finance and creates a consistent enabling environment across the Pacific, advancing RPACA's paradigm shift toward resilient and sustainable financial systems.

9.4.2.9 Contribution to Gender Equality and Social Inclusion

Outcome 1.3 embeds GEDSI by ensuring that climate risk frameworks and sustainable finance taxonomies incorporate gender-disaggregated data, equity indicators, and inclusive classification standards. Regional learning products will highlight differentiated climate risks faced by women, youth, and persons with disabilities, while disclosure requirements will ensure financial institutions report on equity outcomes alongside climate exposures. Country-level implementation support will include advisory services to integrate gender-responsive governance structures within central banks, establish inclusive eligibility criteria for climate-aligned investments, and build supervisory capacity to monitor social as well as financial risks. By embedding GEDSI into financial oversight, Outcome 1.3

ensures that strengthened regulatory systems deliver resilience benefits equitably, advancing RPACA's paradigm shift toward climate-responsive and socially inclusive financial sectors.

10 Component 2: Protecting Pacific Communities through Climate-Resilient Infrastructure and Coastal Protection

This section describes the proposed Component 2 of RPACA which will deliver climate resilient infrastructure.

10.1 Introduction

Component 2 is the infrastructure investment component of RPACA. It is associated with Outcome 2.1: Climate resilience of communities, infrastructure systems, and institutions strengthened.

The Outputs of Component 2 are:

- Output 2.1.1 Evidence-based, system-scale climate adaptation sub-projects developed and approved.
- Output 2.1.2 Climate-resilient and inclusive adaptation infrastructure sub-projects completed and operationalized.
- Output 2.1.3 Institutional capacity and enabling environment of national agencies for climate-resilient and inclusive infrastructure management strengthened.

Based on the analysis of climate vulnerabilities (Chapters 3 – 6) all potential sub-projects are to aligned to a ‘typology’ – ensuring they are optimal for contributing to resilience and for shifting the systems onto an adaptive pathway.⁵⁰ These typologies are described below. Each sub-project will be assessed not only for climate rationale but also for equity outcomes, ensuring that adaptation pathways reduce risks for women, youth, persons with disabilities, and marginalised communities. Further, each potential sub-project will be rigorously assessed against a compressive list of eligibility criteria to ensure it is eligible for RPACA and GCF support. These criteria are described below. The process for developing, selecting and designing projects is also described below.

10.2 RPACA Adaptation Project Typology

Adaptation sub-projects under Component 2 will align with one or more of the identified RPACA adaptation project types outlined in the RPACA typology¹³¹ below. The project types have been developed by mapping sectoral climate impacts and developing adaptation pathways. This identifies the proposed adaptation pathway (climate rationale) for a project concept at an early stage of sub-project development and represents a mechanism for initial screening to ensure that selected sub-projects have the potential for adaptation impact.

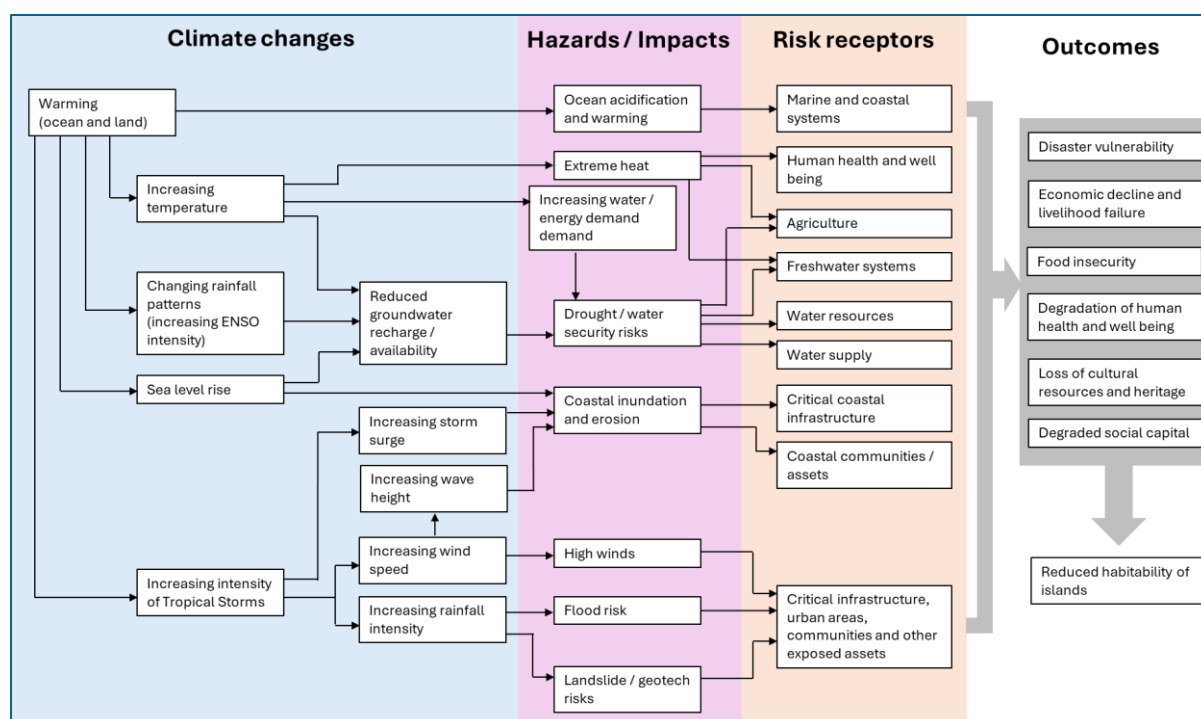
Importantly, the typologies are not a positive list of activities that are ‘approved’ in principle. For each specific potential investment, the climate vulnerability context will be evaluated at a system-scale to provide the evidence base for RPACA eligibility. The RPACA eligibility criteria, described in the sections below, ensure a strong and demonstrated climate adaptation rational, and sub-project level monitoring frameworks to evaluate resilience benefit. Eligibility criteria will also require demonstration of GEDSI outcomes, including gender-disaggregated beneficiary data, inclusive design standards, and safeguards to ensure equitable access to resilience benefits.

In Chapter 5, climate hazards and changes were conceptually mapped to impacts on the risk receptors or ‘systems’. This ‘impact pathway’ is represented in Figure 10 and subsequently extended to identify ‘adaptation pathways’ across the following key development sectors:

- Coastal and flooding;
- Water;
- Energy;
- Transport;
- Urban; and
- Health and social care.

¹³¹ A typology is a system of classifying things into groups, often used in social and natural sciences. So, in this case, a ‘typology’ is an adaptation project classification system. Often typologies have types and sub-types (like a taxonomy).

Figure 10: How Climate Hazards, and Climate Change, Impact Risk Receptors or ‘Systems’ and Lead to Negative Outcomes



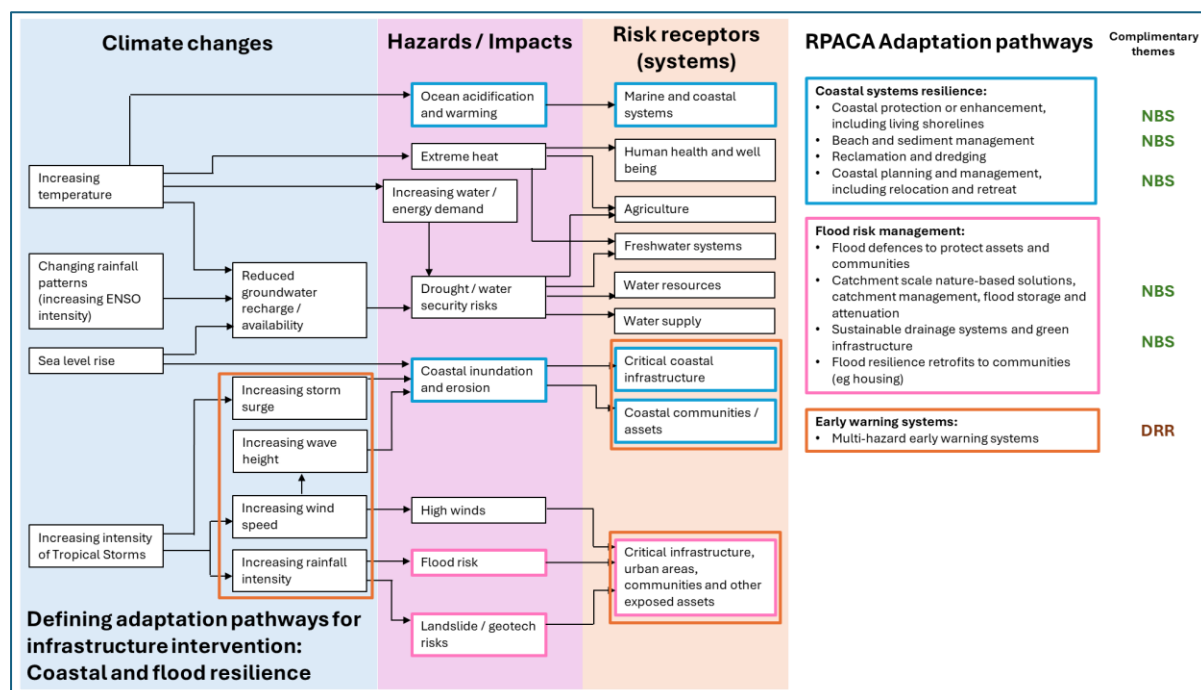
ENSO= El Niño Southern Oscillation.

Note: This builds on analysis and conceptualisation in IPCC (2022).

Source: Asian Development Bank.

Figure 11 to Figure 16 present the results of this sectoral adaptation pathways mapping.

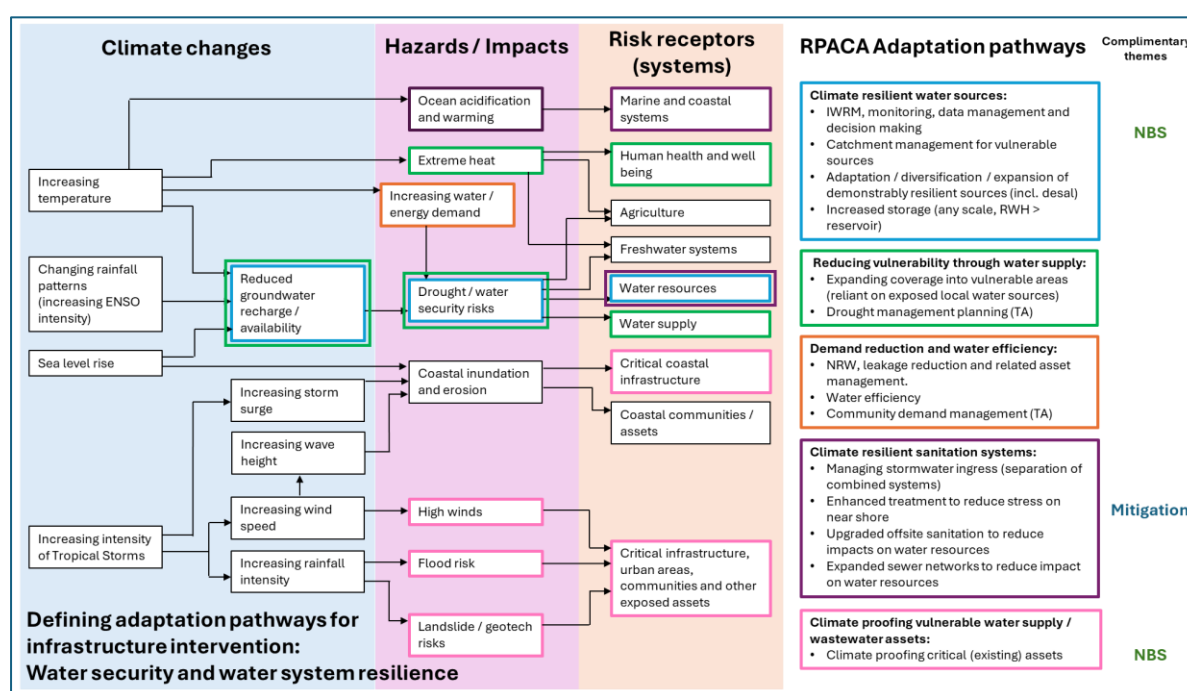
Figure 11: Coastal and Flood Resilience



DRR= disaster risk reduction, ENSO= El Niño Southern Oscillation, NbS= nature-based solutions.

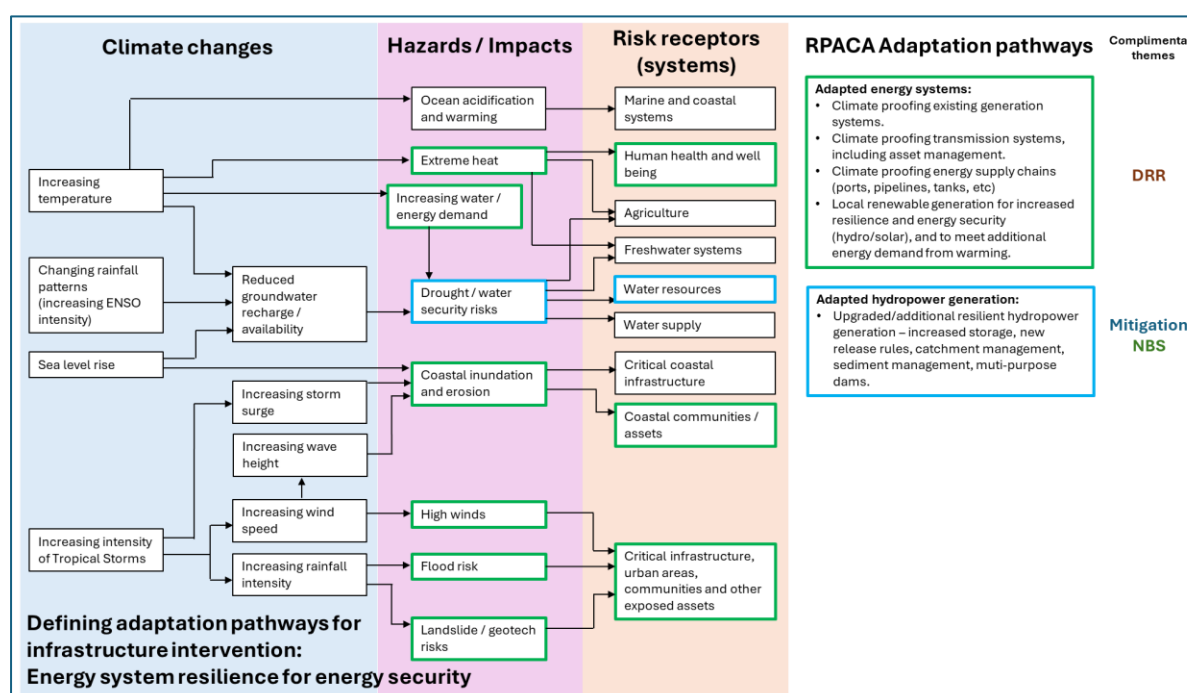
Source: Asian Development Bank.

Figure 12: Water Security and Water System Resilience



ENSO= El Niño Southern Oscillation, IWRM= integrated water resources management, NbS= nature-based solutions, RWH= rainwater harvesting, TA= technical assistance.
Source: Asian Development Bank.

Figure 13: Energy System Resilience



DRR= disaster risk reduction, ENSO= El Niño Southern Oscillation, NbS= nature-based solutions.
Source: Asian Development Bank.

For the energy sector, RPACA's recognises that transformation is not a standalone mitigation objective in the Pacific – it is a foundation for systemic climate resilience. Resilient energy systems and energy security can strengthen critical service delivery, reduce structural dependencies, enable

smart targeting of the more vulnerable and marginal, and provide a platform for the technologies needed for broader systems change (see Box 9).

Box 9: Error! Reference source not found. Energy and Advancing Resilience in the Pacific

Transformation of the energy sector is a foundation for systemic climate resilience in the Pacific. It underpins all dimensions of climate resilience as energy systems are deeply interlinked with infrastructure, services, ecosystems, and livelihoods.

This first includes strengthening the physical resilience to climate hazards:

- Distributed renewable energy systems (solar mini-grids, rooftop PV, battery storage) reduce reliance on centralized, fragile infrastructure that is highly exposed to cyclones, flooding, and sea-level rise.
- Undergrounding, modularization, and climate-proof design of energy assets improves survivability during extreme events.
- Local resilient energy production systems increases energy security by reducing dependence on imported fuels – these supply chains are exposed to climate risks and supply disruptions following disasters (e.g., port damage or shipping interruptions).

Further, if well designed, resilience energy systems enhance the system resilience of critical services, importantly reducing or blocking cascading failures across interconnected infrastructure systems. For example:

Sector	Contribution of resilient energy systems
Water supply	Reliable power for desalination, pumping, and treatment systems during droughts or emergencies.
Health	Continuous electricity for cold chains, emergency care, and telemedicine during disasters.
Transport	Electrification reduces fuel supply vulnerability; enables emergency mobility systems.
Telecommunications	Backup renewable power maintains connectivity for early warning and coordination.

Third, resilient energy systems support adaptive capacity of communities and livelihoods, for example by providing:

- Access to reliable, affordable energy enables diversification of livelihoods , such as agro-processing, fisheries value chains, digital services.
- Energy for climate-smart practices: irrigation, cold storage, and climate-resilient agriculture.
- Reduced energy costs, that free-up household expenditures for adaptation investments.

Resilient energy systems also reduce structural vulnerability and exposure:

- They reduce the reliance on imported diesel that can lead to macroeconomic vulnerability, price shocks and fiscal stress, all vulnerability factors;
- They enable a transition to *locally* available renewables:
 - stabilizes energy costs,
 - improves fiscal space,
 - strengthens energy sovereignty.

Fifth, energy transformation acts as a platform for broader system change by enabling transformational resilience pathways:

- Enables nature-based solutions (e.g., powering coastal monitoring, ecosystem restoration technologies).
- Supports data, climate services, and early warning systems (through reliable power for sensors, modeling, communications).
- Facilitates low-carbon infrastructure systems (e.g., electric transport, resilient urban systems).
- Unlocks regional integration (shared renewable systems, pooled technical capacity).

