



## **Part I: Project Information**

### **GEF ID**

10712

### **Project Type**

FSP

### **Type of Trust Fund**

GET

### **CBIT/NGI**

**CBIT No**

**NGI No**

### **Project Title**

Enhancing water-food security and climate resilience in volcanic island countries of the Pacific

### **Countries**

Regional, Fiji, Solomon Islands, Vanuatu

### **Agency(ies)**

FAO

### **Other Executing Partner(s)**

Executing Agency: Pacific Community (SPC); National lead agency Fiji: Mineral Resources Department, Ministry of Lands and Mineral Resources; National lead agency Vanuatu: Department of Water Resources, Ministry of Lands and Natural Resources; National lead agency Solomon Islands: Water Resources Division, Ministry of Mines, Energy, and Rural Electrification.

### **Executing Partner Type**

Government

### **GEF Focal Area**

International Waters

### **Sector**

**Taxonomy**

Focal Areas, International Waters, Freshwater, Aquifer, SIDS : Small Island Dev States, Stakeholders, Communications, Behavior change, Private Sector, Large corporations, Type of Engagement, Consultation, Local Communities, Beneficiaries, Gender Equality, Gender results areas, Capacity Development, Knowledge Generation and Exchange, Access to benefits and services, Access and control over natural resources, Gender Mainstreaming, Gender-sensitive indicators, Sex-disaggregated indicators, Capacity, Knowledge and Research, Knowledge Exchange, Field Visit, Conference, Knowledge Generation, Training, Seminar, Workshop, Learning, Theory of change, Adaptive management, Targeted Research, Innovation

**Rio Markers****Climate Change Mitigation**

No Contribution 0

**Climate Change Adaptation**

Significant Objective 1

**Biodiversity**

No Contribution 0

**Land Degradation**

No Contribution 0

**Submission Date**

9/28/2020

**Expected Implementation Start**

6/30/2023

**Expected Completion Date**

6/29/2028

**Duration**

60In Months

**Agency Fee(\$)**

570,000.00

**A. FOCAL/NON-FOCAL AREA ELEMENTS**

<b>Objectives/Programs</b>	<b>Focal Area Outcomes</b>	<b>Trust Fund</b>	<b>GEF Amount(\$)</b>	<b>Co-Fin Amount(\$)</b>
IW-3-7	Investments in water, food, energy and environmental security	GET	6,000,000.00	23,151,489.00
<b>Total Project Cost(\$)</b>			<b>6,000,000.00</b>	<b>23,151,489.00</b>

## B. Project description summary

### Project Objective

The project aims to enhance water and food security and climate resilience, sustain ecosystem services, and relieve pressure on over-exploited coastal aquifers by expanding and assessing the role of volcanic aquifers and by introducing sound groundwater governance frameworks in selected volcanic island states of the Pacific.

Project Component	Financing Type	Expected Outcomes	Expected Outputs	Trust Fund	GEF Project Financing(\$)	Confirmed Co-Financing(\$)
Component 1. Expanding and assessing the role of groundwater resources.	Technical Assistance	<b>Outcome 1.1</b> The knowledge of the exploitable groundwater resources improved in the three project island states.	<p><b>Output 1.1.1</b> An assessment of the potential and current state of the groundwater resources in the three project islands is produced.</p> <p>Output 1.1.2 Technical-economic feasibility studies of the exploitation of volcanic aquifers and of their strategic uses are produced.</p> <p>Output 1.1.3 The dialogue with potential public and private investors is facilitated by presenting outputs 1.1.1 and 1.1.2 to Governments.</p>	GET	1,368,903.00	8,520,940.00

Project Component	Financing Type	Expected Outcomes	Expected Outputs	Trust Fund	GEF Project Financing(\$)	Confirmed Co-Financing(\$)
Component 2. Introducing sound groundwater governance frameworks.	Technical Assistance	<b>Outcome 2.1</b> Sound groundwater governance frameworks and policies are adopted.	<p><b>Output 2.1.1</b> Ongoing national efforts in reviewing existing legislations and developing new groundwater policies are supported.</p> <p><b>Output 2.1.2</b> Aquifer conceptual models and diagnostic analyses of the current state of one selected primary aquifer? in each of the project countries are developed.</p> <p><b>Output 2.1.3</b> Aquifer management plans are drafted to complement existing catchment plans where available, and address groundwater issues where they exist.</p>	GET	984,604.00	8,849,880.00

Project Component	Financing Type	Expected Outcomes	Expected Outputs	Trust Fund	GEF Project Financing(\$)	Confirmed Co-Financing(\$)
Component 3. Tackling hot-spots.	Investment	<p><b>Outcome 3.1</b> Groundwater is integrated into IWRM policies and practices.</p>	<p><b>Output 3.1.1</b> Groundwater and water resource monitoring systems to assess the impacts from competing groundwater uses and to improve water resource management are installed in selected developed aquifers.</p> <p>Output 3.1.2 Land use management measures to demonstrate improved environmental and water resources benefits and management in selected hot-spots are integrated into existing practice.</p> <p>Output 3.1.3 Small-scale demonstrations in groundwater utilization to address water and food security are trialled in</p>	GET	2,286,332.00	2,428,000.00

Project Component	Financing Type	Expected Outcomes	Expected Outputs	Trust Fund	GEF Project Financing(\$)	Confirmed Co-Financing(\$)
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selected hot-spots.

Output 3.1.4  
Operational and management plans to help coordinate water drilling activities.

Project Component	Financing Type	Expected Outcomes	Expected Outputs	Trust Fund	GEF Project Financing(\$)	Confirmed Co-Financing(\$)
Component 4. Reinforcing institutional capacity.	Technical Assistance	<b>Outcome 4.1</b> Enhanced national capacities in groundwater assessment, monitoring and management.	<b>Output 4.1.1</b> Capacities of water and land administrators are strengthened through training in groundwater management and technical aspects, and knowledge exchanges with similar contexts in small volcanic.  Output 4.1.2 Project website and knowledge management platform created.  Output 4.1.3 Contribution to IW:LEARN activities, including sharing of results globally focusing on SIDS.	GET	1,075,495.00	1,544,000.00
<b>Sub Total (\$)</b>					<b>5,715,334.00</b>	<b>21,342,820.00</b>
<b>Project Management Cost (PMC)</b>						
		GET	284,666.00			1,808,669.00

**Project Management Cost (PMC)**

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<b>Sub Total(\$)</b>	<b>284,666.00</b>	<b>1,808,669.00</b>
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<b>Total Project Cost(\$)</b>	<b>6,000,000.00</b>	<b>23,151,489.00</b>
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**Please provide justification**

**The GEF grants allocated for Component 4 includes M&E budget**

**C. Sources of Co-financing for the Project by name and by type**

<b>Sources of Co-financing</b>	<b>Name of Co-financier</b>	<b>Type of Co-financing</b>	<b>Investment Mobilized</b>	<b>Amount(\$)</b>
Recipient Country Government	Fiji Government	In-kind	Recurrent expenditures	5,795,404.00
Recipient Country Government	Solomon Islands Government	In-kind	Recurrent expenditures	1,237,500.00
Recipient Country Government	Vanuatu Government	In-kind	Recurrent expenditures	3,070,350.00
Other	Pacific Community (SPC)	In-kind	Recurrent expenditures	196,000.00
GEF Agency	FAO	In-kind	Recurrent expenditures	127,489.00
Recipient Country Government	Solomon Islands Government	Public Investment	Investment mobilized	6,806,746.00
Recipient Country Government	Vanuatu Government	Public Investment	Investment mobilized	5,918,000.00
<b>Total Co-Financing(\$)</b>				<b>23,151,489.00</b>

**Describe how any "Investment Mobilized" was identified**

Non-GEF investments for other ongoing projects with relevant activities which contribute to this project's objectives were classified as 'investment mobilized'. In the Solomon Islands, substantial complementarity is foreseen with the ongoing (2020-2027) ADB/EU financed activities aiming at improving the efficiency, climate change and disaster resiliency, and sustainability of safe water and sanitation in Honiara (<https://www.adb.org/projects/51271-001/main>). The current project, through the enhanced understanding of the Honiara aquifer, the identification of new groundwater sources, and the development of a groundwater management plan will contribute to the objective of the ADB/EU project. Similarly in Vanuatu, complementarity exists with the ongoing (2020-2023) ADB-funded 'Luganville Urban Water Supply and Sanitation' project which is currently under its Project Readiness Financing stage (<https://www.adb.org/projects/51335-002/main>). The project is aiming to improve access to integrated and resilient urban water supply and sanitation services in the greater Luganville, Vanuatu. The resource management activities proposed for Vanuatu under this GEF project will have to consider the current and future groundwater abstraction through the expanded Luganville water supply network. Finally, complementarity also exists with the ongoing GCF-funded 'Climate Information Services for Resilient Development in Vanuatu' project which is aiming to address key climate change vulnerabilities and

support climate resilient development through the delivery of tailored Climate Information Services, with a focus on 5 priority development sectors. A number of activities were identified as contributing to the current project's objectives, and the GCF investment associated with these activities was also classified as co-financing. A detailed description of these activities is presented in Section 6b of this document.

**D. Trust Fund Resources Requested by Agency(ies), Country(ies), Focal Area and the Programming of Funds**

<b>Agency</b>	<b>Trust Fund</b>	<b>Country</b>	<b>Focal Area</b>	<b>Programming of Funds</b>	<b>Amount(\$)</b>	<b>Fee(\$)</b>	<b>Total(\$)</b>
FAO	GE T	Regional	International Waters	International Waters	6,000,000	570,000	6,570,000.00
<b>Total Grant Resources(\$)</b>					<b>6,000,000.00</b>	<b>570,000.00</b>	<b>6,570,000.00</b>

**E. Non Grant Instrument**

NON-GRANT INSTRUMENT at CEO Endorsement

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Includes Non grant instruments? **No**

Includes reflow to GEF? **No**

**F. Project Preparation Grant (PPG)**

PPG Required **true**

**PPG Amount (\$)**

150,000

**PPG Agency Fee (\$)**

14,250

<b>Agency</b>	<b>Trust Fund</b>	<b>Country</b>	<b>Focal Area</b>	<b>Programming of Funds</b>	<b>Amount(\$)</b>	<b>Fee(\$)</b>	<b>Total(\$)</b>
FAO	GET	Regional	International Waters	International Waters	150,000	14,250	<b>164,250.00</b>
<b>Total Project Costs(\$)</b>					<b>150,000.00</b>	<b>14,250.00</b>	<b>164,250.00</b>

## Core Indicators

### Indicator 4 Area of landscapes under improved practices (hectares; excluding protected areas)

Ha (Expected at PIF)	Ha (Expected at CEO Endorsement)	Ha (Achieved at MTR)	Ha (Achieved at TE)
2722470.00	35358.00	0.00	0.00

### Indicator 4.1 Area of landscapes under improved management to benefit biodiversity (hectares, qualitative assessment, non-certified)

Ha (Expected at PIF)	Ha (Expected at CEO Endorsement)	Ha (Achieved at MTR)	Ha (Achieved at TE)

### Indicator 4.2 Area of landscapes under third-party certification incorporating biodiversity considerations

Ha (Expected at PIF)	Ha (Expected at CEO Endorsement)	Ha (Achieved at MTR)	Ha (Achieved at TE)

Type/Name of Third Party Certification

### Indicator 4.3 Area of landscapes under sustainable land management in production systems

Ha (Expected at PIF)	Ha (Expected at CEO Endorsement)	Ha (Achieved at MTR)	Ha (Achieved at TE)
2,722,470.00	35,358.00		

### Indicator 4.4 Area of High Conservation Value or other forest loss avoided

Disaggregation Type	Ha (Expected at PIF)	Ha (Expected at CEO Endorsement)	Ha (Achieved at MTR)	Ha (Achieved at TE)

### Indicator 4.5 Terrestrial OECMs supported

Name of the OECMs	WDPA-ID	Total Ha (Expected at PIF)	Total Ha (Expected at CEO Endorsement)	Total Ha (Achieved at MTR)	Total Ha (Achieved at TE)

**Documents (Please upload document(s) that justifies the HCVF)**

Title

Submitted

**Indicator 7 Shared water ecosystems under new or improved cooperative management**

	<b>Number (Expected at PIF)</b>	<b>Number (Expected at CEO Endorsement)</b>	<b>Number (Achieved at MTR)</b>	<b>Number (Achieved at TE)</b>
<b>Shared water Ecosystem</b>	Northeast Australian Shelf-Great Barrier Reef	Northeast Australian Shelf-Great Barrier Reef		
<b>Count</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>0</b>

**Indicator 7.1 Level of Transboundary Diagnostic Analysis and Strategic Action Program (TDA/SAP) formulation and implementation (scale of 1 to 4; see Guidance)**

<b>Shared Water Ecosystem</b>	<b>Rating (Expected at PIF)</b>	<b>Rating (Expected at CEO Endorsement)</b>	<b>Rating (Achieved at MTR)</b>	<b>Rating (Achieved at TE)</b>
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**Indicator 7.2 Level of Regional Legal Agreements and Regional management institution(s) (RMI) to support its implementation (scale of 1 to 4; see Guidance)**

<b>Shared Water Ecosystem</b>	<b>Rating (Expected at PIF)</b>	<b>Rating (Expected at CEO Endorsement)</b>	<b>Rating (Achieved at MTR)</b>	<b>Rating (Achieved at TE)</b>
Northeast Australian Shelf-Great Barrier Reef	1	1		

**Indicator 7.3 Level of National/Local reforms and active participation of Inter-Ministerial Committees (IMC; scale 1 to 4; See Guidance)**

<b>Shared Water Ecosystem</b>	<b>Rating (Expected at PIF)</b>	<b>Rating (Expected at CEO Endorsement)</b>	<b>Rating (Achieved at MTR)</b>	<b>Rating (Achieved at TE)</b>
Northeast Australian Shelf-Great Barrier Reef	1	1		

**Indicator 7.4 Level of engagement in IWLEARN through participation and delivery of key products(scale 1 to 4; see Guidance)**

<b>Shared Water Ecosystem</b>	<b>Rating (Expected at PIF)</b>	<b>Rating (Expected at CEO Endorsement)</b>	<b>Rating (Achieved at MTR)</b>	<b>Rating (Achieved at TE)</b>
Northeast Australian Shelf-Great Barrier Reef	1	1		

**Indicator 11 People benefiting from GEF-financed investments**

	<b>Number (Expected at PIF)</b>	<b>Number (Expected at CEO Endorsement)</b>	<b>Number (Achieved at MTR)</b>	<b>Number (Achieved at TE)</b>
<b>Female</b>	541,161	72,000		
<b>Male</b>	563,103	78,588		
<b>Total</b>	1104264	150588	0	0

Provide additional explanation on targets, other methodologies used, and other focal area specifics (i.e., Aichi targets in BD) including justification where core indicator targets are not provided

## **Part II. Project Justification**

### **1a. Project Description**

#### **1) Global environmental and/or adaptation problems, root causes and barriers that need to be addressed (systems description)**

##### **Regional context**

The over 30,000 small islands of the Pacific vary greatly in their geological and geomorphological characteristics, as they include 'high' mountainous volcanic and mixed lithology islands, and 'low lying' atoll islands and uplifted limestone islands. High islands are larger, consisting mainly of volcanic rocks and generally forested with fertile soil and usually good availability of freshwater. In contrast, the low islands are small with limited freshwater resources and poor soil. Of the 18 Pacific Island Countries and Territories (PICTs) five are in Melanesia, seven are in Polynesia and six are in Micronesia. The Melanesian countries (Fiji, New Caledonia, Papua New Guinea, Solomon Islands and Vanuatu) are extensions or parts of uplifted submerged ranges. The Polynesian and Micronesian islands are made up of archipelagos or groups of small islands consisting of a mixture of volcanic islands and small coral atoll islands (Samoa, Cook Islands, Federated States of Micronesia, French Polynesia, Guam, Palau, Samoa and Tonga) or consist only of atolls (Kiribati, Marshall Islands and Tuvalu) or of small uplifted limestone islands which are the only non- archipelagic countries in the Pacific (Nauru, Niue).

Volcanic Pacific Island Countries (PICs) are generally characterized by heavy dependence on traditional agriculture, i.e.: subsistence smallholder systems, and suffer from environmental degradation with often devastating effects, determining structural constraints for economic growth, human development and environmental sustainability. At the same time, these PICs possess unique characteristics that further exacerbate the problems associated with environmental degradation, given the small size of the countries (in terms of both physical area and economy), limited infrastructure, distance from large international markets, high vulnerability to natural disasters, low level of human resource development, increasing urbanization, and vulnerable freshwater resources. Small size - combined with diverse soil types, topography, climatic hazards, lack or in some cases archaic water and land use policies - limits the area available for urban settlement, agriculture, mining, commercial forestry, tourism and other infrastructure, and creates intense competition between water and land use options. Degradation has increased in the last 30 years largely due to the following main factors:

- Environmental: growing rainfall variability and frequency of extreme climatic extremes, sea level rise (SLR), decreasing water quality and quantity, limited access to water, sanitation and hygiene (WASH) services.

- Economic: market forces, trade agreements, structural adjustments, national economic and land use policies, land and water tenure policies.
- Social: population dynamics and growth, urbanization, immigration, cultural changes and nutritional transitions.

More specifically, degradation is caused by deforestation and unsustainable land and water use, uncontrolled livestock grazing on fragile lands and poorly planned settlements in environmental and geohazard-sensitive areas. Annually, large amounts of valuable topsoil are eroded and washed into rivers and out to sea during heavy rains, severely damaging coastal ecosystems and coral reefs. Over time, the productivity of land for agriculture is being lost, in addition to the productivity of coral reefs as they become blanketed by silt. This threatens food security as well as economic stability, particularly on the islands with tourism-based economies (such as Fiji and Vanuatu). Siltation of rivers increases the flood risk in low-lying areas with loss of agricultural productivity. Drought is a major natural hazard all PICs are facing, with agricultural drought presenting a particular problem for the leeward side of larger islands.