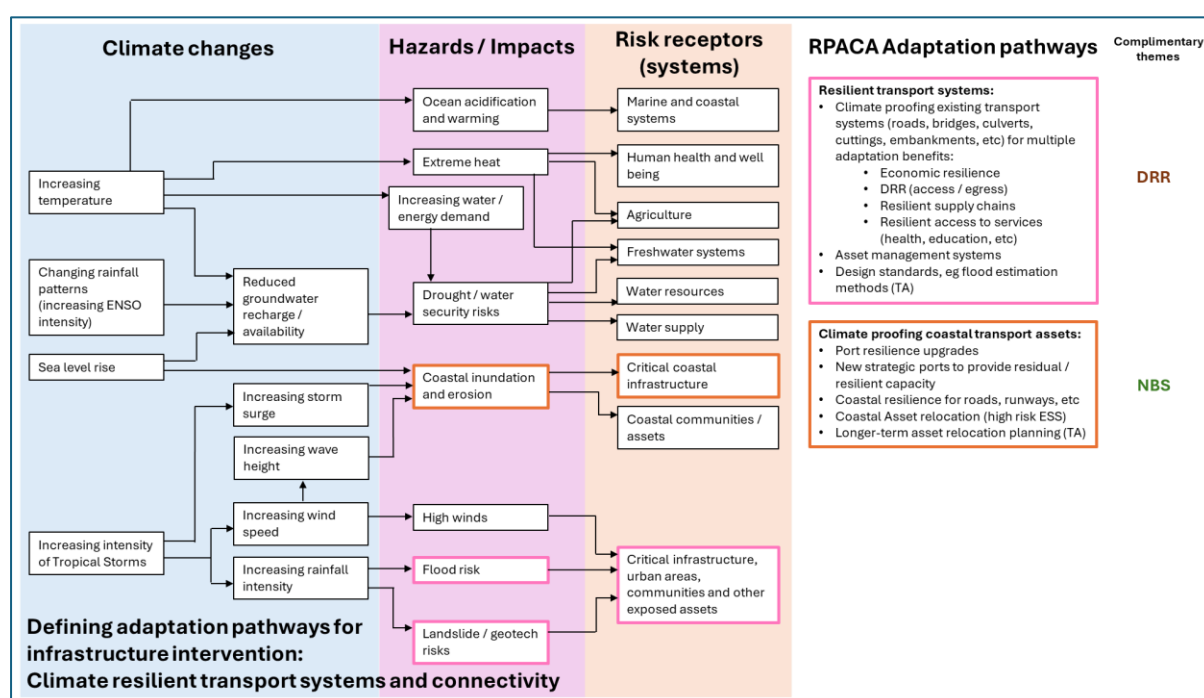
Finally, energy transformation can facilitate targeting of the vulnerable and the strengthening of social inclusion and equity:

- Targeted expansion of decentralized energy improves access in remote and outer islands;
- It can be focussed on vulnerable sites, communities, sectors, population groups (e.g. urban slums);
 - It can be gender-responsive - reducing time burdens, improving safety and enabling income-generating activities.
- Community-owned energy systems can enhance local agency and governance.

PV= photovoltaic

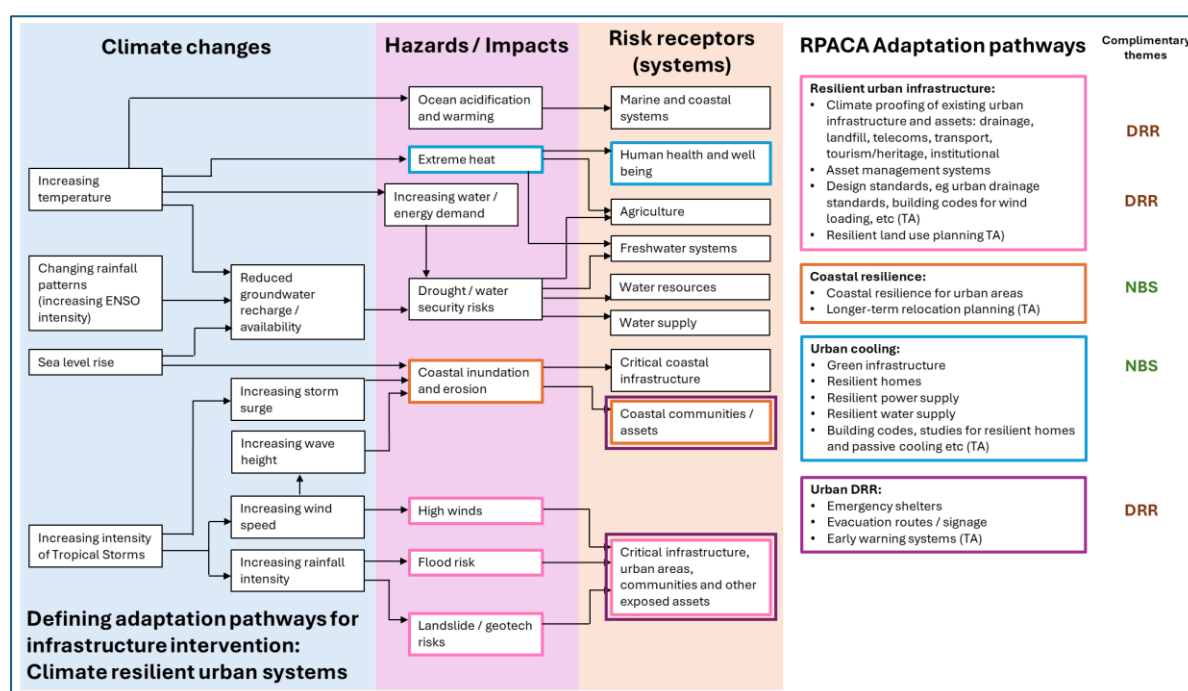
Source: Asian Development Bank.

Figure 14: Transport Systems



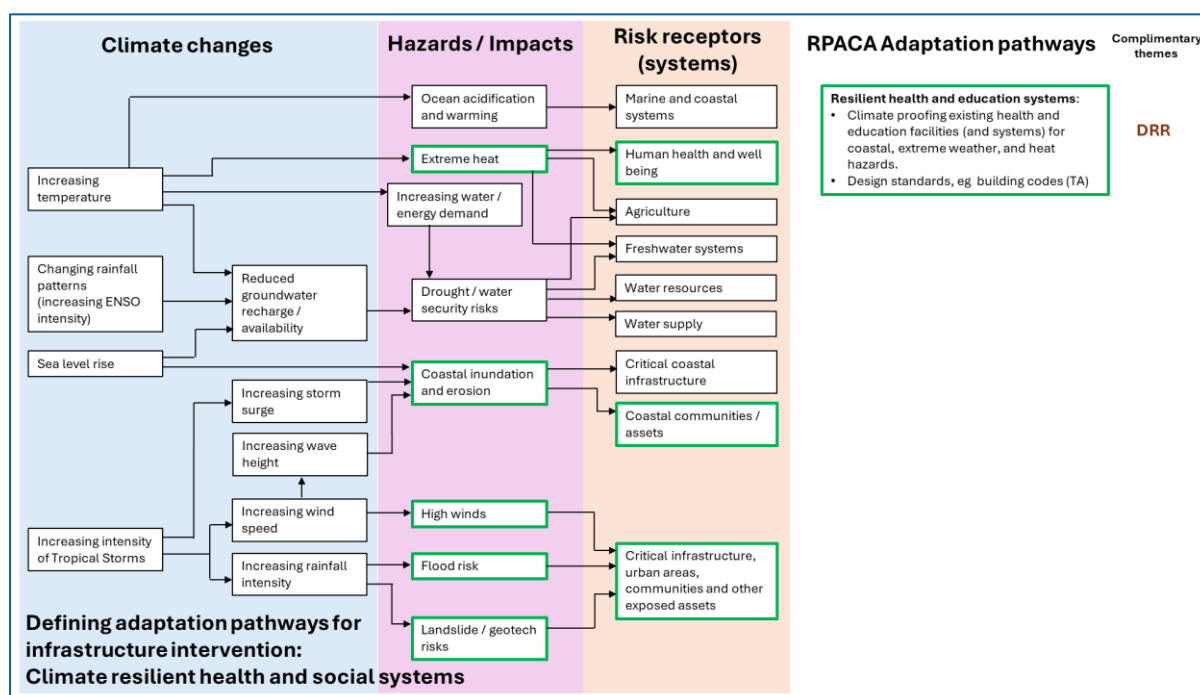
DRR= disaster risk reduction, ENSO= El Niño Southern Oscillation, NbS= nature-based solutions.
Source: Asian Development Bank.

Figure 15: Urban Systems



DRR= disaster risk reduction, ENSO= El Niño Southern Oscillation, NbS= nature-based solutions.
Source: Asian Development Bank.

Figure 16: Health and Social Systems

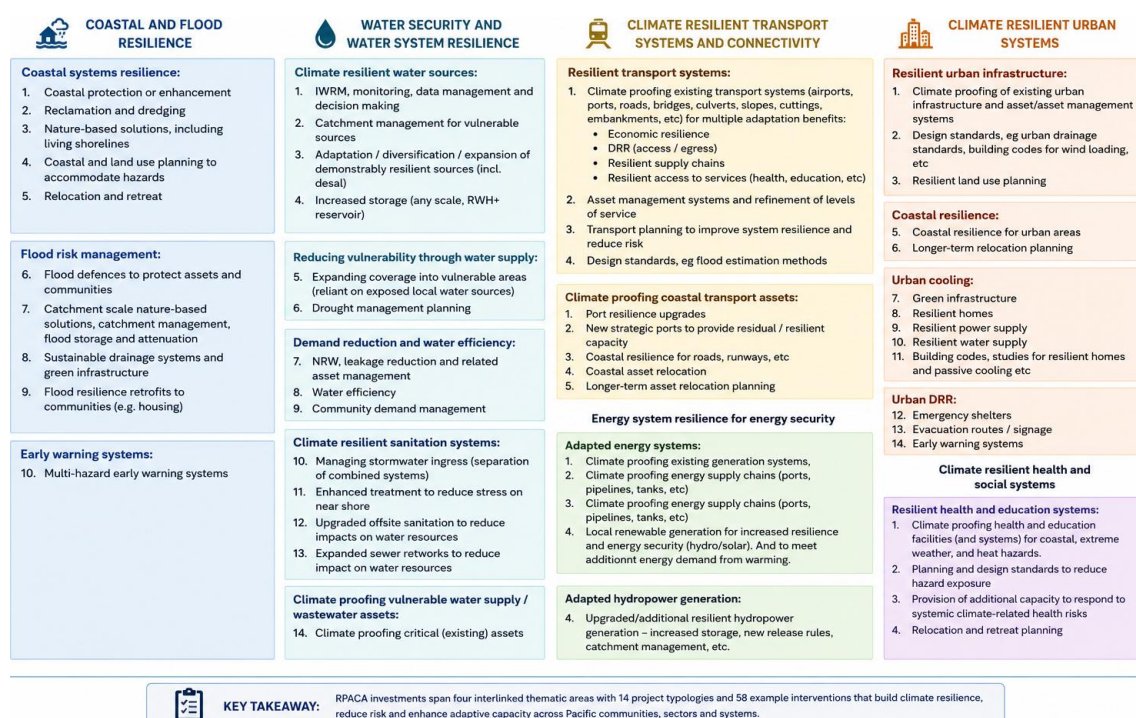


DRR= disaster risk reduction, ENSO= El Niño Southern Oscillation, TA= technical assistance.

Source: Asian Development Bank.

The adaptation pathways mapped in Figure 11 to 17 are then developed into the RPACA adaptation typologies (presented in Figure 17). Table 45 **Error! Reference source not found.** presents more detailed lists of the typologies and sub-typologies.

Figure 17: Adaptation Typologies



DRR= disaster risk reduction, IWRM= integrated water resources management, NbS= nature-based solutions, NRW=Non-revenue water, RWH= rainwater harvesting, TA= technical assistance.

Source: Asian Development Bank.

Table 45: List of RPACA Typologies

Type	Description
1	Coastal and Flood Resilience
1.a	Coastal systems resilience
1.a.i	Coastal protection or enhancement
1.a.ii	Reclamation and dredging
1.a.iii	Nature-based solutions, including living shorelines
1.a.iv	Relocation and retreat
1.b	Flood risk management
1.b.i	Flood defences to protect assets and communities
1.b.ii	Catchment scale nature-based solutions, catchment management, flood storage and attenuation
1.b.iii	Sustainable drainage systems and green infrastructure
1.b.iv	Flood resilience retrofits to communities (e.g. housing)
1c	Early warning systems
1.c.i	Multi-hazard early warning systems
2	Water Security and Water System Resilience
2.a	Climate resilient water sources
2.a.i	IWRM, monitoring, data management and decision making
2.a.ii	Catchment management for vulnerable sources
2.a.iii	Adaptation / diversification / expansion of resilient water sources (incl. desal)
2.a.iv	Increased storage (any scale, household rainwater to reservoir)
2.b	Reducing vulnerability through water supply
2.b.i	Expanding coverage into vulnerable areas (reliant on exposed local water sources))
2.b.ii	Drought management and planning (TA)
2.c	Demand reduction and water efficiency
2.c.i	NRW, leakage reduction and related asset management
2.c.ii	Water efficiency (e.g. household irrigation of commercial efficiency)
2.c.iii	Community water demand management
2.d	Climate resilient sanitation systems
2.d.i	Managing stormwater ingress (separation of combined systems)
2.d.ii	Enhanced treatment to reduce stress on near shore
2.d.iii	Upgraded offsite sanitation to reduce impacts on water resources
2.d.iv	Expanded sewer networks to reduce impact on water resources
2.e	Climate proofing vulnerable water / wastewater assets
2.e.i	Climate proofing critical (existing) assets
3	Climate Resilient Transport Systems and Connectivity
3.a	Resilient transport systems
3.a.i	- Climate proofing existing transport systems (airports, ports, roads, bridges, culverts, slopes, cuttings, embankments, etc) for multiple adaptation benefits: - Economic resilience - DRR (access / egress) - Resilient supply chains - Resilient access to services (health, education, etc)
3.a.ii	Asset management systems and refinement of levels of service
3.a.iii	Transport planning to improve system resilience and reduce risk
3.a.iv	Design standards, e.g. flood estimation methods
3.b	Climate proofing coastal transport assets
3.b.i	Port resilience upgrades
3.b.ii	New strategic ports to provide residual / resilient capacity
3.b.iii	Coastal resilience for roads, runways etc
3.b.iv	Coastal Asset relocation
3.b.v	Longer-term asset relocation planning
4	Energy System Resilience for Energy Security
4.a	Adapted energy systems
4.a.i	Climate proofing existing generation systems
4.a.ii	Climate proofing transmission systems, including asset management.
4.a.iii	Climate proofing energy supply chains (ports, pipelines, tanks etc)
4.a.iv	Local renewable generation for increased resilience and energy security (hydro/solar). And to meet additional energy demand from warming
4.b	Adapted hydropower generation
4.b.i	Upgraded/additional resilient hydropower generation – increased storage, new release rules, catchment management, etc.

5	Climate Resilient Urban Systems
5.a	Resilient urban infrastructure
5.a.i	Climate proofing of existing urban infrastructure and assets: drainage, landfill, telecoms, transport, tourism/heritage, institutional
5.a.ii	Asset management systems
5.a.iii	Design standards, e.g. urban drainage standards, building codes for wind loading, etc
5.a.iv	Resilient land use planning
5.b	Coastal resilience
5.b.i	Coastal resilience for urban areas
5.b.ii	Longer-term relocation planning
5.c	Urban cooling
5.c.i	Green infrastructure
5.c.ii	Resilient homes
5.c.iii	Resilient power supply
5.c.iv	Resilient water supply
5.c.v	Building codes, studies for resilient homes and passive cooling etc
5.d	Urban DRR
5.d.i	Emergency shelters
5.d.ii	Evacuation routes / signage
5.d.iii	Early warning systems
6	Climate Resilient Health and Social Systems
6.a	Resilient health and education systems
6.a.i	Climate proofing health and education facilities (and systems) for coastal, extreme weather, and heat hazards
6.a.ii	Planning and design standards to reduce hazard exposure
6.a.iii	Provision of additional capacity to respond to systemic climate-related health risks or vulnerabilities
6.a.iv	Relocation and retreat planning

DRR= disaster risk reduction, IWRM= integrated water resources management, NRW= non-revenue water, TA= technical assistance.

Source: Asian Development Bank.

10.3 RPACA Sub-Project Development Process and its Outputs

Error! Reference source not found. illustrates how the RPACA programme fundamentally will shape the investment cycle and project development process by mainstreaming climate risk and vulnerability assessments (CRVAs) ‘upstream’ into standard project preparation processes to deliver transformational and scalable adaptation sub-projects. The RPACA eligibility criteria drive this change as eligibility for funding is the desired outcome of the sub-project development process.