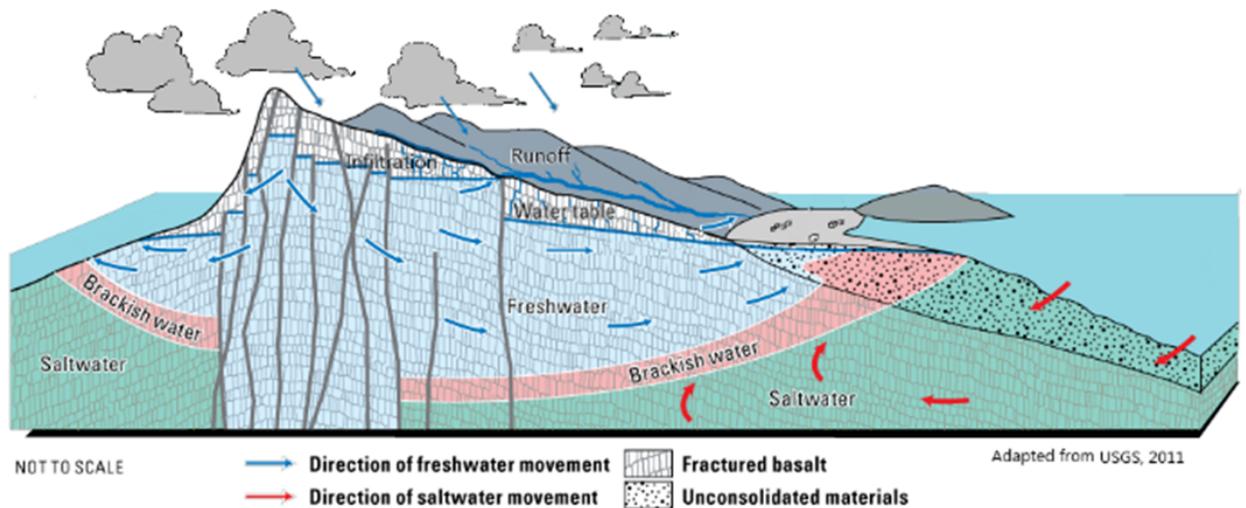
Alongside land resources, the economic and social well-being of volcanic Pacific small island countries are dependent upon the quality and quantity of their freshwater resources. However, the ability of small island countries to effectively develop and manage their water sectors is often constrained by their small size and limited human resource base. In many island countries, factors such as increasing demand for water, rainfall variability, storm water runoff, inadequate sanitation and waste disposal, threaten economic development and human health.

Groundwater, an important freshwater source in all PICs, is particularly abundant in volcanic islands (see Figure 1). Contrary to low lying islands where groundwater is only present in the form of highly vulnerable freshwater lenses floating over seawater, volcanic islands present a variety of aquifer types (coastal volcano-sedimentary, shallow and deep fractured volcanic). Exploitation of groundwater is however essentially concentrated along the more densely populated coastal areas, targeting highly vulnerable coastal aquifers. As well as direct infiltration, recharge of these coastal aquifers can take place at higher elevations in the volcanic edifices, where rainwater infiltrates fractured volcanic rocks, and the deep-reaching vertical faulting that characterize volcanic bodies. Recharge - albeit in principle abundant - is however being reduced by increasing runoff due to climatic factors and to deforestation with consequent soil erosion. Soil erosion and increased sediment load in rivers result from human activities such as large scale clearing from mining and logging activities, as well as impacts from traditional subsistence slash and burn farming, increasing urban development and residential housing. The principal threats to coastal groundwater derive from contamination - sewage (poor sanitation), urban runoff, agro-chemicals and solid waste - and salinization due to both overexploitation and seawater intrusion. Groundwater quality was indeed identified in the 1997 Strategic Action Programme for International Waters of Pacific Islands as being at particular risk because its loss or degradation is often irreversible. Another important threat to coastal aquifers and to soil productivity is the increasing frequency and intensity of wave-overtopping events.

**Water security:** defined as "the availability of an acceptable quantity and quality of water for health, livelihoods, ecosystems and production, coupled with an acceptable level of water-related risks to people, environments and economies". Water insecurity is perceived when it impairs human and environmental well-being, economic development, leading to often difficult cross-sector trade-offs.

**Food security:** defined as "all people, at all times have physical, social, and economic access to sufficient, safe, and nutritious food that meets their food preferences and dietary needs for an active and healthy life. Nutrition-sensitive approaches include improving access to land and to clean water resources and improved sanitation facilities; supporting the participation of vulnerable groups, including women, in policy and governance processes.

**Climate resilience:** defined as the capacity for a socio-ecological system to absorb stresses and maintain function in the face of external stresses imposed upon it by climate change and adapt, reorganize, and evolve into more desirable configurations that improve the sustainability of the system, leaving it better prepared for future climate change impacts.



**Figure 1.** Cross-section of a typical volcanic island (Amadio, 2014).

**Volcanic islands** are assumed to have a basal principal fractured aquifer with high potential productivity. This basal aquifer may be accessed directly by drilling through the volcanic hard rock, or via aquifers within volcanic sedimentary sequences fed by the basal aquifer. Extraction may also occur from other volcanic/sedimentary aquifers which are not connected to the basal aquifer. These sources of groundwater have in general not been assessed.

Severe droughts associated with ENSO can negatively impact food security, public health, and the economy. ENSO-driven droughts are commonplace in the Pacific. Small rainwater storages and a

reliance on water sources that have limited resilience can impact large portions of the population resulting in sudden water shortages. During and after the historic 1997-1998 El Niño event, severe drought similarly impacted islands across the western Pacific. In 2015, the Pacific Humanitarian Team estimated that ENSO-related droughts will place as many as 4.7 million people at risk in 13 countries (PNG, Fiji, Tonga, Palau, Vanuatu, Solomon Islands, New Caledonia, Tokelau, Samoa, Niue, Cook Islands, Marshall Islands, Federated States of Micronesia). This includes 2.4 million people in PNG and the total populations of the remaining affected Pacific nations.

Floods are a significant hazard in volcanic Pacific Island countries, which are subjected to extreme precipitation intensities. Floods can result in loss of life and extensive property damage, especially when river floodplains have been settled and/or cultivated. In cyclone conditions the effects of floods are often exacerbated by high-intensity rain induced landslide and resulting debris which can obstruct river channels and create potentially hazardous temporary dams. In most situations the practical approach to managing flood hazard is to manage the land use in those areas subject to flooding. Increasing flood hazard may result if land use controls are poorly enforced and these areas are allowed to become informal settlements. Land use in river catchments (e.g. forestry, agriculture) can also have a significant effect on flooding risk. This range of factors points to the desirability of the full implementation of Integrated Water Resources Management concepts to assist with hazard management. As with the hazard of drought, it is possible to take advantage of flood warnings in some situations. Flood warning systems require near real-time data on precipitation rates and/or upstream water levels or flows. In the relatively small and steep catchments encountered in Pacific Island countries telemetry systems are likely to be necessary to provide for timely flood warnings.

In conclusion, within the context of high volcanic PICs most aspects of water and food security are directly dependent on, and influenced by, the planning and utilization of land and freshwater resources along the 'source to sea' or 'ridge to reef' continuum. Ensuring the sustainability of groundwater supply is paramount for sustaining socio-economic development (including rural and agriculture-dependent livelihoods), enhancing resilience to climate change - one of the most severe developmental challenges facing all SIDS - and ensuring food security. Threats to food security for PICs are made even more urgent by the high transport costs of imported food due to the remoteness and reliance on sea freight. The ability to grow food to both support local consumption and export markets requires resilience in the food sector through sustainable groundwater use and management. Similarly, groundwater discharge from volcanic aquifers as springs and baseflow is critical to maintain stream flow and support the rich diversity of environmental services associated with these landscapes. Better understanding of these natural assets, and their economic, social, and environmental importance, will be important in the future sustainable development of these groundwater resources.

### **Policy framework**

The Boe Declaration on Regional Security signed at the Pacific Islands Forum in 2018, states that 'climate change remains the single greatest threat to the livelihoods, security and wellbeing of the peoples of the Pacific'. This was reiterated at the 2019 Pacific Islands Forum in the Kainaki II Statement where 'Leaders noted that escalating climate change impact is exacerbating the region's vulnerabilities, weakening water security to a greater extent than food security'.

The Global Action Programme on Food Security and Nutrition in Small Island Developing States (GAP) is a tangible follow-up to the 2014 SIDS Accelerated Modalities of Action (SAMOA) Pathway, which highlights the need to ensure the sustainable management of the water resources required to promote the use of sustainable practices relating to agriculture, crops, livestock, forestry, fisheries and aquaculture to improve food and nutrition security in SIDS - and is aligned with the 2030 Agenda Sustainable Development and other internationally agreed frameworks for sustainable development.

PICs are experiencing particular constraints in meeting their SDG targets, as noted in the Mid-Term Review of the SAMOA Pathway, which calls for greater international support and a 'coherent and coordinated approach' from the international community to address persistent challenges faced by SIDS, including disproportionately high burdens of food/water insecurity, malnutrition, and Non-Communicable Diseases. With regards to SDGs, the development challenge which the project seeks to address is well reflected under Goal 6 and particularly under Target 6.1 on achieving equitable access to safe and affordable drinking water, Target 6.3 on improving water quality, Target 6.4 on improving water-use efficiency, and Target 6.5 on strengthening integrated water resources management. Interlinkages with other goals obviously exist as the proposed work is expected to contribute to enhancing food security (SDG-2), ensuring healthy lives and promoting well-being (SDG-3), protecting terrestrial ecosystems (SDG-15), making cities and human settlements inclusive, safe, resilient and sustainable (SDG-11), taking urgent action to combat climate change and its impacts (SDG-13) and ensuring gender equality and women empowerment (SDG-5).

The Pacific Food and Nutrition Framework recognizes progress made under the Framework for Action on Food Security in the Pacific: Towards a Food Secure Pacific (2011-2015) and aligns with relevant regional strategies and action plans, including the WHO Action Plan to Reduce the Double Burden of Malnutrition in the Western Pacific Region (2015-2020), WHO Western Pacific Regional Action Plan for the Prevention and Control of Non Communicable Diseases (2014-2020), NCD Roadmap (World Bank, 2014), Framework for Resilient Development in the Pacific (SPC, SPREP, PIFS, UNDP, UNISDR and USP, 2016), A New Song for Coastal Fisheries (SPC, 2015), and United Nations Pacific Strategy 2018-2022. Other relevant strategies and initiatives include the Inter-Regional Initiative on SIDS of the Food and Agriculture Organization.

### **Relevant GEF investments in Pacific SIDS**

The conclusions and final recommendations of the GEF/UNEP project 'Assessment of the groundwater systems of Small Island Developing States' - part of the larger 'Transboundary Waters Assessment Program - TWAP' - published in 2016, highlighted the importance, and the fragility, of groundwater resources of small island states, in particular those of the Pacific:

*'On many small islands, groundwater abstraction only occurs within small, thin, alluvial (or carbonate) aquifers along the coastlines. In many cases, these aquifers may constitute the main groundwater supply for the island, as accessing the groundwater contained within more complex, albeit possibly highly productive, fractured volcanic formations at higher elevations poses significant challenge. The situation that emerges from this analysis calls for immediate attention. In the absence of coordinated, sustained remedial national and international action, low-lying islands in the Pacific,*

*highly dependent on scarce, polluted and growingly saline groundwater resources and impacted by climatic variability and change, face dramatic choices. In many mountainous islands, degradation of groundwater quality and growing demands are posing short-medium term threats to human health and impairing the provision of ecosystem services of great economic relevance.?*

The involvement of the GEF International Waters Focal Area in the protection of the freshwater resources of Pacific SIDS had started in 2000, many years before the TWAP assessment, with the approval of the project 'Implementation of the Strategic Action Programme (SAP) of the Pacific Small Island Developing States?', completed in 2005. The SAP was prepared and agreed upon by countries during the project preparation phase in 1997. The SAP addressed issues of concern related to both freshwater and coastal and oceanic living marine resources, and promoted integrated water and coastal resources management, and the ecosystem approach to fisheries. The SAP identified priority concerns including 1) pollution, 2) long term sustainable use of freshwater resources, 3) physical, ecological, and hydrological modification of critical habitats, 4) unsustainable exploitation of non-living resources. The root causes which threaten water resources, identified in the SAP, included deficiencies in management specifically with regards to governance and understanding. The initial SAP project included the 14 PICs, Cook Islands, Federated States of Micronesia, Fiji, Kiribati, Marshall Islands, Nauru, Niue, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu, and Vanuatu. This project will continue this support with focused investment in Fiji, Solomon Islands and Vanuatu to further strengthen the earlier investments from GEF under SAP, IWRM (GEF ID 2586), and R2R.

This SAP was the starting point and guiding framework of a long-lasting commitment of the GEF IW to Pacific SIDS - the 'sentinels' of the global environment - which brought about a number of achievements, particularly in the field of IWRM, fisheries management and habitat protection through a series of regional projects and programs involving all 14 SIDS members of the GEF, and, more recently, projects targeting selected islands (see Table 1). The most recent 'Managing Coastal Aquifers in Selected Pacific SIDS' project, which is currently under implementation, responds to the TWAP recommendations being the first one with main focus on groundwater. It targets Palau, the Marshall Islands, and Tuvalu, all low-lying atolls exclusively relying on their fragile freshwater lenses.

In response to the request of Fiji, Solomon Islands, and Vanuatu 'PICs characterized by the high percentage (> 80%) of population living in volcanic islands, and by the elevated number of households relying on agriculture - the present project expands GEF IW action in the Pacific by targeting for the first time the groundwater resources contained in volcanic aquifers - less impacted by climatic variability and SLR. The present project will focus on addressing the SAP identified root cause of management of groundwater resources in volcanic island settings. Both governance and understanding will be strengthened with project support to establish governance framework mechanisms, which consider environmental, and social-economic considerations as well as techniques to provide evidenced based information for improved impact assessment, groundwater abstraction and allocation determination, and aquifer potential. The project is designed to address the SAP identified root cause of management deficiencies, with the aim of enhancing water-food security and resilience to climate change, in the three countries, while acknowledging the role of groundwater in sustaining environmental and spring flows and setting an example for other volcanic or complex geology islands to follow.

**Table 1.** Previous and ongoing relevant GEF IW support to PICS.

Project Title	Countries	Objective	GEF ID	GEFTF	IA - EA	Status
Implementation of the Pacific Islands Developing States SAP	Regional (14 PICS)	In its first IW project with the PICS, GEF provided support for the process of discussions and negotiation between Pacific SIDSs, other coastal states of the Western and Central Pacific Ocean (including Indonesia and the Philippines) and fishing states, on a new regional arrangement for the conservation, management and sustainable development of transboundary stocks of highly migratory species and related species. The final text of the Convention was agreed in August 2001.	530	\$12m	UNDP SPREP	Completed 2005

Implementing Sustainable Integrated Water Resources and Wastewater Management in PICs (PAS)	Regional (14 PICs)	To improve water resources management and water use efficiency in Pacific Island Countries in order to balance overuse and conflicting uses of scarce freshwater resources through policy and legislative reform and implementation of applicable and effective Integrated Water Resources Management (IWRM) and Water Use Efficiency (WUE) plans.	<b>2586</b>	\$9m	UNDP/UNEP SOPAC	Completed 2017
Ridge to Reef: Testing the Integration of Water, Land, Forest & Coastal Management to Preserve Ecosystem Services, Store Carbon, Improve Climate Resilience and Sustain Livelihoods in Pacific Island Countries	Regional (14 PICs)	To test the mainstreaming of 'ridge-to-reef' (R2R), climate resilient approaches to integrated land, water, forest and coastal management in the PICs through strategic planning, capacity building and piloted local actions to sustain livelihoods and preserve ecosystem services.	<b>5404</b>	\$10.3m	UNDP SPC	Approved 2015
Managing Coastal Aquifers in Selected Pacific SIDS (MCA)	Regional (3 PICs)	To improve the understanding, use, management, and protection of coastal aquifers towards enhanced security in the context of a changing climate.	<b>10041</b>	\$5.2m	UNDP SPC	Approved 2020

The GEF's work in land degradation has emphasized the need to take an integrated approach to sustainable land management while ensuring the sustainability of livelihoods. The projects on land degradation including land use planning have been financed not only from the Land Degradation Focal

area, but also from the Biodiversity and Climate Change Adaptation areas. The GEF has now expanded this approach to include the United Nations Convention to Combat Desertification's guiding principle of land degradation neutrality, defined as: 'a state whereby the amount and quality of land resources necessary to support ecosystem function and services and enhance food security remain stable or increase within specified temporal and spatial scales and ecosystems'. GEF support to SIDS has evolved in the same way, seeking to ultimately halt and reverse land degradation, restore degraded ecosystems, and sustainably manage resources. Sustainable land management with soil and water conservation is often combined with reduced use of pesticides and industrial fertilizers or even organic production, thereby giving health benefits to the population while protecting biodiversity. Land degradation financing to SIDS in previous replenishments has included single country-based projects and support to a global initiative where 15 SIDS identified land degradation neutrality baselines and defined national land degradation neutrality targets.