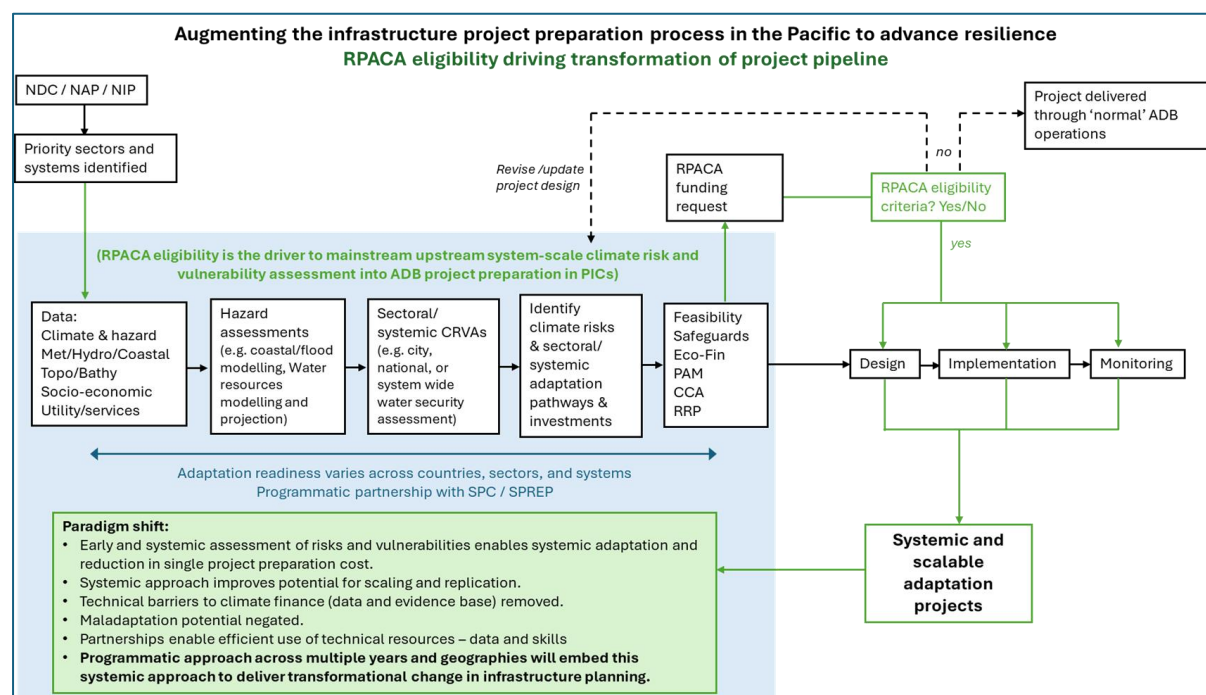
Over the duration of the RPACA programme, the systemic approach will be embedded into government and ADB processes over a number of project cycles and will become the new business as usual, creating lasting change. This is one aspect of the transformational nature of RPACA funding.

Under the RPACA approach, sub-project development begins with alignment to national climate priorities (e.g. NDCs, NAPs, NIPs) and identification of priority sectors and systems. From this point, sub-projects entering the investment pipeline are no longer developed through an asset-focused process. Instead, sub-projects that are screened for RPACA alignment (using the typology described above) and will embed climate risk assessment at the core of sub-project preparation.

Under the RPACA process, system-scale CRVAs are undertaken early in the process to enable identification of interdependencies, cascading risks, and system-wide vulnerabilities to drive sub-project development that would not be captured through traditional project-level assessments. System-scale CRVA assessments extend beyond individual assets to consider risks and vulnerabilities across entire systems—such as cities, island systems, or sector networks (e.g. water or transport systems). To reduce the likelihood of maladaptation and the opportunity for cascading failures the assessment must (i) extend beyond the lifetime of the proposed project; (ii) evaluate robustness under multiple climate scenarios; and (iii) be grounded in quantitative evidence (e.g. hazard modelling). The assessment must also identify differentiated vulnerabilities of women, youth, persons with disabilities, and other under-represented groups. The system-scale CRVAs will be supported by data collection as necessary (including climate and hazard data, socio-economic

information, and utilities/services data) and hazard assessments – note RPACA will leverage existing data from regional partners where possible.

Figure 18: Illustrative Overview of the RPACA Sub-Project Development Approach



ADB= Asian Development Bank, CCA= Climate Change Assessment, CRVA= climate risk and vulnerability assessment, NAP= National Adaptation Plan, NDC= Nationally Determined Contribution, NIP= National Infrastructure Plan, PAM= project administration manual, RRP= Report and Recommendation of the President. Source: Asian Development Bank.

Sub-projects then proceed to project preparation informed by robust climate risk analysis. Following this, sub-projects enter the RPACA approval process, including submission of a RPACA funding request. RPACA eligibility approval will only be granted if all RPACA eligibility criteria are met and the sub-project delivers direct and measurable climate adaptation benefits and has outcome level indicators on adaptation/resilience in the DMF.

The outcome of this process is a set of systematic, scalable infrastructure adaptation sub-projects, rather than conventional infrastructure investments, this has the following transformational benefits:

1. Mainstreaming upstream, system-scale climate risk assessment

RPACA shifts climate risk assessment to an upstream, decision-making tool. By embedding CRVAs early in sub-project development, climate risks and vulnerabilities become a primary driver of investment design. This ensures that infrastructure investments are aligned with identified system-level risks and benefits extend beyond the lifetime of the project.

2. Enabling systemic adaptation rather than asset-level responses

Traditional approaches often focus on climate-proofing individual assets. RPACA instead enables systemic adaptation, identifying coordinated interventions across sectors. This reduces the risk of fragmented investments and addresses cascading impacts.

3. Improving efficiency and reducing project preparation costs

By undertaking system-scale assessments early, RPACA allows multiple projects to be identified and developed from a single analytical process. This reduces duplication of effort and lowers the cost of preparing individual sub-projects, while improving overall programme coherence.

4. Enhancing scalability and replication

The use of typologies, adaptation pathways, and system-level assessments enables sub-projects to be designed in a way that is replicable across countries and sectors. This supports scaling of successful interventions and contributes to a programmatic approach to climate adaptation.

5. Strengthening the evidence base for climate finance

A key barrier to accessing climate finance is the lack of robust data and evidence demonstrating adaptation impact. RPACA directly addresses this by embedding data collection, modelling, and analysis into project preparation. These data sets will support wider assessment and project design providing evidence base for alternative funding proposals that meet climate finance requirements.

6. Reducing maladaptation risks

By considering system-wide risks, long-term climate projections, and interdependencies, the RPACA approach reduces the likelihood of maladaptation—such as investments that inadvertently increase vulnerability elsewhere in the system or fail under future climate conditions.

7. Leveraging regional partnerships and resources

The approach explicitly incorporates programmatic partnerships with regional technical organisations (SPC and SPREP), enabling efficient use of existing data, tools, and expertise. This reduces duplication, improves consistency of methodologies, and strengthens regional knowledge sharing.

8. Embedding transformational change in ADB processes

By applying this approach across multiple projects, sectors, and countries over several years, RPACA creates a programmatic shift in how ADB prepares infrastructure investments. System-scale climate risk assessment becomes embedded in standard processes.

9. Delivering scalable adaptation outcomes

Ultimately, the RPACA approach results in a portfolio of systemic and scalable adaptation sub-sub-projects that deliver measurable resilience benefits at community, sector, and national levels. These projects are better aligned with climate risks, more cost-effective, and more likely to deliver long-term sustainable outcomes.

10.4 Outcome 2.1: Climate Resilience of Communities, Infrastructure Systems, and Institutions in Pacific Island Countries Strengthened with Gender Equality and Social Inclusion Mainstreamed.

10.4.1 Output 2.1.1 Evidence-Based, System-Scale Climate Adaptation Sub-Projects Developed and Approved

This Output includes activities required to develop RPACA sub-projects in accordance with the RPACA project development process described above. The activities under this output have therefore been designed to transform project preparation over the course of the RPACA programme.

10.4.1.1 Establish RPACA Processes

While not defined as a Programme activity with a budget there will be a process required to operationalise the funding eligibility and approval process. These activities will be implemented by the RPACA Secretariat. These represent early activities of the Secretariat to establish the institutional, procedural, and technical foundations of RPACA. They ensure that climate adaptation is not treated as an add-on, but is systematically integrated into sub-project identification, design, and approval, enabling the delivery of a coherent pipeline of high-quality, scalable adaptation investments in the Pacific. This activity will be funded by ADB using the GCF AE fee.

10.4.1.2 Allocate Resources and Finalise the TOR for ADB's RPACA Technical Working Group

This sub-activity establishes the institutional mechanism responsible for reviewing and endorsing RPACA proposals. It includes defining the structure and operational procedures of the RPACA TWG

including: staffing and sector representation; frequency and format of project review meetings (e.g. monthly virtual reviews and quarterly formal decision meetings); mechanisms for coordination with ADB Board approval processes, including recommendation for RPACA eligibility.

10.4.1.3 Finalise RPACA Application Mechanism and RPACA Funding Request Template.

This sub-activity focuses on designing a streamlined and user-friendly process for project teams to apply for RPACA funding. A standardised application process will be developed, integrated within existing ADB project preparation workflows, including submission timelines and review stages, decision rules for progressing, revising or rejecting funding requests. The funding request template will clearly align with the criteria. The mechanism should minimise transaction costs for project teams while ensuring sufficient information for robust evaluation.

10.4.1.4 Prepare Guidance Material on RPACA Process and Sub-Project Eligibility

This sub-activity establishes practical, concise and tailored (to sector specialists, NDAs, consultants) guidance material to support project teams in understanding and applying the RPACA approach. The material will include process guidance notes describing each step of the RPACA pathway; explanations on evidence requirements to meet eligibility criteria, with examples; technical guidance on climate risk assessments and adaptation design (return periods, future climate scenarios and emissions pathways, design standards, as necessary); checklists to support funding request, and case studies of acceptability.

10.4.1.5 Working Sessions with Project Teams and Sector Staff to Introduce Process and Q&A

This sub-activity involves preparing material for and undertaking a series of interactive virtual and in-person workshops and/or clinics with open Q&A sessions to introduce sector staff to the RPACA sub-project development and approval process and how it integrates with ADB's workflows.

10.4.1.6 Activity 2.1.1.1 Develop Evidence to Demonstrate System-Scale RPACA Climate Adaptation Impact

Sub-projects screened for RPACA will have the potential for transformational adaptation in line with the eligibility criteria. In accordance with the RPACA project development process, sub-projects will be based on system scale climate risk and vulnerability assessments. These are to identify climate risks and adaptation interventions that will demonstrably reduce vulnerabilities of beneficiaries in direct and measurable ways.

Proposed interventions must be clearly distinct from business-as-usual development and demonstrate how the design has been adapted to address climate risks.

System-scale climate risk assessments (SCRA) vary in complexity and must be fit-for-purpose, depending on the system and climate risks being evaluated. However, they each should consistently extend beyond the boundary of individual infrastructure assets or services to capture interdependencies, cascading risks, and cross-sectoral vulnerabilities across an entire system.

A “system” may refer to a sector (e.g. water, transport, energy), a group of interconnected sectors (e.g. water and energy), or a defined geographic unit such as an island, city, or community. The assessment should evaluate risks and vulnerabilities affecting both infrastructure assets and service delivery, as well as the exposure, sensitivity, and adaptive capacity of beneficiary populations. This approach enables identification of interdependencies and cascading climate impacts, reduces the risk of maladaptation, and supports (future) project development efficiency by developing coordinated, phased adaptation investment programmes.

The assessments will explicitly identify differentiated vulnerabilities, including those of women, youth, persons with disabilities, and other under-represented or marginalised groups, consistent with GCF gender and social inclusion requirements.

SCRA's rely on high-quality, multi-source datasets. Depending on the required level of complexity, the following data inputs may be required:

- Socio-economic and demographic data: Including spatially disaggregated (e.g. ward- or community-level) data on population, gender, age, income, livelihoods, and access to services.

- Land use and spatial planning data: Current and planned land use, zoning, and development patterns.
- Infrastructure and service data: Asset inventories (location, condition, design standards), service levels, operational performance, and demand projections; including sector-specific indicators (e.g. non-revenue water, traffic volumes, energy demand profiles).
- Historical climate and meteorological data: Observed trends, variability (including ENSO and other large-scale drivers), and extreme events.
- Climate projections: Downscaled and bias-corrected projections under multiple scenarios (e.g. SSPs), including changes in temperature, precipitation, and extremes.
- Hydrological and hydrogeological data: Flood frequency and flow duration, surface water availability, groundwater systems, recharge rates, drought risk, and saline intrusion.
- Oceanographic and coastal data: Sea level rise, tidal regimes, storm surge, wave dynamics, and coastal erosion processes.
- Topographic and geospatial data: Topographic surveys, remote sensed elevation data (e.g. LiDAR), bathymetry.
- Earth observation data: Satellite-derived datasets for land cover, water resources, coastal change, and hazard monitoring.
- Hazard and risk modelling outputs: Including flood modelling, coastal inundation mapping, drought assessments, and multi-hazard risk maps.

These datasets and analyses inform the SCRA and provide the foundation for designing downstream activities, including environmental and social safeguards, engineering design, economic analysis, and establishing (baselines for) monitoring and evaluation frameworks. Early investment in robust data collection and analytical studies is therefore critical to improving project design quality, reducing uncertainty, and ensuring long-term climate resilience outcomes. As necessary, this data acquisition will be funded using GCF Funds through National Level Technical Assistance projects.

Potentially, some of the potential RPACA sub-projects may already have a strong evidence base that is sufficient to demonstrate RPACA eligibility. In such cases, the level of effort required in the system-scale risk assessment and data collection will be less.

The RPACA TWG, as needed, and sectoral project development teams will support socio-economic surveys, undertake stakeholder engagement and utilize climate change consultants, topographic surveys, hazard risk modellers to collect the required data and deliver these SCRA .

Partnerships with both SPC and SPREP established under RPACA will support data collection and SCRA assessments. Existing data and hazard/risk assessment will be used where available, new data and analysis will only be commissioned where necessary.

A climate risk assessment of the investment asset will also be undertaken to ensure the investment or asset is climate proof.

10.4.1.7 Activity 2.1.1.2 Develop and Approve Transformational Projects which Meet RPACA Requirements

Following the preparation of the SCRA, this activity is the standard investment design process. The Technical working group will provide advice to project officers and design teams to ensure that the minimum RPACA eligibility thresholds are met. This includes the following:

- Sector review, enabling environment for resilience is evaluated and sub-project components included to strengthen where necessary.
- Transformational aspects of the sub-project identified
- Co-benefits are estimated
- GEDSI considerations are incorporated into design
- Nature based solutions are implemented
- Environmental and social safeguards assessments are undertaken and risk mitigation measures are incorporated into the design
- Stakeholder engagement is undertaken and evidenced
- Country ownership is demonstrated

- Economic analysis is undertaken and additionality, efficiency, and affordability is demonstrated
- Grant eligibility is demonstrated, if necessary
- Appropriate monitoring and learning frameworks are designed.

Once sub-projects have been developed in accordance with RPACA requirements they will be submitted to the RPACA TWG group in the RPACA Funding request template, with appropriate supporting information in line with the process developed.

Validation will also require systematic review against GAAP infrastructure standards: ensuring disaggregated social data and differentiated vulnerability analysis are integrated; confirming universal design and emergency accessibility measures; verifying survivor-centred SEAH safeguards; checking procurement compliance with gender and inclusion requirements; and embedding inclusive O&M provisions. This strengthens legitimacy, accountability, and resilience outcomes.

The majority of this activity will be funded by ADB as an in-kind contribution to the programme as it will primarily be delivered by existing ADB staff and project development teams, and consultants teams working on 'normal' project development contracts. Some GCF funding has been allocated for these enhanced GEDSI activities.

10.4.2 Output 2.1.2 Climate-Resilient Adaptation Infrastructure Sub-Projects Completed and Operationalized

This output will result in up to 22 adaptation sub-projects implemented over the course of the RPACA Programme.

Each investment sub-project will have hard and soft components. The hard component is the provision or rehabilitation of climate resilient infrastructure (this Output, 2.1.2). The soft component is under Output 2.1.3 (described below) and will focus on the enabling environment around the hard component - and it will provide critical support in the form of capacity building, institutional strengthening and/or policy reform for resilience. Accordingly, the investments and activities under Outputs 2.1.2 and 2.1.3 are integrated – the enabling environment will be developed to support the future management and operations of the sector and the climate resilient infrastructure itself. The integrated work under Output 2.1.2 and 2.1.3 will therefore be underpinned by SCRAs and other assessments described under Output 2.1.1.

Preliminary work under this Output will establish the management processes for implementing RPACA sub-projects. The Activities represent, respectively, infrastructure investments in coastal and flood resilience, water security and sanitation systems, transport and connectivity systems, energy systems, urban systems and health and social systems.

10.4.2.1 Preliminary Processes

Oversight and monitoring occur at two levels – the sub-project investment level and the overall RPACA programme level. At the sub-project level, all implementation and management will directly follow ADB's normal operational processes and be implemented nationally. A sub-project level PIUs will be established for each sub-project at the national level within the implementing agency. These PIUs will be responsible for:

- Procurement of detailed design, including the resilience and adaptation measures defined in the SCRAs;
- Procurement of construction supervision;
- Procurement of works contracts, including the resilience and adaptation measures defined in the SCRAs;
- Implementing surveys and community consultations during works to ensure vulnerabilities identified in SCRAs are addressed.
- Implementing Environmental and Social Management Plans and Gender Action Plans;
- Implementing grievance redress mechanisms;
- Procuring and coordinating technical assistance and training contracts (under output 2.2.2);
- Monitoring and reporting in accordance with RPACA requirements, covering sub-project level indicators that can be rolled up to programme levels;

- Some additional activities with respect to ensuring high quality design for resilience, ensuring the sub-project addresses vulnerabilities, and monitoring and reporting to meet RPACA requirements.
- However, in order to ensure consistency, and GCF quality control, and to provide any necessary technical support, the RPACA Secretariat (or PMU) will oversee each sub-project's processes. In order to do this, the PMU will include a dedicated fund manager, a monitoring and evaluation specialist and other support staff as needed.

In addition, in order to ensure consistency, to ensure GCF criteria quality control, to ensure synergies and coordination, and to provide any necessary technical support, the RPACA Secretariat (PMU) will oversee all sub-projects at a regional level. 's processes. In order to do this, the PMU will include a dedicated fund manager, a monitoring and evaluation specialist and other support staff as needed. The PMU will serve as the focal point for the Programme's day-to-day operations, with the following activities: (i) preparing a regional annual work plan and supervising day-to-day implementation of the annual work plan; (ii) compiling all the national reports and preparing a consolidated regional report; (iii) preparing documentation for sub-project endorsement/approval; (iv) monitoring and evaluation and collating reports to be submitted to GCF; and (v) disseminating RPACA accomplishments and lessons learned.

PMU will guide the implementation of sub-projects in close coordination with project implementation unit (PIUs). PMU will provide training to PIUs in the additional requirements of RPACA, beyond typical ADB requirements.

10.4.2.2 Activity 2.1.2.1 Implement Coastal and Flood Resilience Projects

RPACA sub-projects for coastal and flood resilience will be developed and approved under Output 2.1.1.