## **2) Baseline scenario and associated baseline projects**

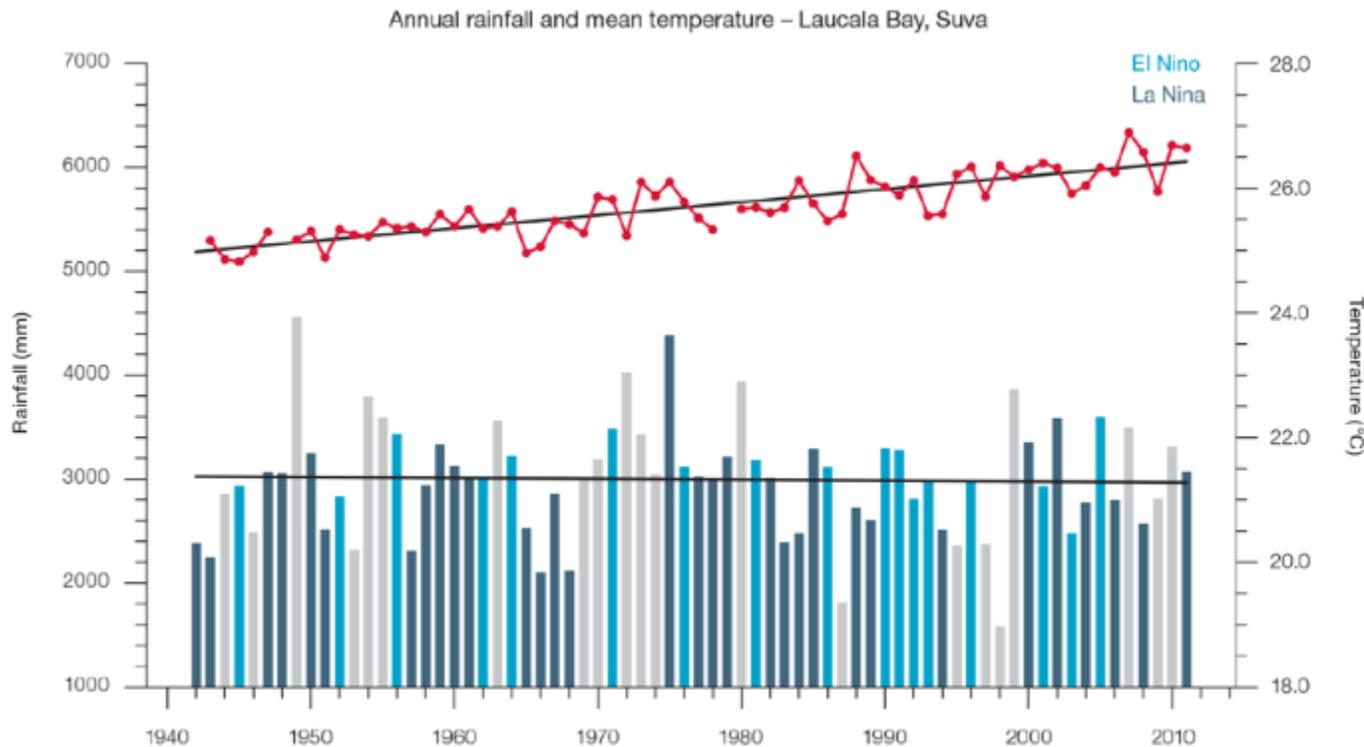
### **Fiji**

Fiji is an archipelago of over 300 islands, 110 of which are permanently inhabited amounting to a total land area of about 18,300 km<sup>2</sup>. These islands form a complex group of high islands of volcanic origin, barrier reefs, atolls and raised limestone islands. The islands exhibit considerable differences in geographical and physiological characteristics. Permanent surface water resources exist in the larger mountainous islands while the low-lying atolls and coral islands rely exclusively on rainwater and groundwater.

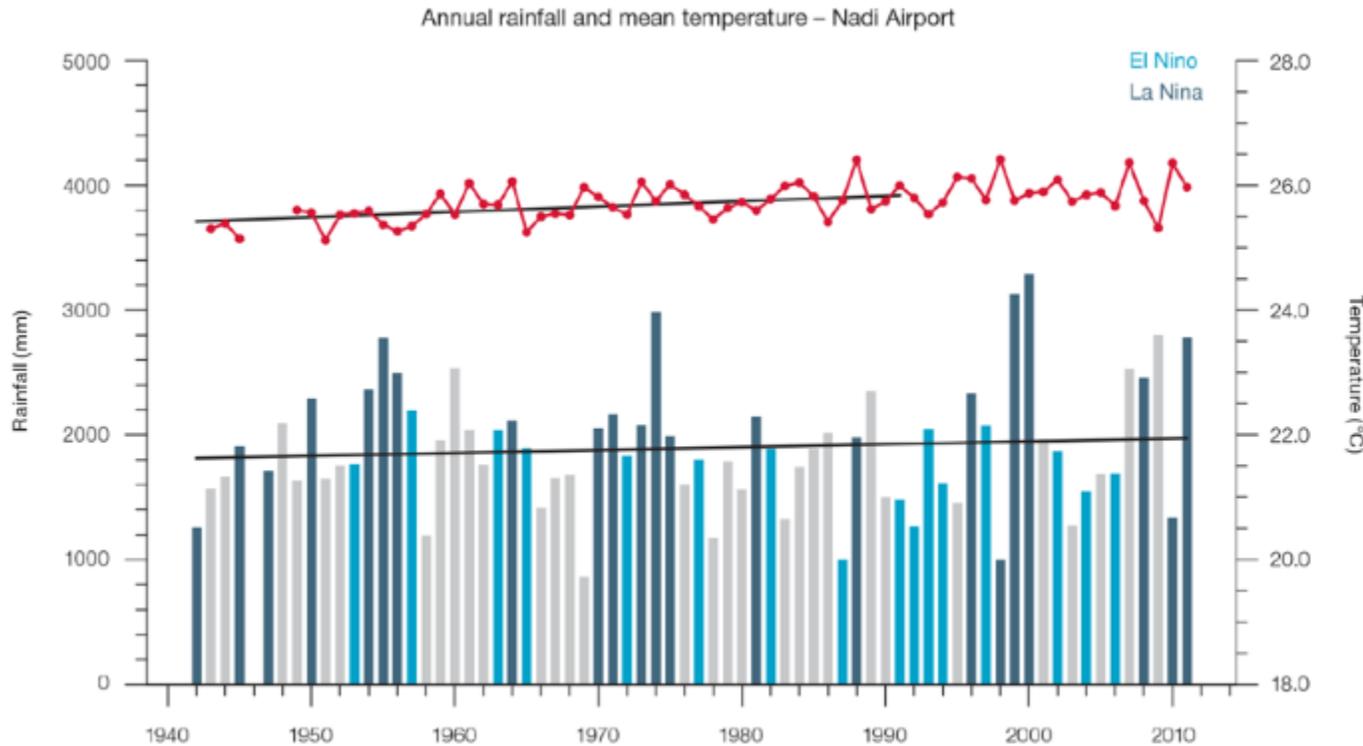
Climate: Fiji's climate is strongly influenced by its geographical location around the Intertropical Convergence Zone and the moisture-laden southeasterly prevailing winds. Fiji has a pronounced wet and dry season from November to April and from May to October, respectively. The presence of mountainous landforms around central Viti Levu influences local climate conditions. The mountainous landforms create a barrier to the southeast trade winds and contribute to rain shadow conditions in most parts of the western provinces, where certain agricultural activities are dominant (e.g. sugar cane farming). High annual, inter-annual and seasonal variation of rainfall makes Fiji particularly vulnerable to floods and droughts. Figure 2 demonstrates the variability in monthly rainfall observed in Viti Levu, with leeward rainfall stations measuring high rainfall during the wet season (November to April) and with considerably less rainfall recorded during the dry months. Around 80% of the annual rainfall in Rakiraki, Ba, Tavua and Nadi is recorded from November to April during episodic high rainfall events which usually result in flooding and when surface water may become contaminated and unusable for drinking water purposes. The dry season from May to October is characterised by low rainfall and increased periods of water scarcity. Suva on the other hand, although showing similar trends of wet and dry seasons, records relatively high rainfall throughout the year.

According to the Pacific-Australia Climate Change Science and Adaptation Planning Program (2014), annual and half-year maximum and minimum temperatures have been increasing at both Suva and Nadi Airport since 1942 whereas annual, half-year and extreme daily rainfall trends have been showing little change. For the period to 2100, the latest global climate model (GCM) projections and climate science findings indicate that El Niño and La Niña events will continue to occur in the future (very high confidence), but there is little consensus on whether these events will change in intensity or frequency. Annual mean temperatures and extremely high daily temperatures will continue to rise (very high confidence), as will extreme rain events (high confidence). Projections also indicate with very high confidence that sea level will continue to rise.

The increasing frequency and intensity of tropical cyclones in Fiji, such as TC Winston, coupled with the vulnerability of farming communities to numerous ENSO-driven droughts, demonstrates the high vulnerability to climate variability and natural disasters (Climate Risk Assessment, Annex I3). The devastation of TC Winston resulted in an estimated loss of more than USD 36 million to the sugar cane industry, with the agricultural sector recording an aggregate loss and damage of around USD 258 million (Esler 2016). Fiji has also recorded numerous ENSO-driven drought events in the last four decades, with increasing intensity and substantial economic cost as a consequence. These events were recorded in 1987, 1992, 1997/98, 2003 and 2010 (Australian BOM and CSIRO 2011). The 1997/98 event, one of the worst on record, resulted in 50% loss in production and, in turn, demonstrated the vulnerability of farming communities when these extreme climatic events occur.



**Figure 2.** Mean air temperature (red dots and line) and total rainfall (bars) at Suva. Light blue, dark blue and grey bars denote El Niño, La Niña and neutral years respectively (AUSTRALIAN BUREAU OF METEOROLOGY AND CSIRO, 2014).



**Figure 3.** Mean air temperature (red dots and line) and total rainfall (bars) at Nadi Airport. Light blue, dark blue and grey bars denote El Niño, La Niña and neutral years respectively (AUSTRALIAN BUREAU OF METEOROLOGY AND CSIRO, 2014).