The sub-projects will be implemented by national PIU's established within the implementing agency.

The sub-projects will be implemented in accordance with ADB's policies with respect to fund flows, risk management, safeguards, procurement, monitoring, *etc.* and additional RPACA requirements and processes as necessary.

The expected outcomes for coastal and flood resilience sub-projects by typology is presented in Table 46. The table includes examples of the sub-project level outcomes and indicators that will be used to report up to RPACA programme level.

Table 46: Expected Outcomes for Coastal and Flood Resilience Sub-Projects

Type	Project Type	Adaptation Outcome	GCF Result Area	Example Indicators
1.a.i	Coastal protection or enhancement	Reduced coastal erosion and flood exposure	A1, A4	• Number of people with reduced exposure • Coastline protected (km)
1.a.ii	Reclamation and dredging	Improved coastal stability and drainage capacity	A1, A4	• Area reclaimed (ha) • Reduction in flood frequency
1.a.iii	Nature-based solutions (living shorelines)	Enhanced ecosystem buffering and resilience	A1, A5	• Area of ecosystems restored (ha) • Number of beneficiaries
1.a.iv	Relocation and retreat	Elimination of exposure in high-risk zones	A1, A2	• Number of assets or households relocated
1.b.i	Flood defences	Reduced flood risk to communities/assets	A1, A4	• Number of people protected • Defences (km)
1.b.ii	Catchment NbS / flood storage	Reduced downstream flood peaks	A1, A5	• Storage capacity (m³) • Peak flow reduction
1.b.iii	Sustainable drainage / green infrastructure	Reduced urban flooding	A1, A4	• Area covered (ha)

				• Runoff reduction (% or volume)
1.b.iv	Flood resilience retrofits	Reduced damages and faster recovery	A3, A4	• Number of buildings retrofitted • Damage reduction (USD)
1.c.i	Multi-hazard early warning systems	Increased preparedness and reduced losses	A2, A3	• Number of people covered • Warning lead time

NbS= nature-based solutions, GCF= Green Climate Fund, USD= United States Dollar.

Source: Asian Development Bank.

10.4.2.3 Activity 2.1.2.2 Implement Water Security and Water System Resilience Projects

RPACA sub-projects for water security and water system resilience will be developed and approved under Output 2.1.1. The sub-projects will be implemented by national PIU's established within the implementing agency.

The sub-projects will be implemented in accordance with ADB's policies with respect to fund flows, risk management, safeguards, procurement, monitoring, etc. and additional RPACA requirements and processes as necessary.

The expected outcomes for water security and water system resilience sub-projects by typology is presented Table 47. The table includes example sub-project level outcomes and indicators that would be used to report up to RPACA programme level.

Table 47: Expected Adaptation Outcomes and Indicators for Water Security and Water System Resilience Sub-Projects

Type	Project Type	Adaptation Outcome	GCF Result Area	Example Indicators
2.a.i	IWRM, monitoring, data systems	Improved climate-informed decision-making	A2	• Number of monitoring assets deployed. • Systems operational (yes/no) • Data availability and usage
2.a.ii	Catchment management	Sustained water quantity and quality in vulnerable catchments	A5, A6	• Area managed (ha) • Water quality (turbidity)
2.a.iii	Resilient water sources (incl. desal)	Reliable supply under climate stress, residual capacity	A6, A4	• Raw water capacity (m³/day or MLD) • Drought water availability (m³/day or MLD)
2.a.iv	Increased storage	Improved drought buffering capacity	A6	• Storage added (m³ / MLD)
2.b.i	Expanding coverage	Reduced vulnerability of underserved groups	A1, A6	• Number of people served
2.b.ii	Drought planning	Improved preparedness and response	A2	• Number of Plans adopted
2.c.i	NRW / leakage reduction	Improved efficiency and reduced losses	A6	• NRW reduction (%) • Leakage reduction (% or m³/day or MLD)
2.c.ii	Water efficiency	Reduced water demand to improve water security	A6	• Demand reduction (% or m³/day or MLD)
2.c.iii	Community demand management	Behavioural resilience to support water security	A2	• Number of households engaged
2.d.i	Stormwater ingress management	Reduced system overload during extreme events	A4	• Sewer rehabilitated (m or km) • Overflow events reduced

2.d.ii	Enhanced treatment	Reduced environmental and health risks to ecosystems vulnerable to climate change	A6	• Effluent compliance (%)
2.d.iii	Offsite sanitation upgrades	Reduced contamination of water resources vulnerable to climate change	A6, A3	• Number of systems upgraded
2.d.iv	Sewer expansion	Reduced contamination of water resources vulnerable to climate change	A6	• Number of population connected
2.e.i	Climate-proofing water assets	Reduced disruption of services during extreme events	A4	• Number of assets upgraded for resilience

IWRM= integrated water resources management, MLD= millions of litres per day.

Source: Asian Development Bank.

10.4.2.4 Activity 2.1.2.3 Implement Projects for Climate Resilient Transport Systems and Connectivity

RPACA sub-projects for climate resilient transport systems and connectivity will be developed and approved under Output 2.1.1. The sub-projects will be implemented by national PIU's established within the implementing agency.

The sub-projects will be implemented in accordance with ADB's policies with respect to fund flows, risk management, safeguards, procurement, monitoring, etc. and additional RPACA requirements and processes as necessary.

The expected outcomes for climate resilient transport systems and connectivity sub-projects by typology is presented in Table 48. The table includes example sub-project level outcomes and indicators that would be used to report up to RPACA programme level.

Table 48: Expected Adaptation Outcomes and Indicators for Climate Resilient Transport Systems and Connectivity Sub-Projects

Type	Project Type	Adaptation Outcome	GCF Result Area	Aligned Indicators
3.a.i	Climate-proofing transport systems	Continuity of transport services during extreme events	A4, A3	• Resilient transport infrastructure (km or assets) • Disruption days reduced
3.a.ii	Asset management systems	Improved lifecycle resilience planning	A2	• Systems implemented
3.a.iii	Transport planning	Reduced systemic climate risk	A2	• Number of Plans adopted
3.a.iv	Design standards	Future-proofed infrastructure design	A2	• Number of Standards updated or adopted
3.b.i	Port resilience upgrades	Climate resilient maritime connectivity	A4	• Port downtime reduction
3.b.ii	New strategic ports	Increased system redundancy	A4	• Additional capacity
3.b.iii	Coastal protection (transport assets)	Reduced exposure to coastal hazards	A1, A4	• Linear protection (km)
3.b.iv	Coastal asset relocation	Reduced long-term exposure to coastal hazards	A1	• Number of assets relocated
3.b.v	Relocation planning	Improved long-term adaptation readiness	A2	• Number of Plans developed

GCF= Green Climate Fund.

Source: Asian Development Bank.

10.4.2.5 Activity 2.1.2.4 Implement Energy System Resilience Projects for Energy Security

RPACA sub-projects for energy system resilience will be developed and approved under Output 2.1.1. The sub-projects will be implemented by national PIU's established within the implementing agency.

The sub-projects will be implemented in accordance with ADB's policies with respect to fund flows, risk management, safeguards, procurement, monitoring, *etc.* and additional RPACA requirements and processes as necessary.

The expected outcomes for energy system resilience sub-projects by typology is presented in Table 49. The table includes example sub-project level outcomes and indicators that would be used to report up to RPACA programme level.

Table 49: Expected Adaptation Outcomes and Indicators for Energy System Resilience Sub-Projects

Type	Project Type	Adaptation Outcome	GCF Result Area	Aligned Indicators
4.a.i	Climate-proofing generation	Reliable energy supply during extreme events and under climate stress	A4, A3	Number of assets upgraded for resilience
4.a.ii	Transmission resilience	Improved grid stability and supply to vulnerable communities	A4	Outage reduction (incidence and customers)
4.a.iii	Supply chain resilience	Reduced climate-related disruption to fuel supply	A4	Days disruption avoided
4.a.iv	Renewable energy for resilience	Diversified and climate resilient supply for energy security	A4, A6	- MW installed - Number of beneficiaries
4.b.i	Hydropower adaptation	Sustained generation under variability	A4, A6	Reliability (%)

GCF= Green Climate Fund.

Source: Asian Development Bank.

10.4.2.6 Activity 2.1.2.5 Implement Projects for Climate Resilient Urban Systems

RPACA sub-projects for climate resilient urban systems will be developed and approved under Output 2.1.1. The sub-projects will be implemented by national PIU's established within the implementing agency.

The sub-projects will be implemented in accordance with ADB's policies with respect to fund flows, risk management, safeguards, procurement, monitoring, *etc.* and additional RPACA requirements and processes as necessary.

The expected outcomes for climate resilient urban systems sub-projects by typology is presented in Table 50. The table includes example sub-project level outcomes and indicators that would be used to report up to RPACA programme level.

Table 50: Expected Adaptation Outcomes and Indicators for Climate Resilient Urban Systems

Type	Project Type	Adaptation Outcome	GCF Result Area	Aligned Indicators
5.a.i	Climate-proofing urban infrastructure	Reduced service disruption during extreme weather events for various urban infrastructure: drainage, landfill, telecoms, transport, tourism/heritage, institutional	A4, A3	Number of infrastructure assets retrofitted for resilience
5.a.ii	Asset management	Improved resilience planning	A2	- Number of systems implemented - Number of assets included
5.a.iii	Design standards	Climate-resilient development for urban roads, urban infrastructure, green infrastructure, housing, <i>etc.</i>	A2	Number of Standards adopted
5.a.iv	Land use planning	Reduced exposure to hazards	A1, A2	- Plans developed - Area covered (ha)
5.b.i	Coastal resilience (urban)	Reduced urban coastal risk	A1, A4	Number of people protected
5.b.ii	Relocation planning	Long-term exposure reduction	A2	Plans developed

5.c.i	Green infrastructure	Reduced heat and flood risk	A1, A6	Area provided (ha)
5.c.ii	Resilient homes	Improved household climate resilience	A1, A4	Number of homes upgraded for resilience
5.c.iii	Resilient power supply	Continuity of energy services for managing heat exposure	A4, A6	- Downtime reduced - Service reliability (%)
5.c.iv	Resilient water supply	Continuity of water services for managing heat exposure	A4, A6	- Downtime reduced - Service reliability (%)
5.c.v	Building codes for passive cooling	Reduced heat exposure	A1, A2	- Number of codes adopted - Indoor temperature of new homes
5.d.i	Emergency shelters	Increased disaster preparedness and response to extreme weather	A2, A3	- Shelter capacity - Reduced mortality
5.d.ii	Evacuation routes	Improved emergency response to extreme weather	A2	Number of people covered
5.d.iii	Early warning systems	Improved emergency response to extreme weather	A2, A3	Number of people covered

GCF= Green Climate Fund.

Source: Asian Development Bank.

10.4.2.7 Activity 2.1.2.6 Implement Projects for Resilient Health and Social Systems

RPACA sub-projects for resilient health and social systems will be developed and approved under Output 2.1.1. The sub-projects will be implemented by national PIU's established within the implementing agency.

The sub-projects will be implemented in accordance with ADB's policies with respect to fund flows, risk management, safeguards, procurement, monitoring, etc. and additional RPACA requirements and processes as necessary.

The expected outcomes for resilient health and social systems sub-projects by typology is presented in Table 51. The table includes example sub-project level outcomes and indicators that would be used to report up to RPACA programme level.

Table 51: Expected Adaptation Outcomes and Indicators for Resilient Health and Social Systems Sub-Projects

Type	Project Type	Adaptation Outcome	GCF Result Area	Aligned Indicators
6.a.i	Climate-proof health/education facilities	Continuity of essential services and resilience to climate risks	A4, A6	- Number of facilities upgraded for resilience - Capacity of resilient facilities upgraded for resilience (e.g. hospital 'beds', school 'desks')
6.a.ii	Planning/Design standards	Long-term resilience of social infrastructure	A2	Climate informed Standards adopted
6.a.iii	Additional capacity	Increased system capacity to manage climate-induced health risks (e.g. heat, disease) and systemic vulnerabilities (e.g. access)	A6, A2	- Additional beds / service capacity created - Number of people with access to climate-resilient health services
6.a.iv	Relocation and retreat planning	Reduced long-term exposure of health and education systems to climate hazards	A1, A2	- Relocation plans developed/adopted - Number of facilities identified for relocation

GCF= Green Climate Fund.

Source: Asian Development Bank.

10.4.3 Output 2.1.3 Institutional Capacity and Enabling Environment of National Agencies for Climate-Resilient Infrastructure Management Strengthened

This Output will strengthen the enabling environment required to ensure that climate-resilient infrastructure investments delivered under Output 2.1.2 are effectively operated, maintained, and sustained under current and future climate conditions, while also enabling the systematic scaling of adaptation across sectors. They are fundamental to the sustainability of the investments under Output 2.1.2. These activities will have been identified through detailed evaluation of existing related capacity to be undertaken. These activities will be approved and implemented as part of the package including the infrastructure under 2.1.2.

The Output covers on building the technical, institutional, and regulatory capacity of national and sub-national agencies to manage climate risks and deliver resilient infrastructure services. It will support the development and operationalisation of climate-informed asset management systems, monitoring and early warning systems, and decision-support tools to enable proactive risk management.

In parallel, the output will strengthen policy, planning, and regulatory frameworks by integrating climate risk into sector strategies, spatial planning processes, and infrastructure design standards. This includes the development of risk-informed sector adaptation plans, updated building codes, and land use policies that reduce exposure and guide resilient development pathways.

The programme will also address key institutional and legislative barriers by supporting institutional strengthening, coordination mechanisms, and legal reforms necessary to define roles and responsibilities for climate risk management, infrastructure ownership, and service delivery under changing climate conditions.

Capacity development is a core component of this output, with targeted training and knowledge transfer to ensure that government agencies, utilities, and relevant stakeholders have the skills, tools, and systems required to sustain adaptation investments over the long term.

Overall, this output ensures that infrastructure investments are embedded within a robust enabling environment, reducing the risk of maladaptation, improving long-term performance, and supporting a transformational shift toward climate-resilient development pathways.

10.4.3.1 Activity 2.1.3.1 Develop the Technical Capacity of National Agencies to Operate, Maintain and Manage Climate-Resilient Infrastructure

Without strengthened institutional capacity, infrastructure assets risk performance degradation, maladaptation, or premature failure. This activity ensures that investments delivered under Output 2.1.2 are sustainably operated and maintained under future climate conditions. Examples of sub-activities are described below. The development and design of specific interventions will be sub-project dependent and approved through the RPACA approval process.

Asset Management Systems:

- Design and deployment of climate-informed asset management systems (AMS);
- Integration of risk-based maintenance planning and lifecycle costing;
- Digitalisation of asset registries and condition monitoring tools.

Infrastructure Monitoring Systems:

- Installation of sensors and monitoring equipment (e.g. water levels, structural performance, leakage detection);
- Development of data platforms for real-time performance tracking.

Standard Operating Procedures (SOPs):

- Development of climate-responsive SOPs (e.g. drought management, flood response, emergency repairs);
- Integration of SOPs into agency operational frameworks.

Design Standards and Codes:

- Development and/or revision of climate-resilient infrastructure standards;

Integration of updated climate projections into engineering design parameters;.

Technical Training and Capacity Building:

- Training programmes for utility operators, engineers, and planners;
- Certification programmes for climate-resilient infrastructure management;
- Knowledge exchange across Pacific SIDS facilitated under Component 1.

Sub-project level outputs from this activity will include:

- Climate-informed asset management systems operational;
- Monitoring systems installed and functional;
- Training programmes delivered and staff certified;
- Approved SOPs and operational manuals;
- Updated design standards and engineering guidelines.

10.4.3.2 Activity 2.1.3.2 Develop the Technical Capacity of National Agencies to Monitor and Respond to Relevant Climate Risks

This activity strengthens national systems for climate risk monitoring, forecasting, and response, enabling proactive rather than reactive adaptation. Examples of sub-activities are described below. The development and design of specific interventions will be sub-project dependent and approved through the RPACA approval process.

Hydro-meteorological and Coastal Monitoring Systems:

- Upgrade and expansion of meteorological networks including automatic and manual approaches;
- Installation of flow gauging stations;
- Installation of groundwater observation wells;
- Implementing manual/automatic groundwater level, temperature, salinity, etc;
- Installation of coastal monitoring systems;
- Integration with regional climate and technical services (e.g. SPC).

Early Warning Systems (EWS):

- Development of multi-hazard early warning systems including alert levels and trigger level thresholds;
- Strengthening communication channels to communities (SMS, radio, digital platforms);
- Community-level preparedness training.

Decision Support Systems (DSS):

- Development of tools to support climate-informed decision-making (e.g. drought triggers, flood forecasting models) including GIS based platforms and dashboards incorporating hydro-met data, asset data, spatial socio-economic land use and other data;
- Integration of climate data into sector planning (water abstraction/allocation, transport operations, energy demand planning and management);

Institutional Training:

- Capacity building for national meteorological, water, and disaster management agencies;
- Training in data analysis, forecasting, and interpretation;
- Knowledge exchange across Pacific SIDS facilitated under Component 1.

Sub-project level outputs from this activity will include:

- Expanded and operational climate monitoring networks;
- Functional early warning systems with national coverage;
- Decision support tools embedded in sector planning;
- Trained personnel across key agencies.

10.4.3.3 Activity 2.1.3.3 Update Sector Policies and Plans

This activity ensures that climate resilience is mainstreamed into national and sectoral planning frameworks, enabling scaling and replication beyond individual investments. Examples of sub-

activities are described below. The development and design of specific interventions will be sub-project dependent and approved through the RPACA approval process.

Sectoral Adaptation Planning:

- Development of climate-resilient sector strategies (water, transport, energy, urban);
- Integration of climate risk assessments into sectoral master planning and investment planning and prioritisation.

Spatial and Land Use Planning:

- Development of risk-informed spatial plans;
- Hazard and risk modelling and mapping;
- Identification of no-build zones and areas with opportunities for climate resilience, nature restoration, etc.

System-Level Adaptation Planning:

- Use of system-scale CRVAs developed under Activity 2.1.1.1 to support multi-sector adaptation planning to address cascading risks;
- Prioritisation of future adaptation investments.

Sub-project level outputs under this activity will include:

- Approved sector adaptation plans;
- Climate-informed spatial development plans;
- Integrated multi-sector adaptation strategies;
- Policy guidance notes and planning tools.

10.4.3.4 Activity 2.1.3.4 Provide Institutional and Legislative Support for improving the enabling environment for climate-resilient infrastructure design, operations, and maintenance

This activity addresses systemic barriers by strengthening the legal and institutional framework required to sustain climate-resilient development. Examples of sub-activities are described below. The development and design of specific interventions will be sub-project dependent and approved through the RPACA approval process.

Institutional Strengthening and Restructuring:

- Clarification of roles and responsibilities for climate resilience across agencies;
- Establishment of climate units or focal points in sector agencies, establishment of sector focal points in climate agencies;
- Establishment of coordination mechanisms (e.g. inter-ministerial committees).

Legislative Development. Drafting and enactment of legislation supporting:

- Climate-resilient infrastructure standards;
- Risk-informed land use planning;
- Utility regulation and service delivery under climate stress.

Regulatory Frameworks. Development of regulations for:

- Asset ownership and management;
- Maintenance obligations.

Capacity Building for Policymakers:

- Training for government officials on climate policy, regulation, and enforcement.

Sub-project level outputs under this activity will include:

- Revised or new legislation enacted;
- Strengthened institutional mandates and coordination mechanisms;
- Operational regulatory frameworks;
- Trained policymakers and regulatory bodies.

10.4.4 Contribution of Outcome 2.1 to Theory of Change

Under Outcome 2.1, across the Pacific, and across several sectors, investments will lead to increased community and/or sector resilience. Capacity to implement and upscale climate resilient investments

will be increased. This large-scale demonstration will transform the 'business-as-usual' approach. This will help remove or reduce institutional, technical and ecological barriers to: Protecting Pacific Communities through Climate-Resilient Infrastructure and Coastal Protection.

10.4.4.1 Gender and Social Inclusion

Outcome 2.1 embeds GEDSI by ensuring that climate-resilient infrastructure investments deliver equitable benefits across populations. National PIUs will implement Gender Action Plans, inclusive consultations, and accessible grievance mechanisms to ensure women, youth, and persons with disabilities are actively engaged in project design and oversight. Infrastructure typologies — from coastal protection to resilient health systems — will integrate universal design standards, gender-disaggregated monitoring, and safeguards against exclusion. Indicators will track equity outcomes alongside technical resilience, ensuring that vulnerable groups benefit from improved water security, reliable energy, safe transport, and resilient social services. Capacity-building activities under Output 2.1.3 will include women, youth, and persons with disabilities as participants and leaders, embedding inclusion into institutional strengthening. By mainstreaming GEDSI across infrastructure delivery and enabling environments, Outcome 2.1 ensures that resilience outcomes are socially equitable, advancing RPACA's paradigm shift toward inclusive climate-resilient infrastructure systems.

11 Gender

Annex 8 provides full details of the gender assessment findings of the detailed action plan.

Gender Equality and Inclusion Analysis and Action Plan (GAAP). The GAAP has been prepared for RPACA, aligned with the Green Climate Fund's Gender Policy (2022). It operationalises core requirements by embedding intersectional analysis, ensuring diverse groups participate in governance, and addressing differentiated risks so that women, youth, persons with disabilities, and socially excluded groups benefit equitably from climate finance and infrastructure investments. While the analysis identifies programme-wide gender and inclusion criteria agreed by Pacific leaders, it focuses on ADB-managed Components One and Two.

Process and Co-Design. The GAAP was developed through policy reviews and consultations, supported by intersectional analysis of risks and opportunities in climate action and finance. A regional design workshop consolidated inputs, with ministries of finance, national designated authorities, and civil society organisations co-designing the framework. Iterative drafting and validation ensured the GAAP reflects structural barriers and compounded vulnerabilities, while examining how these dynamics shape access to climate finance, fiscal governance, and coastal protection decisions.

Climate Vulnerabilities and Social Impacts. Pacific Island Countries face rising seas, ocean warming, and severe cyclones that displace communities, damage infrastructure, and erode growth and social capital. Climate migration and resettlement are reshaping social structures, with families losing land, livelihoods, and cultural continuity. Women and girls shoulder intensified workloads and caregiving, face heightened risks of exclusion and exploitation, and reduced access to finance and authority. Persons with disabilities, elderly populations, SOGIESC communities, and female-headed households encounter compounded barriers to relocation, recovery, and governance. Intersectional realities magnify exclusion, shaping who adapts, who recovers, and who is left behind. Demographic pressures, including youth bulges and aging populations, disability prevalence, and rapid urbanisation, combine with climate-driven migration to concentrate vulnerability and intensify differentiated impacts.

Systemic Adaptation Challenges. Adaptation challenges are systemic. Coastal concentration of populations and infrastructure amplifies risk, while reliance on agriculture, fisheries, and tourism heightens sensitivity to shocks. Displacement and saline intrusion undermine food and water security, while health systems struggle with disease and disrupted care. Climate impacts could reduce GDP growth and require investment equal to 2–3% of GDP annually, yet fiscal space is constrained. Strengthening public financial management is essential to mobilise and track climate finance, while infrastructure and coastal protection must embed universal design, SEAH-safe protocols, and inclusive governance. Adaptation cannot succeed without shifting decision-making structures to institutionalise diverse representation, dismantling discriminatory norms, and resourcing civil society and community-led approaches.

The Gender Equality and Inclusion Action Plan. The GAAP sets programme-wide gender and inclusion criteria and applies them across RPACA. It provides actions and indicators, alongside component-specific measures for ADB-managed Components One and Two. The plan identifies barriers, defines actions, sets timelines and responsibilities, and integrates monitoring and budget provisions to embed equality, inclusion, and resilience throughout climate finance and adaptation. Grounded in a Gender-Transformative Climate Action (GTCA) approach, the GAAP frames resilience outcomes as systemic shifts, embedding empowerment logic and active participation of women, youth, persons with disabilities, and socially excluded groups, and institutionalising inclusive practices across the programme.

The specific costs of implementing the GAP (\$3.75 million) are earmarked within Component 2 budget.

PART 3 DUE DILIGENCE, PROGRAMME SUPPORT AND IMPLEMENTATION ARRANGEMENTS

12 Capacity Building and Technology Development/Transfer

All Programme components and outputs will contribute to capacity development across the Pacific.

Output 1.1.2 is the only output that can be considered 'purely' capacity development. Its focus and its endpoint are to build capacity. All other outputs and outcomes will 'build capacity by doing', i.e. the capacity built will be a standard critical co-benefit of all activities. This will support individuals, teams and institutions across the region to undertake key tasks, and this support will be delivered in a manner that leads the individuals, teams and institutions to acquire the skillsets, tools, competencies, networks and knowledge required to then undertake such tasks without external support.

12.1 Component 1

Under Outcome 1.1, Output 1.1.2 focuses specifically on capacity development for accessing climate finance.

Outcome 1.2 provides broad support to capacity development of public financial management in order to increase the capacity of PIC governments to access and manage climate finance.

Outcome 1.3 focuses more on soft technology transfer. Outcome 1.3 will transfer the technologies required to increase private sector investments into adaptation activities. The focus is on MSME and on women-led enterprises. Outcome 1.3 is limited to a small number of countries that are best able to benefit from this.

Outcome 1.4 will build 'green finance' capacity. Outcome 1.4 will build capacity in central banks, private banks and the insurance sector, for example to assess climate risks and to report on climate performance. Outcome 1.4 is limited to the countries that are best able to benefit from this.

12.2 Component 2

Component 2 consists of investment projects in all participating countries– the sub-projects. Component 2 will deliver up to 21 climate adaptation investments through these investment sub-projects. The sub-project investments will be focussed into key sectors (coastal management, water and urban services, health and social services, energy, transport). As discussed in Box 10 **Error! Reference source not found..**

in order to be sustainable, ADB investment projects include important soft and capacity building activities. Accordingly, in the Pacific, ADB investment projects follow a similar project cycle and implementation curve, and project will generally have three parts:

- Identification, participatory design, appraisal and approval. In the Pacific, this is typically a sizable component of the project and is funded by ADB;
- Infrastructure completed and operationalized. This accounts for the bulk of the project funds. It is overseen by design supervision teams.
- Capacity building of beneficiaries and strengthening of the enabling environment. In the Pacific, this typically accounts for 5-20% of the project budget (see Box 10). The activities are determined through the project design process and target specific needs relate to the investment and in the targeted sector. This may include, for example, data management, individual training, financial management, institutional strengthening, policy reform, planning, etc.

Box 10: Assessing the Soft Costs Around Investment Projects in the Pacific

Previous ADB studies^a point to the following constraints as being generally more significant in the Pacific than across Asia:

- limited implementation capacity;
- small administrations;
- geographic dispersion, and;
- procurement challenges

These constraints undermine the impact and sustainability of all investments. Accordingly, and subsequent to these studies, ADB has developed a range of additional and bespoke support measures. As a result, technical assistance, project preparation and project "soft" costs tend to be significantly higher in the Pacific than in other Asian countries.

These soft costs are broken down into: Project preparation; Project implementation support; and capacity building. The amounts vary across countries and sectors, and as yet there are no agreed defining lines separating preparation/implementation support/general capacity building. Hence specific, agreed figures are not available for breakdown of the soft and hard costs. Generally, from reviewing ADB's infrastructure, energy, water and governance operations, the following costs are reasonable:

Cost component	Typical Pacific grant project	Typical Pacific loan project
Soft: Project preparation & design	5–15%	3–10%
Soft: Implementation support / PMU / supervision	8–20%	5–15%
Soft: Capacity building, institutional strengthening, policy support	5–20%	2–10%
Hard: Physical investments / construction / equipment	50–80%	70–90%

ADB, and other development partners, finance these soft interventions through several modalities. In many cases the soft support is financed in connection with the hard components of an investment project, and the objectives of the soft support are entirely or almost entirely focussed around the focus of the investment project – i.e the site, the departments, the sub-sectors. In other cases, the soft support is finance by a separate initiative, typically having a broader reach. Typically, in these latter cases, the objectives of the soft support include, but are not limited to, accompanying an investment project and supporting its impact and sustainability.

^a Asian Development Bank. 2020. Knowledge and Support Technical Assistance (KSTA), Enhancing Quality Portfolio Performance in the Pacific. (notably Appendix 3: FRAMEWORK FOR PORTFOLIO PERFORMANCE ENHANCEMENT); Asian Development Bank. 2021. *Preparing Nonsovereign Operations in the Pacific*; Asian Development Bank. 2021. *Preparing Clean and Renewable Energy Investments in the Pacific: Technical Assistance Report*; Asian Development Bank. 2024. *Effective and Sustainable Capacity Development Pathways for the Pacific. Technical Assistance Cluster Report*; and PWC. 2024. *Enhancing Quality Portfolio Performance in the Pacific*, Prepared by PricewaterhouseCoopers Private Limited For Asian Development Bank

Source: Asian Development Bank

13 Stakeholder Consultations and Engagement Plan

The RPACA Stakeholder Engagement Plan (SEP) supports open, participatory, and accountable development processes. It promotes inclusive decision-making, shared responsibility, and constructive dialogue among diverse stakeholders to strengthen credibility and foster trust. The SEP covers the ADB-led components 1 and 2 of the RPACA programme, namely, programme design and sub-project implementation. The implementation phase also includes the design of sub-projects, which are subject to enhanced due diligence and community participation, under ADB's Environmental and Social Framework (ESF), which provides policy guidance that reinforces these principles. The SEP is also fully aligned with GCF's Environmental and Social Policy.

To support a country-driven and contextually grounded RPACA programme, stakeholders at regional and national levels were engaged to provide feedback and inputs to the programme design. The objectives of these consultations included

- (i) Strengthening RPACA programme design through stakeholder insights
- (ii) Ensuring country ownership and programme alignment with national climate priorities and development strategies
- (iii) Promoting inclusive participation across diverse stakeholder groups
- (iv) Building trust, transparency and accountability in RPACA programme design
- (v) Understanding stakeholder communications and engagement needs

Stakeholders were identified and mapped based on their influence, interest, and vulnerability. These included

- (i) Government agencies and National Designated Authorities (NDAs)
- (ii) Civil society organizations (CSOs)
- (iii) Local communities, Indigenous Peoples
- (iv) Private sector actors

To support the design of the RPACA programme, extensive stakeholder engagement consultations were conducted between April 2024 and April 2026 at national and regional levels. This included two major regional workshops with GCF National Designated Authorities (NDAs), relevant line ministries, and ADB country climate and sector focal points; and two partner-led regional dialogues which included opportunities for RPACA focused presentations and discussions.

National consultations were integrated into ADB's country operations missions in close coordination with ministries of finance and relevant line ministries. Where possible RPACA stand alone consultations were also conducted. These engagements played a critical role in refining the RPACA programme structure, identifying priority sectors, and informing the country needs.

Following RPACA approval, ADB will conduct extensive subproject-level engagement from design through to implementation, carried out in accordance with its comprehensive due diligence standards, ensuring that women, communities, Indigenous Peoples, civil society organizations and other key stakeholders are meaningfully involved in planning and decision-making. Each subproject will develop a stakeholder engagement plan which will identify how meaningful engagement will occur. As the programme moves into implementation, engagement will continue through the RPACA governance structure, advisory committees, grievance and accountability mechanisms, and community/stakeholder consultations.

14 Cost Estimates

Table 52: Stakeholder Engagement Costs

Component	Output	Indicative cost Options	GCF financing		Co-financing		
			Amount Options	Financial Instrument	Amount Options	Financial Instrument	Name of Institutions
Component 1: Enhancing PICs' Access to Climate Finance	1.1.1. Skills and capacity to address climate- and disaster-responsive PFM are enhanced, retained and applied.	<u>3,781,825</u>	<u>3,781,825</u>	<u>Grant</u>	<u>0</u>	<u>Grant</u>	<u>ADB</u>
	1.1.2 Regional institutional mechanisms for climate finance and adaptation planning coordination established.	<u>2,250,000</u>	<u>2,250,000</u>	<u>Grant</u>	<u>0</u>	<u>Grant</u>	<u>ADB</u>
	1.1.3. Climate-related fiscal risk analytics and budget integration tools developed and operationalized	<u>999,980</u>	<u>999,980</u>	<u>Grant</u>	<u>0</u>	<u>Grant</u>	<u>ADB</u>
	1.1.4 Prioritized, costed, and finance-ready climate adaptation investment pipelines developed.	<u>1,149,995</u>	<u>1,149,995</u>	<u>Grant</u>	<u>0</u>	<u>Grant</u>	<u>ADB</u>
	1.1.5 Innovative climate finance instruments and enabling frameworks designed and deployed.	<u>1,950,000</u>	<u>1,950,000</u>	<u>Grant</u>	<u>0</u>	<u>Grant</u>	<u>ADB</u>
	1.2.1 Regional blended finance platform for MSME adaptation lending established and operationalized.	<u>46,650,000</u>	<u>15,650,000</u>	<u>Grant</u>	<u>31,000,000</u>	<u>Grant</u>	<u>ADB</u>
	1.2.2 Pacific Infrastructure Risk Advisory and Transfer Support (PAC-INFRAT) piloted and operational.	<u>1,500,000</u>	<u>1,500,000</u>	<u>Grant</u>	<u>0</u>	<u>Grant</u>	<u>ADB</u>
	1.3.1 National financial sector policy, regulatory and institutional capacities are strengthened (in accordance with regional and international frameworks)	<u>4,500,200</u>	<u>4,500,200</u>	<u>Grant</u>	<u>0</u>	<u>Grant</u>	<u>ADB</u>

	Component 1 Gender action plan implementation.	<u>1,218,000</u>	<u>1,218,000</u>	<u>Grant</u>	<u>0</u>	<u>Grant</u>	<u>ADB</u>
	M+E/Programme oversight	<u>1,500,000</u>	<u>1,500,000</u>	<u>Grant</u>	<u>0</u>	<u>Grant</u>	<u>ADB</u>
Component 2: Climate- Resilient Infrastructure & Coastal Protection	2.1.1 Evidence- based, system- scale climate adaptation sub- projects developed and approved.	<u>10,000,000</u>	<u>10,000,000</u>	<u>Grant</u>	<u>0</u>	<u>Grant</u>	<u>ADB</u>
	2.1.2 Climate- resilient adaptation infrastructure sub- projects completed and operationalized.	<u>933,800.00</u> <u>0</u>	<u>194,389.00</u> <u>0</u>	<u>Grant</u>	<u>272,211,000</u>	<u>Grant</u>	<u>ADB</u>
					<u>467,200,000</u>	<u>Loans</u>	<u>ADB</u>
	2.1.3 Institutional capacity and enabling environment of national agencies for climate-resilient infrastructure management strengthened.	48,468,100	9,579,000	<u>Grant</u>	<u>38,889,000</u>	<u>Grant</u>	<u>ADB</u>
	Component 2 Gender action plan implementation	1,532,000	1,532,000	<u>Grant</u>	<u>0</u>	<u>Grant</u>	<u>ADB</u>
Indicative total cost (USD)		<u>1,059,000,300</u>	<u>250,000,000</u>		<u>809,000,300</u>		

ADB= Asian Development Bank, GCF= Green Climate Fund, M+E= monitoring and evaluation, MSME= micro small medium enterprise, PAC-INFRAT= Pacific Infrastructure Risk Advisory and Transfer Support Service, PFM= public financial management, PIC= Pacific Island Countries.
Source Asian Development Bank.

15 Exit Strategy

The exit strategy for the RPACA programme must recognise the structural realities of Pacific SIDS: high climate exposure, small and dispersed populations, constrained fiscal space, and long-term dependence on concessional finance. The IMF estimates that the Pacific needs an average of \$2.3 billion per year¹³² for "hard" adaptation investment —specifically for upgrading infrastructure, retrofitting assets, and coastal protection. As such, "exit" should not be interpreted as a withdrawal of external support, but rather as a transition to sustained, country-led systems for planning, financing, and delivering climate-resilient infrastructure, with continued but more strategic use of international climate finance including GCF, AF, L&D funds etc.