Volcanic geology: The oldest rocks in Fiji are island-arc volcanics of Late Eocene age formed by westwards subduction of the Pacific plate beneath the Australian plate (Neall and Trewick, 2008). On the island of Viti Levu, the oldest rocks belong to the Wainimala Group extending along the southern part of Viti Levu and comprising of andesitic beds of Upper Eocene ? Lower Oligocene age and of younger volcanic conglomerates with tuff, pillow lava, pillow breccia, and minor sandstone (Rodda, 1967). The central part of the island is mainly comprised of the Nadi, Navosa, and Ra sedimentary groups of Late Miocene age consisting of fine sandy tuffs and fractured conglomerates, sandstones, and mudstones, with limited groundwater potential. Volcanic groups comprising basaltic and andesitic submarine lava flows and breccias with moderate groundwater potential are present in the northern half of Viti Levu (Ba and Koroimavua volcanic groups of Pliocene age). The most permeable formations occurring in these volcanic deposits are subaerial lava flows with scoria horizons and fracture zones. On the island of Vanua Levu, the moderate to high groundwater potential Bua volcanic group of Pliocene age in the southwest consists of subaerial alkali-basalt lava flows interbedded with subordinate volcanoclastics. Groundwater mainly occurs within weathered material along contact zones and within lava flows. The rest of Vanua Levu is mainly characterized by the moderate groundwater potential Natewa and Monkey Face volcanic groups (Late Miocene ? Pliocene), consisting of submarine andesitic and basaltic flows, breccias, conglomerates, and fine-grained reworked and epiclastic rocks. Taveuni is a basaltic volcanic island with a northeast-southwest lineament of over 150

Quaternary vents along its 40?km length. The Taveuni volcanic group of Pleistocene age consist of subaerial alkali olivine basalt flows and ash beds deriving from a Pleistocene fissure type volcano. The group is characterized as moderate to high groundwater potential due to high permeabilities and the presence of perched aquifers.

Socio-economic data: According to the latest Census of 2017, around 70% of the population has access to treated, metered reticulated water supply although continuity of supply is not always reliable, particularly in the drier months. This high percentage is achieved because of the concentration of the population in urban settlements and urban corridors such as between Lautoka-Nadi and Nausori-Suva. Between 2007 and 2017, the population with access to reticulated water increased by 3%. The situation in the rural areas and settlements is different, with supply usually achieved through subsidized small rural surface or borehole schemes. The smaller islands support significant but much smaller populations and have variable water resources relying on conjunctive use of rainwater, springs, minor streams and groundwater boreholes for supply. According to the Census data, 10% of the population relies on groundwater for their drinking water supply, accessed through boreholes, hand-dug wells, and springs. This marked a 4% increase in population dependency on groundwater between 2007 and 2017. Reliance to groundwater is mainly observed in the western provinces of Viti Levu and Vanua Levu. Of course, a substantial proportion of metered piped connections (e.g. Sigatoka, Navua, Labasa) derives from groundwater too but the actual number is hard to quantify. 33% of the population reports that they never run up of water supplies, 61% reports occasional run up and 5% report frequent run up of their water supplies, the latest one marking a 7% decrease from 2007. Also, 21% of the population has access to piped sewer system, 63% to a septic tank toilet facility, and 9% uses pit latrines. In terms of agriculture, 35% of the population is involved in growing crops and an additional 21% is involved in subsistence activities. 63% of the total population growing crops, does so exclusively for home consumption. It is expected that with COVID-19 having affected the tourism industry in Fiji, this proportion has substantially increased in 2020 and 2021.

The Water Authority of Fiji (WAF) is responsible for providing access to quality drinking water and wastewater services to over 154,000 residential and non-residential metered customers in the urban areas of Fiji and also setting up water supply systems in rural areas. Even though WAF is the main implementing agency, the Mineral Resources Department (MRD), various NGOs, and private drilling companies are involved in the development of groundwater for town and community water supply. Currently, the administration of groundwater in Fiji is the mandate of the Mineral Resources Department (MRD) of the Ministry of Lands and Minerals, which has the technical expertise, data, capacity and experience in groundwater investigation, risk assessment, development, planning and management. MRD is responsible for providing an alternative water supply to all Fiji, especially to the disadvantaged communities living in remote areas. MRD is provided funds annually to undertake scientific groundwater surveys for borehole drilling and has also been assisting WAF with the survey and development of groundwater for town water supply schemes (e.g. Navua, Sigatoka, Labasa). The government has a mandate to monitor and manage the water resources of Fiji sustainably. In total there are 838 boreholes archived at MRD, and 20 ? 30 strategic sites are surveyed monthly to monitor fluctuations of groundwater levels associated with aquifer recharge through rainfall, evaporation rates, geology and vegetation types. Monitoring of groundwater levels is mainly carried out in areas where groundwater is used for public water supplies and areas prone to depletion due to over-pumping or

contamination from underlying poor-quality water. Regular groundwater monitoring is hindered by difficult access to outer islands and extreme weather events. Lack of equipment able to transmit monitoring data in real time is also limiting the collection of data. Monitoring data is used for the development of hydrogeological reports. A groundwater monitoring report is developed every 5 years to consolidate all groundwater data and integrate groundwater and surface water data into a basin catchment analysis. Groundwater data are stored in a database and includes groundwater level, electrical conductivity, temperature, and water quality information (cations & anions). GIS software is used to assist in data analysis.

**Table 2.** Fiji 2017 Census - WASH data at provincial level

Province	Number of households	Main source of drinking water (%)						Running out of water supplies (%)			Main type of toilet facility (%)					
		Metered connection	Well, borehole	Spring	Surface water (incl. streams)	Rainwater	Never	Sometimes	Often	Flush to piped sewer system	Flush to septic tank	Flush to pit latrine	Pit latrine with slab	Pit latrine without slab - open pit	Water sealed	Shared toilet
<b>Total</b>	<b>191,910</b>	<b>70%</b>	<b>6%</b>	<b>4%</b>	<b>7%</b>	<b>12%</b>	<b>33%</b>	<b>61%</b>	<b>5%</b>	<b>21%</b>	<b>63%</b>	<b>3%</b>	<b>4%</b>	<b>2%</b>	<b>7%</b>	<b>1%</b>
Ba	56,112	83%	7%	2%	2%	5%	44%	53%	3%	24%	64%	2%	3%	2%	4%	1%
Bua	3,244	15%	12%	12%	8%	49%	14%	82%	4%	0%	53%	2%	9%	3%	31%	2%
Cakaudrove	10,594	28%	2%	12%	9%	48%	23%	71%	7%	0%	74%	2%	3%	1%	18%	1%
Kadavu	2,464	0%	3%	42%	30%	25%	24%	64%	12%	0%	70%	6%	4%	1%	18%	1%
Lau	2,349	24%	6%	6%	11%	54%	28%	62%	11%	0%	66%	1%	2%	0%	31%	0%

Lomaiviti	3,335	29%	1%	22%	24%	19%	27%	65%	8%	0%	77%	4%	1%	0%	15%	3%
Macuata	14,898	66%	9%	7%	2%	13%	20%	73%	7%	8%	65%	10%	5%	1%	11%	1%
Nadroga-Navosa	13,089	44%	27%	6%	7%	16%	25%	65%	11%	4%	71%	3%	10%	5%	7%	1%
Naitasiri	37,020	86%	0%	2%	7%	4%	31%	66%	3%	41%	51%	2%	2%	1%	3%	1%
Namosi	1,583	10%	3%	11%	53%	23%	20%	76%	3%	0%	82%	1%	3%	1%	12%	1%
Ra	7,034	26%	9%	10%	26%	27%	29%	59%	12%	1%	64%	6%	11%	6%	8%	3%
Rewa	22,252	96%	0%	1%	1%	1%	48%	50%	2%	37%	54%	3%	1%	0%	4%	1%
Rotuma	383	37%	63%	0%	0%	0%	8%	92%	0%	1%	98%	1%	1%	0%	0%	0%
Serua	4,340	79%	0%	1%	7%	12%	25%	65%	10%	8%	80%	2%	3%	1%	6%	1%
Tailevu	13,213	66%	1%	1%	17%	14%	20%	72%	8%	3%	75%	2%	5%	2%	13%	1%

**Table 3.** Fiji 2017 Census - Agriculture data at provincial level

Province	Number of households	Agriculture summary				Growing crops - purpose				
		Growing Crops	Fishing	Livestock	Subsistence activities	Home Consumption	For Sale	Mainly Consumption, but some sale	Mainly Sale but some home Consumption	None
<b>Total</b>	<b>191,910</b>	<b>35%</b>	<b>9%</b>	<b>10%</b>	<b>21%</b>	<b>63%</b>	<b>2%</b>	<b>18%</b>	<b>16%</b>	<b>24%</b>
Ba	56,112	9%	2%	3%	6%	75%	3%	12%	10%	8%

Bua	3,244	2%	0%	1%	1%	48%	2%	28%	22%	1%
Cakaudrove	10,594	0%	0%	0%	0%	35%	3%	26%	36%	0%
Kadavu	2,464	2%	0%	0%	1%	47%	2%	26%	26%	2%
Lau	2,349	0%	0%	0%	0%	73%	0%	21%	5%	0%
Lomaiviti	3,335	1%	0%	0%	0%	48%	0%	41%	10%	1%
Macuata	14,898	1%	0%	1%	1%	63%	5%	15%	18%	0%
Nadroga-Navosa	13,089	3%	0%	1%	2%	55%	4%	17%	24%	4%
Naitasiri	37,020	0%	0%	0%	0%	69%	1%	15%	14%	0%
Namosi	1,583	1%	1%	0%	0%	45%	0%	30%	25%	0%
Ra	7,034	0%	0%	0%	0%	44%	3%	27%	26%	0%
Rewa	22,252	0%	0%	0%	0%	86%	1%	8%	5%	0%
Rotuma	383	1%	0%	0%	0%	62%	0%	24%	14%	0%
Serua	4,340	0%	0%	0%	0%	67%	1%	21%	12%	0%
Tailevu	13,213	3%	1%	1%	1%	55%	1%	29%	15%	0%