The RPACA design supports sustainability through three mutually reinforcing pillars:

(i) institutionalisation of climate-informed infrastructure planning, (ii) development of a robust and replicable project pipeline, and (iii) strengthened national systems for financing, managing, and maintaining resilient assets.

The programme embeds climate risk management into core government and ADB planning processes, rather than treating adaptation as a standalone activity. Through the development of standardised eligibility criteria (section 8), evaluation frameworks, and application processes, RPACA creates a repeatable model for identifying and prioritising adaptation investments. This is directly embedded into ADB's project planning and preparation processes. Over the duration of RPACA it is expected that this will become the new 'business as usual' and project teams and national agencies will default to identifying systemic climate risks early in project development to develop pipelines of adaptation projects which deliver long term resilience and reduce maladaptation. Indeed, it is expected that the system-scale climate risk assessments undertaken under RPACA will directly identify 2 to 3 additional robust adaptation projects in each system or sector evaluated. Over time, this reduces reliance on external technical assistance for project identification, as national agencies and ADB sector teams adopt and internalise these approaches.

The programme is proposed to invest heavily in upstream analytical capacity, including systemic climate risk and vulnerability assessments, improved data collection, and decision-support systems. These investments generate a long-term evidence base that can be reused and updated, rather than recreated for each project. This is particularly important in the Pacific context, where data gaps and capacity constraints often limit effective planning. By strengthening national capabilities to monitor climate risks (e.g. hydro-meteorological systems, groundwater monitoring, early warning systems) and to translate this information into planning decisions, RPACA ensures that countries are better equipped to continuously identify and adapt to evolving climate risks beyond the life of the programme. This pipeline approach reduces transaction costs over time and positions countries to access future rounds of climate finance more efficiently and competitively. In this sense, RPACA does not eliminate the need for external finance, but it significantly improves countries' ability to mobilise and utilise it effectively.

The programme strengthens the enabling environment for sustainable infrastructure delivery and management. This includes building the technical and institutional capacity of national agencies to operate and maintain infrastructure assets, developing standard operating procedures, and updating policies, regulations, and design standards. These interventions address a critical sustainability challenge in the Pacific: the tendency for infrastructure performance to degrade over time due to limited maintenance capacity and unclear institutional responsibilities. By clarifying roles, improving asset management systems, and embedding climate considerations into policies and standards, RPACA helps ensure that investments deliver long-term resilience.

Component 1 of the programme further reinforces sustainability by enhancing long-term access to climate finance and strengthening financial management systems. By building capacity in areas such as financial planning, risk analytics, and climate finance accreditation or readiness, the programme supports countries in taking a more proactive role in financing their adaptation

¹³² IMF. 2021. [*Fiscal Policies to Address Climate Change in Asia and the Pacific*](#).

priorities. Improved financial governance and risk management also increase confidence among development partners, potentially unlocking additional concessional and blended finance over time.

The RPACA programme expects to deliver a shift from ad hoc, project-by-project support to a more programmatic and predictable financing model, where countries, ADB and other MDB's, other donors, and climate funds collaborate around a shared pipeline of investments. Over time, it is anticipated that the role of external partners can evolve from intensive project preparation support to more targeted financing and technical backstopping.

Finally, sustainability is reinforced through a focus on learning, replication, and scaling. By documenting processes, developing guidance materials, conducting regional knowledge sharing RPACA ensures that lessons learned are institutionalised and applied across sectors and countries. The regional partnerships with technical partners SPREP and SPC established under RPACA will be critical to this outcome. This knowledge sharing creates the foundation for scaling the approach beyond the initial set of investments and embedding it within national NDAs and other national agencies planning processes and into ADB's broader Pacific operations.

In summary, the RPACA exit strategy is grounded in the creation of enduring systems—analytical, institutional, and financial—that enable Pacific countries to continuously plan, finance, and manage climate-resilient infrastructure. While external financing will remain a critical component, the programme ensures that such financing is used more strategically and effectively, supporting a long-term transition toward resilient, self-sustaining infrastructure systems in the Pacific.

16 Monitoring, Evaluation, Learning, and Reporting Arrangements

16.1 Introduction and Approach

See Annex 11 for detailed description of what will be measured, why there is a need for it to be measured, how measuring will be done, who will be responsible, and when to expect accomplishments of key performance indicators and reporting arrangements. Annex 11 provides guidance to programme and project managers, implementers, partners, and other relevant stakeholders.

At the GCF global programme level, Annex 11 illustrates the results architecture and maps out the result areas where the programme is expected to contribute, and guides stakeholders in demonstrating evidence on the progress and lessons across the different pathways of change. At the level of RPACA, it outlines the detailed processes and requirements to ensure alignment of contributions to the programme's result areas and consistency of tools, practices, and systems to facilitate efficient and quality aggregation of results across levels of implementation.

16.1.1 Strategic Overview

Monitoring, Evaluation, and Learning (MEL) is a foundational pillar of the RPACA Programme. It responds to a key challenge in climate adaptation across the Pacific: the fragmentation of projects, weaknesses in long-term impact tracking, and limited cross-country learning. RPACA addresses these by embedding a structured and regionally coordinated MEL system into programme design from the outset.

The MEL approach supports both compliance and innovation—ensuring accountability to the GCF and ADB, while enabling adaptive learning, reflection, and policy feedback. It facilitates continuous improvement and enhances the programme's ability to respond to emerging climate risks and opportunities. To do this, the MEL framework is designed to support two core functions:

- Ensuring compliance and accountability with GCF and ADB reporting, evaluation, and safeguards requirements;
- Fostering adaptive learning to inform decision-making, enable regional collaboration, and promote effective climate resilience strategies in glacial basins and downstream communities.

16.1.2 Alignment with ADB and GCF Frameworks

The RPACA MEL system is firmly grounded in ADB's institutional architecture and aligned with the best global practices:

- ADB's Evaluation Policy ensures independent, credible, and evidence-based evaluation of outcomes, impacts, and institutional effectiveness;
- ADB's Corporate Results framework sets standards for tracking development effectiveness, including resilience, inclusivity, and cross-border cooperation;
- ADB's Knowledge Management Action Plan (KMAP) 2021–2025 promotes the systematic use of knowledge to strengthen programme design, implementation, and learning.

At the same time, RPACA Programme fully adheres to GCF's:

- Integrated Results Management Framework (IRMF), including core adaptation indicators, paradigm shift potential, and enabling environment criteria;
- Evaluation Policy, which emphasizes learning, accountability, and the assessment of long-term transformation.

RPACA Programme's MEL structure is designed as a multi-level, participatory, and iterative system that reflects both institutions shared commitment to impact, transparency, and continuous improvement.

16.1.3 ADB Knowledge and Impact Assessment Approach

ADB views knowledge as a strategic asset and a core driver of development effectiveness. Under Strategy 2030, knowledge is recognized as one of ADB's operational priorities, and the KMAP (2021–2025) provides a roadmap to operationalize this vision across the project cycle.

RPACA applies the four pillars of ADB's knowledge approach throughout the programme:

1. **Enhancing the Quality of Knowledge Products** - RPACA will generate practical, demand-driven knowledge products—such as field-based case studies, policy briefs, and learning synthesis papers—to support evidence-informed action and replication across the region.
2. **Improving the Management of Knowledge Assets** - A digital knowledge repository will store lessons, implementation results, and community innovations, ensuring institutional memory and wider accessibility even after project completion.
3. **Strengthening Knowledge Partnerships** ADB will work with RPACA partners – SPC and SPREP and other regional platforms (e.g. PRIF, PIFS), academic institutions, and civil society to co-develop knowledge and promote peer-to-peer learning across participating countries.
4. **Promoting a Knowledge Culture** The programme will invest in building the capacity of NDAs, executing entities, and local stakeholders in adaptive learning, results communication, and impact assessment. Regional learning events and country-level workshops will further embed a culture of inquiry and learning.

16.1.4 Knowledge Generation and Learning Systems

To support regional learning and replication, RPACA will establish a dedicated Knowledge and Learning Workstream under Component 1. At a later time, should SPREP GCF RPACA proposal be approved, this will be fusionned with knowledge management in Component 4. This will include:

- Regional learning exchanges, enabling dialogue among implementing partners, NDAs, and technical agencies;
- A digital knowledge platform that aggregates tools, innovations, and real-time learning across countries;
- Synthesis reports and learning papers that communicate lessons to GCF, ADB, and external audiences;
- Regional partnerships to share results and scale regional adaptation efforts.

A Knowledge Management Strategy will be finalized during inception to ensure learning is embedded in implementation and contributes to policy and institutional development at the national and regional levels.

16.1.5 MEL Governance and Capacity

A dedicated RPACA MEL Expert will be embedded in the Programme Management Unit and will:

- Oversee the design and implementation of MEL systems across countries and components;
- Ensure consistency in data collection, safeguards reporting, and results synthesis;
- Manage external evaluations and quality assurance;
- Facilitate learning loops and engagement between NDAs, EEs, and ADB teams.

Participatory monitoring will be institutionalized through annual stakeholder reviews, led by NDAs and involving local communities, civil society organizations, and marginalized groups.

RPACA will also, where appropriate, adopt evaluative monitoring—a hybrid approach that not only tracks implementation milestones but also captures learning on how resilience is built, what adaptation pathways succeed, and under what conditions.

16.2 RPACA Monitoring and Evaluation Arrangements

The MEL system is structured across three levels:

- **Sub-Project Level:** EEs will conduct semi-annual reporting, monitor safeguards (ESMPs, IPPs, GAPs), and provide audited financial statements. This ensures systematic data collection on outputs and early outcomes (see next section).
- **Programme Level:** ADB, as Accredited Entity, will submit Annual Performance Reports to GCF, aggregating progress across projects and assessing achievements against core indicators,

gender and inclusion targets, and financial milestones. This covers both achievements within the RPACA logical framework, and contributions to GCF global, corporate and Fund level results frameworks.

- Independent Oversight: Mid-Term Reviews and Terminal Evaluations will be conducted by external experts to ensure objectivity. All evaluations will be publicly disclosed and include mechanisms for tracking follow-up actions.

16.2.1 Evaluation Schedule and Approach

RPACA will undergo the following evaluations:

- Mid-Term Review (Year 3–5): To assess implementation status, identify emerging outcomes, and enable course correction.
- Terminal Evaluations (end of sub-projects/programme): To evaluate strategic relevance, effectiveness, sustainability, and contributions to transformation using GCF's three-point paradigm shift and enabling environment rating scales. All evaluations will be independent, methodologically rigorous, and structured to feed into both GCF reporting and ADB's organizational learning.

16.2.2 Indicators, Targets, Milestones and Means of Verification

See Annex 11.

16.3 Sub-Project Monitoring

As mentioned above, Component 2 will deliver up to 21 climate adaptation investments, each providing both hard and soft deliverables. These investments are to be implemented as 'sub-projects'. Each sub-project will have its own governance system, implementation arrangements, financial arrangements and monitoring system. Each sub-projects monitoring system will be fully aligned to the overall RPACA monitoring framework.

This current document does not set out the details of the sub-project monitoring frameworks - they are each to be developed by the concerned sub-project teams. Each sub-project will have its own DMF, linked to the overall RPACA monitoring framework and DMF. Data from sub-projects will feed into RPACA monitoring.

At the sub-Project level, each project will establish:

- Quantitative baselines for output and outcome indicators, disaggregated by gender, geography, and beneficiary group;
- Qualitative baselines to assess institutional readiness, enabling environment, and risk context;
- Scorecards based on GCF's IRMF to track progress toward enabling transformation at midterm and terminal stages.

17 Environmental and Social Risk Assessment

Based on the activities proposed under each component of the Programme, the overall environmental and social (E&S) risk classification of the Programme is High Risk, reflecting the activity with the highest anticipated E&S risks and impacts. This risk classification may be subject to revision as specific activities are further defined and confirmed in consultation with participating developing member countries (DMCs). The risk classification has been assigned in accordance with ADB's Environmental and Social Framework (ESF), 2024. An Environmental and Social Management Framework (ESMF) has been prepared in accordance with the ADB's ESF (2024) and all relevant policy requirements, as well as the Green Climate Fund Environmental and Social Policy and associated requirements. The ESMF defines the screening process and environmental and social risk classification procedures that will be applied to assess and classify the E&S risks and impacts of each activity financed under the Programme. Following confirmation of specific activities in consultation with participating countries, the applicable E&S documentation and requirements, in accordance with ADB's ESF (2024), will be identified and prepared. This may include technical assessments, as required, based on the presence of sensitive environmental or social receptors. The primary E&S risks and impacts are expected to arise during construction activities. These impacts are anticipated to be largely site-specific and reversible through the implementation of appropriate mitigation measures, which will be incorporated into Environmental and Social Management Plans (ESMPs) and associated subplans.

For activities involving financial intermediation, an audit-based approach will be applied to assess and verify compliance with applicable E&S standards among participating clients. This will include the establishment and implementation of Environmental and Social Management Systems (ESMS) to guide screening, risk classification, and monitoring of such activities.

The capacity of executing entities (EEs) to implement ESMPs and ESMFs, and to ensure effective compliance monitoring, supervision, and reporting, will be strengthened through targeted capacity development activities.

A dedicated Grievance Mechanism (GM) will be established under the Programme in accordance with the requirements of ADB's ESF to receive, record, and resolve concerns or grievances related to Programme activities. The Programme GM will include a confidential and survivor-centered mechanism to address sexual exploitation, abuse, and harassment (SEAH)-related incidents, consistent with relevant good practice guidance and ESF requirements. In addition, each participating DMC will establish or strengthen its own grievance mechanism aligned with the Programme-level GM.

A Stakeholder Engagement Plan (SEP) will be developed in accordance with ADB's ESF, specifically Environmental and Social Standard (ESS) 10, to guide engagement with relevant stakeholders at regional and national levels. The SEP will define stakeholder engagement approaches throughout the preparation and implementation phases of Programme activities.

All relevant information and documentation prepared under the Programme will be disclosed in accordance with ADB's *Access to Information Policy*, the Green Climate Fund *Information Disclosure Policy*, and applicable provisions of their respective environmental and social policies.

All activities financed under the Programme will be screened to assess potential impacts on Indigenous Peoples. Activities will be designed to ensure that adverse impacts are avoided or minimized. Where adverse impacts are identified, an Indigenous Peoples Plan (IPP) will be prepared in accordance with ADB's ESF, particularly Environmental and Social Standard (ESS) 7 and ESS 10, as well as the Green Climate Fund Indigenous Peoples Policy.

18 Risk Factors and Mitigation Measures

The RPACA programme recognises the diverse and multi-layered risks associated with delivering a regional, multi-country, and multi-sectoral climate adaptation initiative across PICs. These risks reflect the unique characteristics of the Pacific context, including geographic isolation, small and capacity-constrained institutions, high exposure to climate hazards, and reliance on external financing and technical support. They also include systemic gender equality and social inclusion (GESI) risks that can undermine effectiveness, equity, and sustainability if not addressed.

The selected risk factors presented in this section are grouped by category, described in terms of their likelihood and potential impact, and accompanied by appropriate mitigation strategies. Each risk is assessed based on its probability and the severity of its potential consequences for programme implementation and outcomes. Where relevant, risks are analysed through a gender and inclusion lens to ensure differentiated impacts on women, youth, persons with disabilities, and other vulnerable groups are recognised and mitigated.

The mitigation measures are designed to reduce both the likelihood of risks occurring and the magnitude of their impacts, through a combination of institutional strengthening, robust technical design, enhanced coordination mechanisms, and adaptive programme management. This includes embedding gender-responsive budget tagging, universal design standards, SEAH-safe safeguards, and inclusive governance mechanisms into programme delivery. The programme emphasises upstream risk reduction, such as strengthening national systems, improving planning and data availability, and ensuring alignment with country priorities, as well as downstream measures that enhance resilience during implementation. This integrated approach ensures that climate action does not reinforce existing inequalities but instead contributes to transformative inclusion.

The ADB implements a number of programmes and projects in the Pacific Island region. The institutional knowledge of implementation in the region will strengthen RPACA and broader Pacific programming by systematically learning from existing regional climate and development initiatives to better anticipate, manage, and reduce programme risks under RPACA. Many Pacific initiatives already operate in environments with similar constraints -small markets, fragile infrastructure systems, data gaps, and high climate exposure - so they provide practical lessons on what delivery models actually work in practice.

The risk management approach for RPACA is aligned with the policies and standards of the Green Climate Fund (GCF), as well as the applicable frameworks of the implementing entities, including the Asian Development Bank. These include ADB's Anticorruption Policy (1998, as amended) and Integrity Principles and Guidelines; the Procurement Policy (2017, as amended) and Procurement Regulations for ADB Borrowers (2017, as amended from time to time); the Environmental and Social Framework (2024); and ADB's financial management, disbursement, and fiduciary assurance procedures, including financial management assessments and audit requirements applied to sovereign operations.

In addition, implementation will be guided by ADB's operational guidance on climate risk management and disaster risk management, as well as its approaches for Fragile and Conflict-Affected Situations (FCAS) and Small Island Developing States (SIDS). Together, these frameworks guide due diligence, fiduciary oversight, procurement integrity, environmental and social safeguards, and compliance across all programme activities, ensuring that risks are managed in a consistent, transparent, and accountable manner. Risk and mitigation measures specific to gender equality and social inclusion are detailed in Annex 8: GAAP, which provides the programme's dedicated framework for systematically identifying, mitigating, and monitoring GESI risks.

Risk management under RPACA will be implemented as a continuous and adaptive process throughout the programme lifecycle. Regular monitoring, reporting, and review mechanisms will be established to track risk levels, assess the effectiveness of mitigation measures, and enable timely adjustments in response to evolving risks, including those associated with climate variability, economic conditions, and institutional changes. Monitoring frameworks will require sex, age, and disability-disaggregated data, and grievance mechanisms will be SEAH-safe and accessible

to all groups. This adaptive management approach will ensure that RPACA remains responsive to the dynamic risk environment of the Pacific region and is able to safeguard the achievement of its intended outcomes and long-term resilience objectives.