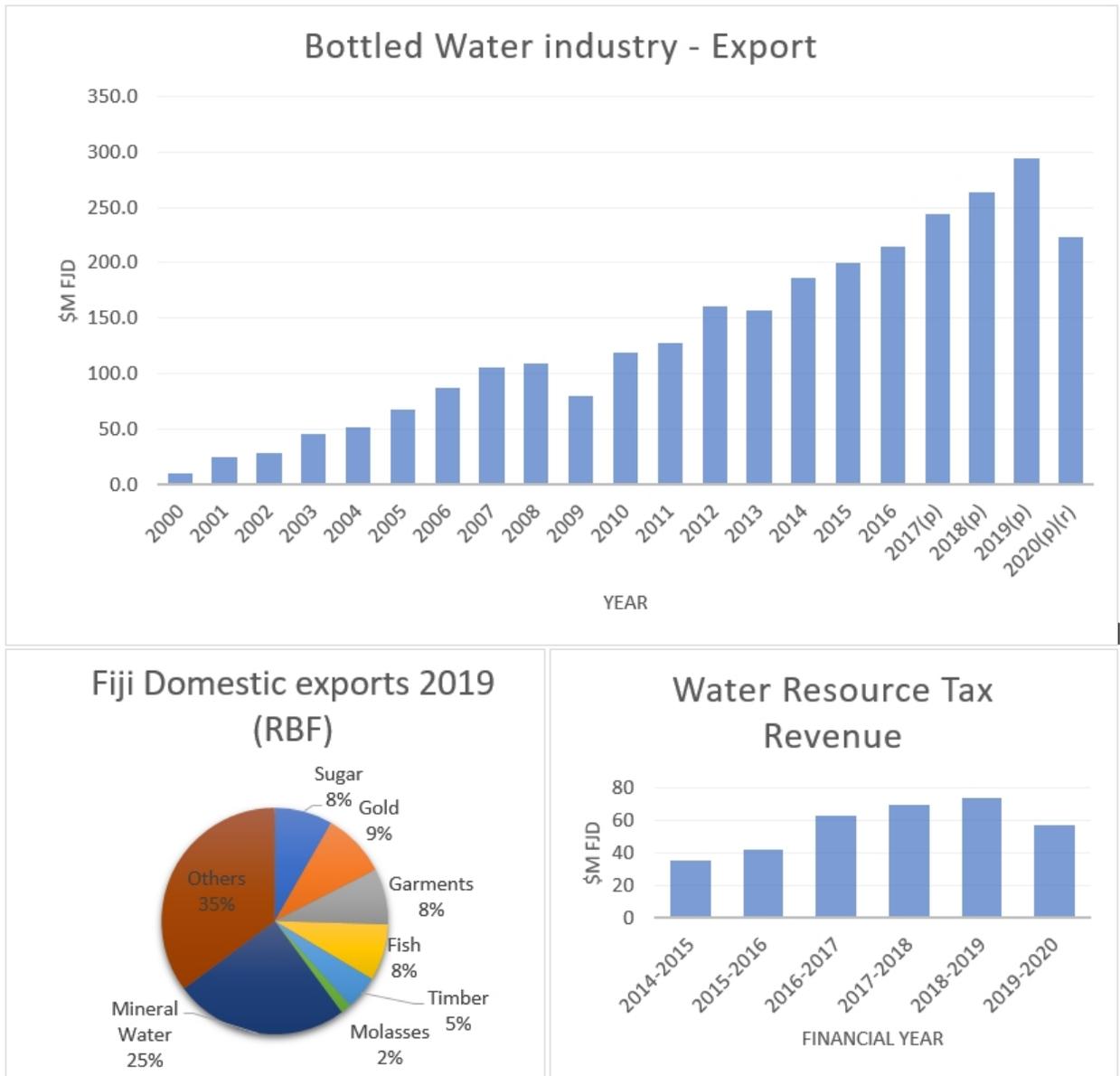
Groundwater also supports agriculture (e.g. Sigatoka valley, Legalega agriculture station) with farm irrigation schemes and livestock water supply through boreholes and spring-fed streams. MRD has been assisting the Ministry of Agriculture with the provision of groundwater sources for irrigation. Ministry of Agriculture has also been developing springs for multi-purpose irrigation schemes.

Groundwater also plays a key role in sustaining groundwater dependent ecosystems (e.g. through stream baseflow) even through dry periods. The Department of Environment provides for protecting natural resources in terms of development and the Fiji Meteorological Service provides additional

support with the monitoring of river and stream baseflows. Groundwater extraction is required to go through the Environmental Impact Assessment (EIA) process as stipulated under the Environment Management Act (2005) administered by the Department of Environment.

Finally, groundwater is the source of all bottled water industry (BWI) companies which is seeing an increasing interest from local and foreign investors. Currently four companies operate in Fiji, and two additional companies are in the process of setting up. The economic value of groundwater in terms of exports has surpassed gold and sugar, which has traditionally been the backbone of Fiji's economy. The BWI contributed 25% of all exports in 2019 and 20% in 2020, through a royalties water tax of USD 0.005 per litre, contributing to USD 112 million in 5 years (estimated abstraction 350 ML/year average over the last 5 years). The bottling water industry is clearly resilient to natural disasters and the COVID-19 pandemic. MRD has been responsible for the survey and development of the sources for some of these companies while other companies have engaged private drilling companies and consultants. When it comes to setting up a business this involves the simultaneous engagement of a number of departments and legislations (Trade Standards 2004, Water Resources Tax Act, Public Health Act, Environmental Management Act). As groundwater development increases and the bottled water industry also grows, hotspots of competing users (and potential conflicts) are identified. There has been increasing interest for investments in catchments where other BWI companies already exist.

In Fiji there is currently no control, or licensing, of water well drilling in the private sector. The government does not maintain records on the private drilling companies, or a registry of bores drilled, and permits for groundwater exploration do not exist. This can result in issues over standardization of drilling techniques and completion of boreholes. Ownership of groundwater remains doubtful as the law is unclear. As a consequence, conflicts can arise between local BWI companies and other groundwater users. Addressing substandard drilling techniques and enforcing the completion of boreholes to sanitary standards across the entire drilling industry is of critical importance.



**Figure 4.** Fiji's water economic data.

Water regulation and governance: In Fiji, there are a number of policies and legislations which address water to some extent. The 'Rivers and Streams Act (1880)' governs the flow and the use and management of rivers and streams. It is administered by the Department of Lands under the Ministry of Lands and Mineral Resources. Administration involves approval of authorizations to take water from rivers and approval of river gravel excavation (based on technical evaluation provided by the Department of Waterways).

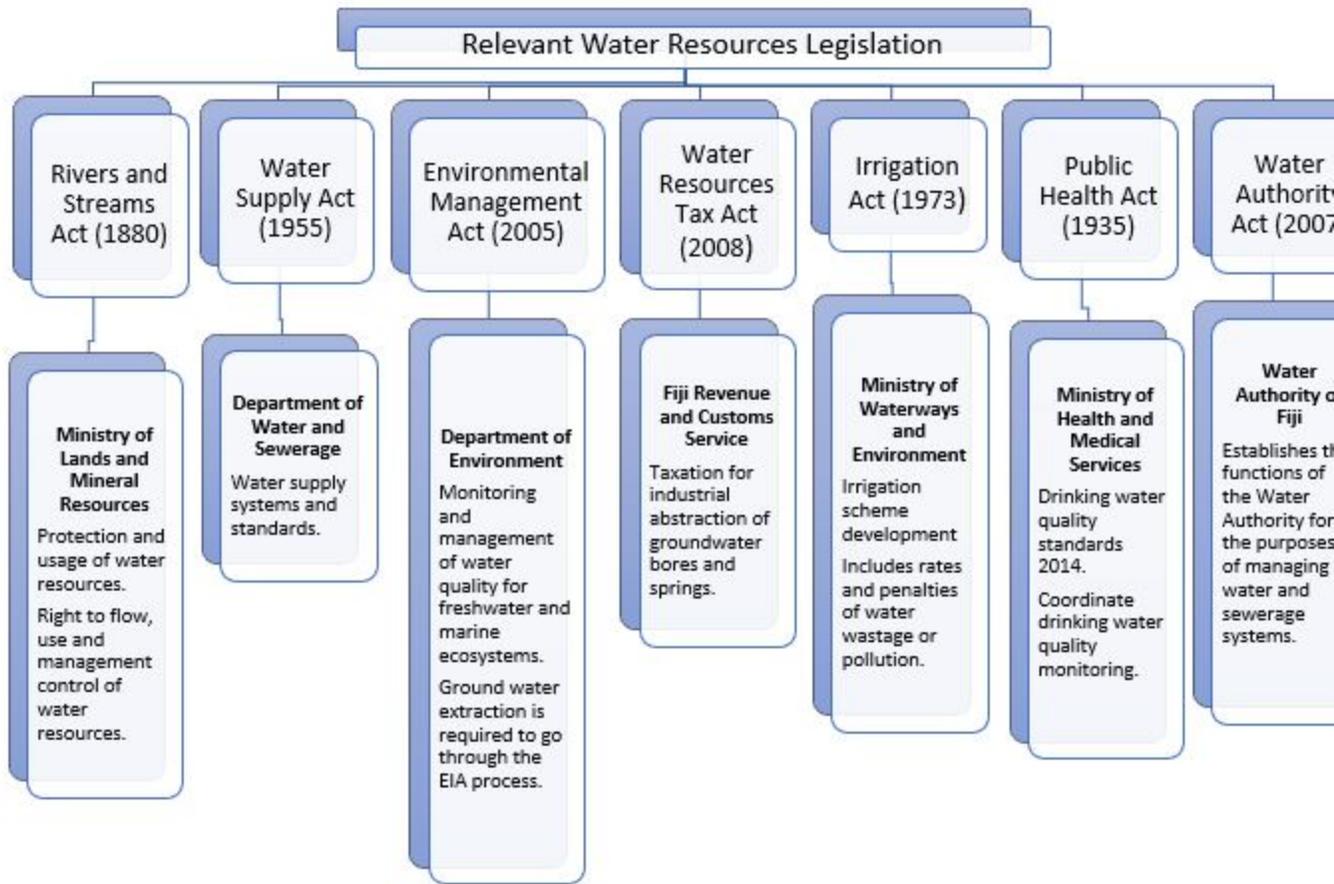
The 'Environmental Management Act (2005)' governs the protection of natural resources and controls the development of groundwater through the EIA process. It is enforced by the Department of Environment prior to any groundwater extraction works. The 'Water Resources Tax Act (2008)'