Box 11: Selected Risk Factor 1: Multi-Country Governance and Institutional Coordination Complexity		
Category	Probability	Impact
Governance	Medium	High
Description		
RPACA will be implemented across multiple PICs, each characterised by distinct governance systems, institutional arrangements, regulatory frameworks, and sectoral priorities. Differences in national planning cycles, procurement rules, safeguards requirements, and reporting obligations create inherent coordination challenges across jurisdictions. These challenges are compounded by overlapping mandates between national governments, regional organisations, and development partners, as well as small public administrations with limited staffing and high turnover. Further, RPACA is designed as an integrated, programmatic intervention in which the four components are mutually reinforcing and collectively necessary to achieve the intended paradigm shift outcomes. While Components 1–2 (ADB), Component 3 (SPC), and Component 4 (SPREP) are implemented through separate financing proposals reflecting institutional mandates, the programme logic is explicitly structured to ensure functional interdependence rather than fragmentation. The risk that components may not progress in sync, or that delays or partial implementation could affect overall programme outcomes, is recognised. However, this risk is mitigated through several design and implementation safeguards. Without effective coordination, there is a risk of fragmented implementation, inconsistent application of standards, duplication of effort, delays in decision-making, and reduced programme coherence across countries and sectors. There is also a risk that governance platforms exclude women, youth, persons with disabilities, youth and SOGIESC groups, limiting equitable voice and access to programme benefits.		
Mitigation Measure(s)		
RPACA will implement an integrated regional coordination model that combines strong central oversight with country-level ownership, ensuring consistency while allowing flexibility for national contexts. A dedicated Programme Management Unit will provide strategic oversight, technical guidance, and quality assurance across all participating countries, supported by regional and national governance structures. Standardised implementation procedures, reporting frameworks, and safeguards systems will be applied to ensure harmonisation, while formal agreements will clarify institutional roles and responsibilities. Continuous coordination, adaptive management, and alignment with national policies will reduce fragmentation and ensure timely decision-making. Key measures include: Programme is anchored in a single theory of change, where outcomes are not allocated linearly to individual components but are instead achieved through their combined effect. Formation of regional steering committee and links to national coordination platforms to ensure effective oversight and coordination – a regional and joint coordination architecture will bring together ADB, SPC, and SPREP, along with participating governments. This ensures alignment on sequencing, risk monitoring, and adaptive implementation, and provides a structured mechanism to manage delays or recalibrate delivery pathways if needed. Sequencing logic is embedded in design, with Components 1 and 2 (ADB-led) acting as foundational enablers for scaling finance and investments, while Components 3 (SPC) and 4 (SPREP) strengthen enabling systems (capacity, information, and climate services). Where sequencing risks arise, implementation will be adjusted through adaptive management to prioritise critical dependencies. Adoption of standardised operating procedures, templates, and reporting systems (i.e. ADB procurement, environmental and social safeguards, and financial management procedures) Formalisation of roles through project-level MoUs and implementation agreements Alignment with national policies, NAPs, and sector strategies. Regular coordination meetings, joint reviews, and adaptive management processes. Transparent reporting on participation and benefit-sharing, disaggregated by sex, age, and disability ADB= Asian Development Bank, MoU= Memorandum of Understanding, NAP= National Adaptation Plan, PIC= Pacific Island Countries, SPC= Pacific Community, SPREP= Secretariat of the Pacific Regional Environment Programme, SOGIESC= Sexual Orientation, Gender Identity and Expression, and Sex Characteristics. Source: Asian Development Bank.		

Box 12: Selected Risk Factor 2: Non-Compliance of Country-Submitted Projects with GCF Investment Criteria		
Category	Probability	Impact
Governance / Technical	Medium	High
Description		
Under RPACA, participating countries will identify and submit priority projects for inclusion in the programme pipeline. There is a risk that proposed projects may not fully align with GCF investment criteria, including climate rationale, paradigm shift potential, sustainable development impact, efficiency and effectiveness, and country ownership. In some cases, project concepts may be insufficiently developed, lack robust climate justification, or not meet GCF technical, financial, gender or safeguards requirements. This risk is heightened by varying levels of institutional capacity across PICs and limited experience with GCF processes. As a result, non-compliant proposals may delay programme preparation, require significant revision, or be excluded from funding, affecting overall programme delivery and pipeline strength.		
Mitigation Measure(s)		
RPACA will implement a structured project screening, development, and quality assurance process to ensure that all country-submitted proposals meet GCF and RPACA investment criteria prior to inclusion in the programme. This will include clear guidance to countries, early-stage screening against GCF requirements, and provision of technical support to strengthen project concepts. A centralised review mechanism will ensure consistency and quality across submissions, while iterative engagement with countries will support alignment with GCF expectations. This approach will reduce the risk of non-compliant proposals entering the pipeline and improve overall programme readiness and approval prospects. Key measures include: - Disseminate standardised project selection criteria aligned with GCF investment criteria - Establish a centralised screening and quality assurance process within the Programme Coordination Unit - Provide technical assistance to countries for project concept development and climate rationale strengthening - Implement multi-stage review processes (concept, pre-feasibility, full proposal) - Conduct capacity building on GCF requirements for national stakeholders - Facilitate early engagement with GCF Secretariat and NDAs for feedback and alignment - Maintain a pipeline management system to track compliance and readiness of projects - Integrate gender, women's empowerment and social inclusion criteria into project screening and appraisal as outlined in the GAAP - Require sex, age, and disability-disaggregated data in planning and reporting. GAAP= Gender Analysis Action Plan, GCF= Green Climate Fund, NDA= National Designated Authority. Source: Asian Development Bank.		

Box 13: Selected Risk Factor 3: Limited Institutional and Absorptive Capacity		
Category	Category	Impact
Technical and operational	Medium	High
Description		
PICs typically operate with small public sectors, limited technical expertise, and high dependence on external support, which constrains their capacity to implement complex, multi-sectoral programs. These constraints affect procurement, financial management, safeguards compliance, monitoring, and reporting, particularly in the context of large-scale climate finance. Competing priorities, including disaster response and essential service delivery, further strain limited institutional resources. Institutional cultures may be male-dominated, limiting participation and influence of women, youth, and persons with disabilities. As a result, there is a risk of delays in implementation, reduced quality of outputs, exclusion of a significant portion of the population and increased fiduciary and compliance risks.		
Mitigation Measure(s)		
The programme will adopt a capacity-first implementation model, embedding technical assistance and institutional strengthening within all programme components to ensure that capacity development occurs alongside delivery. Comprehensive capacity assessments will inform tailored support packages, including		

training, mentoring, and deployment of embedded specialists in key areas such as procurement, financial management, and safeguards. A phased implementation approach will align activities with institutional readiness, while continuous performance monitoring will enable adaptive support. This integrated approach ensures that national systems are progressively strengthened, reducing long-term dependence on external support. Key measures include:

- Conducting institutional and capacity assessments as part of ADB due diligence process
- Providing targeted training, mentoring, and technical assistance
- Embedding procurement, financial, and safeguards specialists within agencies
- Implementing phased rollout aligned with capacity levels
- Establishing ongoing performance monitoring and support mechanisms
- Provide training and tools for ministries to apply gender-responsive budgeting and track allocations to excluded groups
- Introduce change-management and leadership training to embed inclusive institutional norms.

Source: Asian Development Bank.

Box 14: Selected Risk Factor 4: Design standards, Procurement, Market Capacity, and Supply Chain Constraints for Infrastructure Investments

Category	Probability	Impact
Technical and operational	High	High
Description		
Infrastructure investments, including transport, water, and energy systems, face a heightened risk of being under designed for future climate conditions in the Pacific. This risk is driven by limited availability of localised climate or baseline data, evolving technical standards, and constrained engineering capacity across PICs. These challenges are compounded by procurement bottlenecks, a limited pool of contractors, the small size and remoteness of PIC markets, and shallow supplier market depth. Regional supply chains are fragile, with restricted availability of qualified contractors, suppliers, and service providers. Procurement systems often have limited experience with international standards, increasing the likelihood of delays and administrative inefficiencies. Supply chains are particularly vulnerable due to infrequent shipping services, limited port capacity, and high exposure to climate related disruptions. Male-dominated contractor networks and limited supplier diversity risk excluding women-owned businesses, youth enterprises, and disability-inclusive suppliers. Collectively, these factors elevate the risk of project delays, cost overruns, reduced competition, and compromised construction quality, ultimately undermining the effectiveness and resilience of infrastructure investments.		
Mitigation Measure(s)		
The programme will implement a proactive, risk-based procurement and supply chain strategy that strengthens national systems while leveraging regional and international markets. Standard procurement frameworks and documentation will be applied, supported by targeted capacity building for national agencies. Contract packaging and regional procurement approaches will be used to attract qualified firms, while advanced logistics planning will mitigate supply chain risks. Local contractor development will also be promoted to enhance market capacity over time. Key measures include: - Application of climate standards and climate risk screening across all infrastructure investments, - Using updated hazard data and scenario analysis - Applying ADB/GCF procurement frameworks and standard bidding documents - Providing procurement training and certification programs - Packaging contracts to attract qualified regional and international firms - Leveraging on ADB technical assistance, regional procurement approaches and, where available, framework agreements - Developing advanced logistics and supply chain management plans - Supporting local contractor capacity development - Embed inclusive procurement standards to ensure diverse suppliers can participate equitable. - Require contractors to adopt SEAH-safe safeguards and compliance mechanisms ADB= Asian Development Bank, GCF= Green Climate Fund, PICs= Pacific Island Countries, SEAH= Sexual Exploitation and Abuse and Sexual Harassment. Source Asian Development Bank.		

Box 15: Selected Risk Factor 5: Increasing Hazard Intensity, Climate Uncertainty, and Compound Events Impacting Coastal Settlements		
Category	Probability	Impact
Climate	High	High
Description		
PICs are highly exposed to climate hazards, including tropical cyclones, extreme rainfall, droughts, and sea-level rise. Climate change is expected to increase the intensity and frequency of these hazards, while uncertainty in climate projections complicates infrastructure planning and design. Compound events, where multiple hazards occur simultaneously or in close succession, have the potential to significantly amplify impacts on infrastructure systems, livelihoods, and institutional capacity. These climate shocks may disrupt RPACA implementation by diverting government and community attention and resources toward immediate response and recovery efforts. As a result, participation in programme activities may be reduced, leading to delays in implementation and diminished effectiveness. Such disruptions may limit the ability of communities and governments to engage consistently in RPACA activities, adversely affecting delivery timelines and outcomes.		
Mitigation Measure(s)		
The programme will adopt a climate-resilient and adaptive design approach that incorporates uncertainty and future risk scenarios into all investments. Climate projections aligned with international standards will inform design thresholds, while scenario-based planning will ensure flexibility. Disaster risk management will be integrated into programme design, and nature-based solutions will be used where appropriate to enhance resilience. Continuous updating of data and design parameters will ensure that investments remain robust under changing conditions. Key measures include: • Applying IPCC-aligned climate projections and design standards • Using scenario-based and adaptive design approaches, Integrating disaster risk management and contingency planning to ensure continuity of programme activities during and after climate events • Incorporating nature-based and hybrid solutions • Updating designs using latest climate data and modelling • Incorporate flexible and adaptive implementation arrangements, including contingency planning with countries • Re-sequence activities in response to shocks IPCC= Intergovernmental Panel on Climate Change Source: Asian Development Bank.		

Box 16: Selected Risk Factor 6: Data Limitations, Climate Information Gaps and Potential Maladaptation in the Coastal Environment		
Category	Probability	Impact
Technical	Medium	Medium
Description		
Coastal investments, including hybrid shoreline protection measures and nature-based solutions, risk resulting in maladaptation or suboptimal outcomes if they are not informed by robust, location-specific understanding of coastal processes and long-term climate projections. This risk is heightened by significant data and climate information gaps, as limited availability and variable quality of climate, hydrological, and environmental data constrain effective risk assessment, planning, design, and monitoring. Monitoring networks across Pacific Island Countries are often sparse, and historical datasets may be incomplete or inconsistent. While regional datasets are available, they may not adequately capture fine-scale local variability across islands and coastal settings, reducing confidence in projections and undermining evidence-based decision-making for site-specific interventions.		
Mitigation Measure(s)		

RPACA will implement a coordinated data-strengthening approach that combines targeted investments in climate, coastal, and environmental monitoring systems with strategic use of regional and global datasets. Data-sharing platforms will be strengthened to improve accessibility, interoperability, and use across institutions, while partnerships with regional organisations will support data generation, analysis, and application. Capacity-building initiatives will ensure national agencies are able to effectively interpret and apply data in planning, design, and decision-making. Where data gaps materially affect investment decisions, RPACA will support the collection of location-specific data to inform climate-resilient design and future adaptation planning at the project level. Key measures include:

Integrate climate risk and vulnerability assessments into all investment due-diligence, planning, and design processes.

Invest in priority data collection, monitoring systems, and targeted local studies to address critical climate and data gaps.

Systematically apply climate projections and multi-hazard modelling, using multiple data sources, to manage uncertainty.

Strengthen data-sharing systems and national capacity to improve access, interoperability, and use of climate and environmental information for decision-making.

Source: Asian Development Bank.

Additional Risks for Potential Consideration

Box 17: Selected Risk Factor 4: Fiscal Constraints and Financial Sustainability Risks		
Category	Probability	Impact
<u>Financial</u>	<u>Medium</u>	High
Description		
PICs face structural fiscal constraints due to small and undiversified economies, limited domestic revenue, high debt burdens, and exposure to external shocks. These factors limit the ability of governments to provide counterpart funding, meet co-financing commitments, and sustain long-term O&M of infrastructure and systems. Dependence on imported goods and services further exposes programmes to exchange rate volatility and global price fluctuations. Fiscal constraints disproportionately affect under-resourced gender and social inclusion agencies, weakening accountability for equitable outcomes. Without careful financial planning, there is a risk that investments may not be sustainable beyond the programme lifecycle.		
Mitigation Measure(s)		
RPACA will apply a financially conservative and sustainability-focused approach, prioritising grant financing and integrating lifecycle cost considerations into all investments. Early engagement with governments and partners will secure co-financing commitments, while contingency provisions will address cost escalation risks. O&M requirements will be embedded within project design and national budgeting processes to ensure long-term sustainability. The programme will also explore blended finance options and partnerships to leverage additional resources and reduce fiscal pressure on participating countries. Key measures include: • Structuring financing with high grant and concessional components • Securing co-financing commitments early in programme development • Including contingency and cost escalation provisions • Integrating O&M financing into project design and national budgets • Exploring blended finance and partner co-investment mechanism • Apply gender-responsive budgeting and embed GAAP PFM safeguards to ensure allocations support inclusive climate investments • Provide targeted support to under-resourced gender and social inclusion agencies GAAP= Gender Analysis Action Plan, PFM= public financial management, O&M= operation and maintenance. Source: Asian Development Bank.		

Box 18: Selected Risk Factor 9: Environmental and Social Safeguards, Including Land Tenure and Community Consent		
Category	Probability	Impact
Environmental and social	High	High
Description		
Customary land tenure systems in PICs require complex negotiation with landowners and communities, which may delay or prevent project implementation. Safeguards risks include exclusion of women, youth, persons with disabilities, and SOGIESC groups from FPIC processes. Limited capacity to implement environmental and social safeguards increases risks of non-compliance, environmental harm, and social conflict. Ensuring inclusive engagement and protection of vulnerable groups adds further complexity.		
Mitigation Measure(s)		
The programme will adopt a safeguards-led and community-centred approach, ensuring early engagement, strong compliance systems, and continuous monitoring. FPIC processes will be applied where required, and projects will be designed in close consultation with communities. Institutional capacity for safeguards implementation will be strengthened through training and technical support, supported by grievance redress mechanisms to manage risks effectively. Key measures include: • Conducting early stakeholder engagement and FPIC processes • Working with customary leaders and community institutions • Applying ADB/GCF safeguards frameworks rigorously • Establishing grievance redress mechanisms • Providing safeguards capacity building and monitoring • Ensure FPIC processes are inclusive of women, youth, persons with disabilities, and SOGIESC groups • Strengthen SEAH-safe grievance mechanisms with disaggregated reporting to monitor equitable outcomes ADB= Asian Development Bank, FPIC= Free, Prior and Informed Consent, GCF= Green Climate Fund, SEAH= Sexual Exploitation and Abuse and Sexual Harassment. Source: Asian Development Bank.		

Box 19: Selected Risk Factor 6: Geographic Isolation and Logistics Challenges		
Category	Probability	Impact
Technical and operational	High	High
Description		
The geographic dispersion of PICs, often consisting of multiple remote islands, creates significant logistical challenges for programme implementation. Transporting materials, equipment, and personnel is costly and time-consuming, particularly for outer islands with limited infrastructure. Constraints in ports, storage facilities, and inter-island transport systems further complicate delivery, leading to delays, increased costs, and reduced efficiency.		
Mitigation Measure(s)		
RPACA will integrate logistics planning into all stages of programme design and implementation, adopting a flexible delivery model that accounts for geographic constraints. Regional hubs and storage facilities will be established to improve efficiency, while procurement and delivery schedules will be aligned with shipping cycles and seasonal conditions. Time and cost contingencies will be incorporated into planning, and local partners will be engaged to support last-mile delivery. Key measures include: - Developing detailed country-specific logistics and delivery plans - Establishing regional hubs and storage facilities		

Aligning procurement with shipping schedules and seasonal windows
Including time and cost contingencies in planning
Engaging local partners for last-mile delivery

PICS= Pacific Island Countries.
Source: Asian Development Bank.

Box 20: Selected Risk Factor 10: Community Acceptance, Social Inclusion, and Behavioral Uptake

Category	Probability	Impact
<u>Social</u>	<u>Medium</u>	Medium
Description		
The success of RPACA interventions depends on community acceptance and behavioral uptake. Projects that are not aligned with local needs, cultural practices, or traditional knowledge systems may face resistance or limited adoption. Social dynamics, including gender inequality and exclusion of vulnerable groups, may further affect participation and benefits.		
Mitigation Measure(s)		
RPACA will adopt a participatory and inclusive approach that ensures communities are actively involved in the design and implementation of interventions. Engagement strategies will prioritise inclusivity and gender responsiveness, while local knowledge will be integrated into project design. Continuous consultation and feedback mechanisms will support adaptive implementation and strengthen community ownership.		
Key measures include:		
• Nationally led and formulated projects • Developing inclusive stakeholder engagement strategies • Ensuring gender-responsive and socially inclusive design • Integrating local knowledge and practices • Maintaining continuous consultation and feedback mechanisms • Promoting community ownership and co-design		
Source: Asian Development Bank.		

Box 21: Selected Risk Factor 11: Long-Term Sustainability and Dependence on External Support

Category	Probability	Impact
<u>Institutional</u>	<u>Medium</u>	High
Description		
RPACA may rely heavily on external technical assistance and financing during implementation. However, long-term sustainability depends on national capacity to operate, maintain, and scale interventions. Limited technical capacity, funding constraints, and reliance on external actors may result in declining performance after programme completion.		
Mitigation Measure(s)		
The programme will embed sustainability into its design by prioritising institutional strengthening, knowledge transfer, and long-term financial planning. Capacity building will be integrated throughout implementation, ensuring that national systems are strengthened and local expertise is developed. Operation and maintenance planning will be incorporated into project design and exit strategies will be developed to ensure continuity beyond the programme lifecycle.		
Key measures include:		
• Strengthening national institutions and systems		

- Implementing structured knowledge transfer and training programs
- Integrating O&M planning and financing into design
- Promoting local workforce development
- Developing exit strategies and sustainability plans

Source: Asian Development Bank.

19 Governance and Management Arrangements

19.1 Role of ADB: Accredited Entity

ADB has an established and recognized record of delivering climate finance at scale across Asia and the Pacific, making it well-positioned to act as the Accredited Entity (AE) for the RPACA Programme. ADB has committed to delivering USD 100 billion in cumulative climate finance between 2019 and 2030 under its Strategy 2030, with at least 75% of all operations supporting climate adaptation and mitigation objectives by 2030. In 2024 alone, ADB delivered over USD 11.1 billion in climate finance, including USD 4.4 billion for climate adaptation – demonstrating its strong implementation capacity and commitment to climate-resilient development. ADB has extensive experience with GCF-funded operations, acting as AE for 14 approved GCF projects as of 2024, totalling over USD 1.4 billion in GCF financing. These projects span multiple sectors, water security, climate-resilient agriculture, energy transition, and disaster risk reduction, and include both mitigation and adaptation objectives. ADB has successfully mobilized co-financing from bilateral, multilateral, and private sector partners, using a range of financial instruments such as grants, concessional loans, and blended finance structures.

In the Pacific region, ADB has an extensive background in supporting development and climate change investments through its country programme and regional cooperation activities. ADB committed \$4.5 billion to the region between 2019 and 2024 from its own resources. The RPACA Programme will build on ADB's extensive climate operations in the region to implement and finance a new generation of transformative and innovative projects that will serve as demonstration projects and upscale and accelerate adaptation and resilience measures across the Pacific small island states.

Under RPACA, ADB will administer grants and technical assistance funds from GCF, as follows:

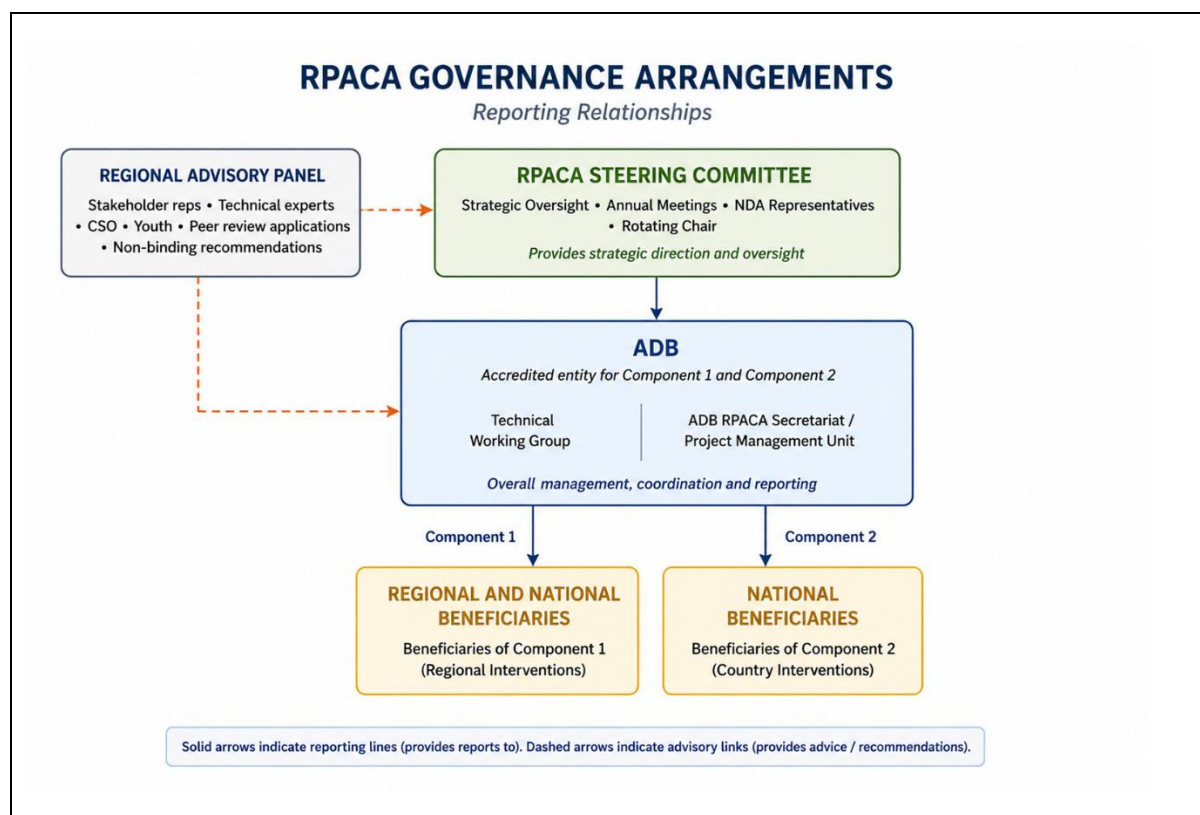
- Select sub-projects for grants (including TA) as per RPACA/GCF terms and requirements and agreed eligibility criteria, alongside loans/grants from ADB financing (ADB loans/grants), as applicable;
- In accordance with the AMA and FAA, ADB will carry out such management and administration of the RPACA Proceeds in accordance with its policies, procedures, and practices, and with at least the same degree of care as it uses in the administration of its own funds or other donor funds;
- Establish a governance structure for the RPACA Programme comprising of Steering Committee; Advisory Panel, Technical Working Group and RPACA/ADB Secretariat (or Programme Management Unit [PMU]);
- Oversee and manage the dedicated RPACA Secretariat (PMU), staffed by full-time and intermittent experts, including additional experts specifically engaged in the RPACA, with the following responsibilities:
 - originate projects and develop a pipeline for RPACA;
 - provide support to structuring projects and identify financing partners;
 - contribute to identifying and screening potential projects, reviewing project documentation and ensuring the project meets the programme's criteria;
 - verify and monitor project impacts and prepare annual performance reports to GCF;
 - as relevant, manage and monitor procurement and contracts.
 - Work closely and explore other potential partnerships to identify and mobilise additional parallel financing sources for projects.

As Accredited Entity, ADB will also ensure that project origination, structuring, and monitoring systematically assess national GESI contexts and embed strategies to address identified gaps, so that gender equality, disability inclusion, and social equity are not only mainstreamed across all RPACA investments but also drive transformational change and strengthen the long-term sustainability of adaptation outcomes.

19.2 RPACA Governance Structure

Governance of Components 1 and 2 lies within the overall RPACA Governance framework (see Figure 19).

Figure 19: Proposed Governance Arrangements



Source: Asian Development Bank.

Components 1 and 2 of the RPACA Programme will be implemented under the oversight and guidance of the following governance bodies.

19.2.1 The RPACA Steering Committee

The RPACA Steering Committee (RSC) is a high-level committee providing non-operational oversight. Day-to-day management is delegated to the ADB/RPACA Secretariat or Programme Management Unit. The RSC has the following characteristics, procedures and functions:

- **Membership - National Representation** - all countries are to be represented through their NDA. Details of the representation modality to be determined by the countries.
- **Rotating Chair** - Chairpersonship rotates among member Pacific country NDAs to ensure equitable regional ownership. The length of terms and process of co-chair nomination to be determined by NDAs.
- **Strategic Oversight** – the RSC provides high-level strategic direction and oversight for the entire RPACA programme (covering ADB, SPC and SPREP).
- **Functioning** - Annual Meetings to be convened on an annual basis to review progress, endorse ADB, SPC and SPREP annual RPACA work plans, and provide guidance.
- **Programme Accountability** – RSC holds ADB, SPC and SPREP accountable to regional climate priorities and RPACA goals (ADB, SPC and SPREP submit annual work plans for RSC endorsement, and updates to RSC annual on progress each year).
- Ensures equitable allocations between countries.
- Ensures agreed gender equality and social inclusion (GESI) principles and standards are systematically applied in investment design, allocation, and monitoring across all RPACA components.

- Oversight of All Bodies - receives consolidated reports from ADB PMU, SPC, and SPREP; ensures strong coordination between entities e.g. sharing of data. Receives feedback from independent Regional Advisory Panel (RAP).
- Partnerships - develops and maintains regional partnerships with concerned regional entities.
- Cofinancing and Development – identifies, attracts and negotiates with potential additional investors.

19.2.2 The RPACA Advisory Panel

The RPACA Advisory Panel (RAP) is an independent external peer review body. It has a non-binding advisory role. Notably:

- Membership and Representation: RAP includes representatives from Pacific island countries (government technical staff, civil society, gender/youth, disability, academic representatives) to ensure Pacific ownership, cultural integrity and the integration of GESI perspectives.
- Appointments: ADB/SPC/SPREP jointly decide and propose nominated representatives to the RSC for endorsement. Nominations to RAP confirmed by Steering Committee.
- Role: Advisory. A key role is the independent review and peer-review of all sub-project proposals for quality, relevance and regional fit. All funding proposals above certain threshold e.g. \$5 million, are submitted for RAP review.
- Role: The RAP is mandated to technically support the RSC on all issues.
- Functioning: Representatives meet virtually on a quarterly basis and as needed. All efforts will be made to facilitate annual in-person meetings.
- RAP will provide broader guidance, related to all four Components strategy, activities and outputs.

19.2.3 ADB RPACA Secretariat or Programme Management Unit

The Secretariat or PMU will be established within ADB.

Composition: A dedicated Programme and/or Fund Manager, a dedicated Monitoring and Evaluation (M&E) Specialist, a Gender and Inclusion Specialist and other support staff as needed. This may include Communication Specialists, and Finance and Administrative Officers, etc.

Functions: The PMU will serve as the focal point for the Programme's day-to-day operations, with the following activities: (i) preparing the annual work plan and annual report; (ii) supervising day-to-day implementation of the annual work plan; (iii) preparing documentation of project endorsement/approval; (iv) monitoring and evaluation and collating reports to be submitted to GCF; and (v) disseminating RPACA accomplishments and lessons learned. (iv) ensuring implementation of the Gender Analysis and Action Plan (GAAP), embedding agreed GESI requirements into project design, work planning, monitoring and evaluation, and semi-annual reporting, with compliance tracked alongside fiduciary and technical criteria. It will guide the implementation of projects in close coordination with project implementation unit (PIUs) and resident missions. The programme implementation guidelines will serve as the manual for implementing the Programme, outlining processes to implement the Programme in accordance with the provisions in the FAA. The PMU will also implement TA activities under RPACA, including overseeing procurement of consulting services, design and delivery of TA activities, overseeing events and training, and developing knowledge products.

Costs: The cost of staffing for the Secretariat will be covered by the AE Fee received for this RPACA in accordance with the GCF Policy on fees and the General Principles and indicative list of eligible costs covered under GCF fees and project management.

The Secretariat/PMU will provide semi-annual reporting to the GCF Secretariat to continuously assess the compliance of the approved technical assistance and projects with the eligibility criteria and, where appropriate, recommend remedial measures. Such reporting will be in addition to annual performance reports.

19.2.4 ADB Technical Working Group

The principal role of the technical working group (TWG) is the efficient screening of all sub-projects under Component 2 to ensure technical robustness of proposals from a resilience perspective. The TWG comprises ADB staff nominated by their respective departments to serve on the working group for a period of 2 years. The TWG includes technical staff with expertise from across sectors (coastal management, health, energy, transport and water and urban development), and gender and social inclusion, and climate change.

Key task: Review and provide technical inputs/suggestions into project proposals which are submitted for RPACA funds and endorse the projects for RPACA funds once projects meet technical standards.

Technical support: The TWG will be supported by full-time and intermittent climate change specialists with expertise in the RPACA sectors who will be responsible in reviewing and endorsing projects to be financed under the RPACA programme based on its established eligibility criteria. The proposals will be processed in accordance with all relevant ADB policies and procedures for loans and grants approval (including TA), including review of consulting services and procurement, environmental and social safeguards, financial management and reporting, and anti-corruption (following ADB policies on anticorruption and due diligence) and governance. The TWG will also ensure gender equality and social inclusion considerations are suitably met by the projects with explicit review of compliance against the GAAP.

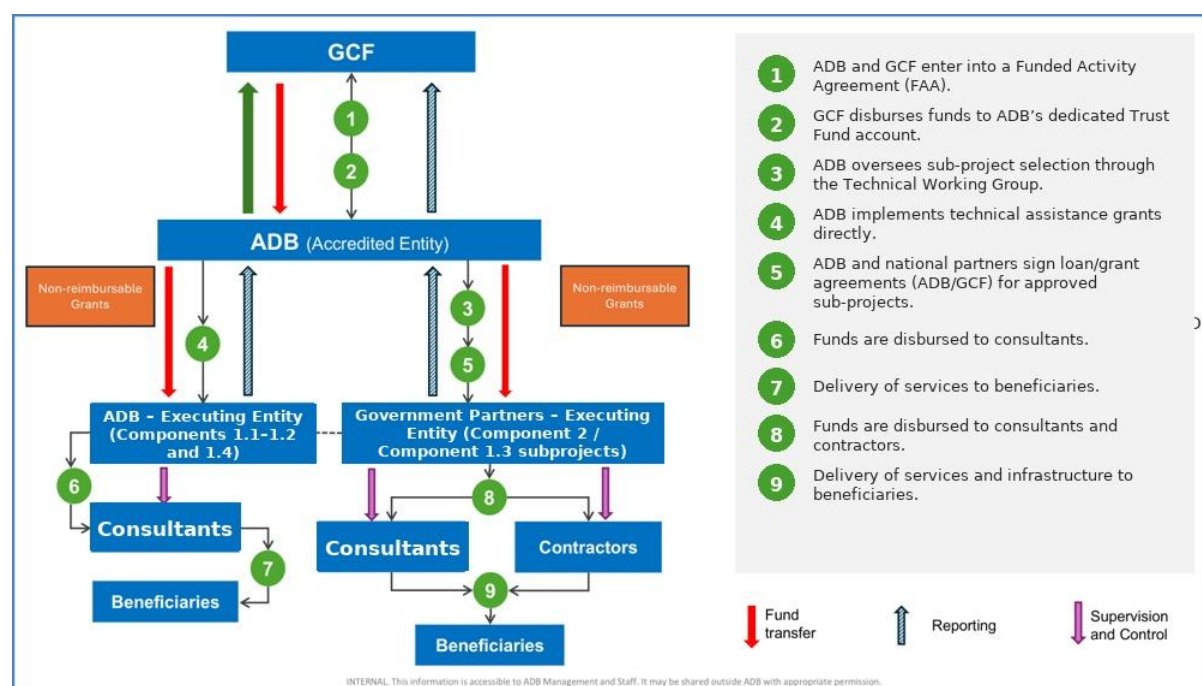
19.2.5 Allocation of Resources

The GCF proceeds for the RPACA Programme will be ring-fenced within ADB GCF Trust Fund which will be created pursuant to the AMA. The procedure for allocation of resources from RPACA (which will blend ADB and GCF proceeds) will include the following steps:

- Activity or sub-Project proposals for RPACA can be initiated by ADB in discussion with all relevant governments.
- The Secretariat/PMU in close consultation with the Technical Working Group (TWG) will prepare the annual work plan which would include the list of prioritized sub-project proposals.
- Governments and/or ADB will prepare project proposals using a standardized application form (to be developed as part of Implementation Guidelines) and prepare all relevant approval documents in accordance with ADB policies and procedures and will submit them to the Secretariat for review of the TWG.
- The PMU, with support from the TWG, will review applications according to the criteria for specific components of the Programme. If the application does not meet the agreed criteria set out in this Funding Proposal and the Term Sheet, the TWG will discuss the issues for further revision or withdrawal of the project.
- The PMU defines the review and endorsement procedures in the Programme implementation guidelines. Where needed, the PMU may engage technical climate change experts (consultants) to support the TWG review of proposals, conduct the climate assessments of the projects.
- The proposals will be processed in accordance with all relevant policies and procedures for grant and loan approval, including, without limitation, consulting services and environmental and social safeguards, financial management and reporting, and anticorruption and governance. Compliance with the GAAP and agreed GESI standards will also be a mandatory criterion in the review and allocation process.
- For each sub-project an RPACA funding request will be made once feasibility and other project development studies are complete. The RPACA funding request will be prepared in a standard template. The funding request will provide evidence to demonstrate how each of the criteria are met, referencing the relevant project documents.

19.3 Flow of GCF Funds

Figure 20: Proposed Flow of GCF Funds



ADB= Asian Development Bank, GCF= Green Climate Fund.

Source Asian Development Bank.

19.4 Sub-Project Execution and Implementation

Execution and implementation of the sub-projects in Component 2 will follow ADB policies and procedures for investments. As the Accredited Entity, the ADB will conduct full due diligence and appraisal of all proposed investments in line with GCF policies and ADB procedures.

Final selection and structuring of projects will be guided by the eligibility and prioritization criteria outlined in the Funding Proposal. This process will include selection and capacity building, as needed of executing and implementing agencies.