provides a framework for the taxing of water bottling companies and defines the power of the controller and other authorized offices. It is enforced by the Fiji Revenue and Customs Service (FRCS) whereas extraction licenses (certificates of production) are issued by the Ministry of Commerce, Trades, Tourism and Transport (MCTTT). Application of tax is focused on all industrial and commercial ventures using groundwater. Extraction licenses are issued based on the EIA and a hydrogeological assessment (including recommended pumping volume and extracted water quality) which is provided by an independent company or by the Mineral Resources Department (MRD). If MRD is not involved in the hydrogeological assessment, it can be part of the review process. Noteworthy is the absence of any allocation system. Another role of MCTTT includes the installation of flow meters in all production bores within the lease boundary of a bottled water company. The flow meters are checked annually by MCTTT, and the readings are cross checked with the monthly readings provided to FRCS by the bottled water companies.

The ?Water Authority Act (2007)? establishes the functions of the Water Authority of Fiji (WAF) for the purposes of managing water and sewerage systems. The functions of WAF include harvesting, treating and reticulating water for supply to its customers; complying with standards in relation to the supply and quality of water in its water system; and collecting, transporting, treating and discharging wastewater. The WAF is monitored by the Department of Water and Sewerage under the Ministry of Infrastructure.

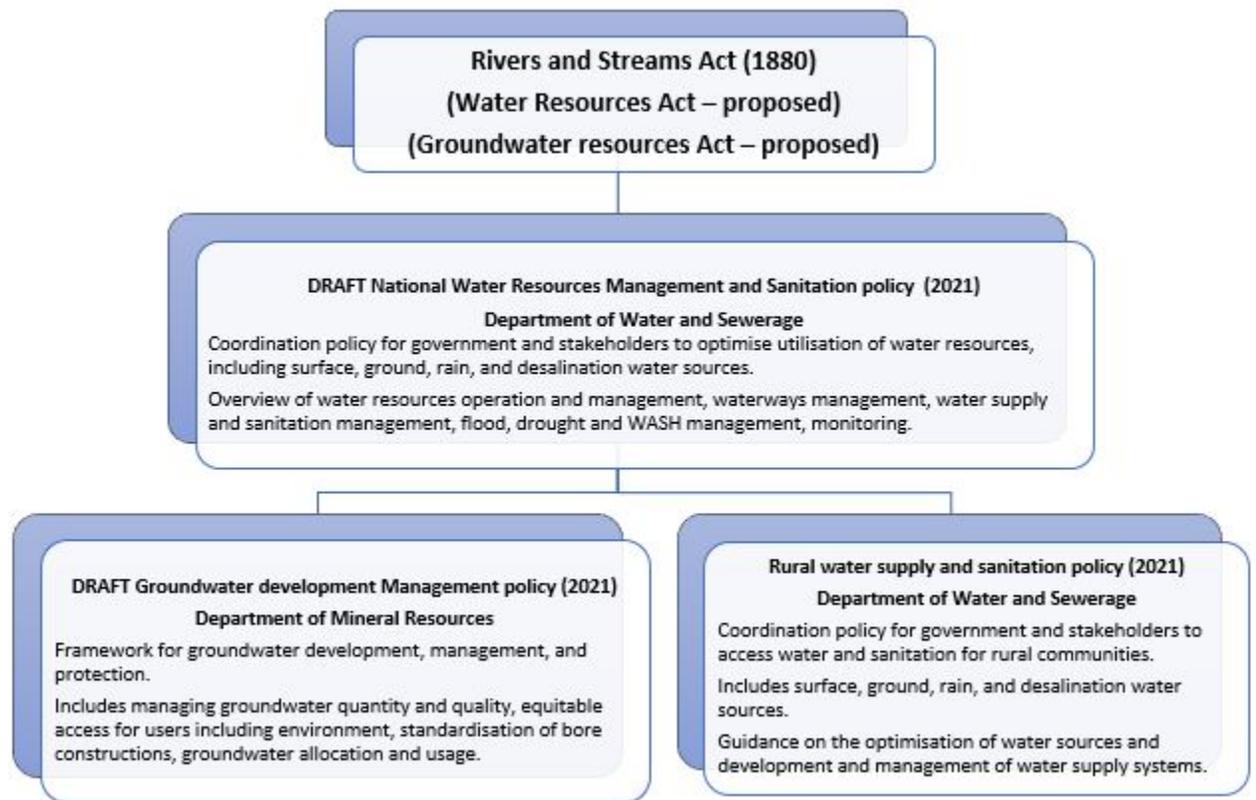
The ?Irrigation Act (1973)? is enforced by the Ministry of Waterways and Environment which, among other things, coordinates water usage for agricultural purposes and is responsible for irrigation development and operations, rural farming drainage, land reclamation, flood control works and flood management measures on catchment basis.

Finally, the ?Public Health Act (1935)? enforced by the Ministry of Health and Medical Services administers the Fiji national drinking water quality standards and promotes water and sanitation management planning in urban, rural, and maritime areas.



**Figure 5. Relevant water resources legislation in Fiji.**

Figure 5. Relevant water resources legislation in Fiji.



**Figure 6. Relevant policies for groundwater in Fiji.**

Figure 6. Relevant policies for groundwater in Fiji.

The great number of Acts creates a complex situation, yet none of these legislations addresses entirely all aspects related to groundwater development, management, and protection. The existing Rural Water Supply and Sanitation Policy (revised in 2021) governs the coordination of government departments and private contractors in the development of water supply (including groundwater) and sanitation for rural communities. The draft Groundwater Resources Development and Management Policy that has recently been submitted for approval by Cabinet, is envisaged to become the main framework for groundwater development, management and protection. The Policy will empower MRD to issue drilling licenses and permits for groundwater development, to conduct relevant inspections and enforcements and to define the evidence-based conditions for groundwater allocations. These two policy documents (Rural Water Supply and Sanitation Policy and Groundwater Resources Development and Management Policy) will be linked to the draft National Water Resource Management and Sanitation Policy which is intended to serve as the overarching policy. The development of a Groundwater Resources Act is additionally proposed to support the Groundwater Resources Development and Management Policy once endorsed by Cabinet.

Associated baseline projects: Groundwater investigations in Fiji began in late 1960s in response to requests from communities for sources of water. First drilling for groundwater boreholes was conducted in 1971 ? 1973 targeting the Nadi coastal aquifer. From 1978 ? 1980 through British technical cooperation the development of the groundwater based Nadi ? Lautoka water supply was further implemented. In the period 1987-1990, investigations, mapping, and development of groundwater deposits in the Sigatoka Valley deposits for irrigation purposes was realized as part of the Sigatoka Valley Rural Development Programme, implemented by ADB. Areas targeted included Keiyasi, Dubalevu, and Naduri. During the same period, the groundwater potential of the alluvial deposits of the Navua delta were assessed as part of the Navua Groundwater Supply Project. In 1994-1996, the volcanic deposits around the north-east Viti Levu (Ba, Tavua, Rakiraki) were investigated and developed under JICA funding. In 1996-1997, under French funding, the volcanic units in Vanua Levu (Seaqaqa, Labasa, Coqeloa) were assessed for development for improved water supply purposes. Groundwater development and abstraction has increased dramatically in a relatively short period of time due to greater awareness around groundwater which has contributed to an increase in its commercial value and due to increasing climate variability and more frequent climate extremes which have contributed to increasing its socioeconomic importance.



A hydrogeological map of Fiji was compiled by I.N. Gale in 1991 as part of the series of reports and maps produced by the Groundwater Resources Assessment and Development Unit (GRADU), Fiji. The Unit was established in 1985 in a cooperative project between the Mineral Resources Department and the British Geological Survey who produced the map under British Overseas Development Administration funds.

More recently (2017), a hydrogeological assessment of selected areas in the Ba and Ra provinces in the Western District of Viti Levu was undertaken by SPC as part of the EU-funded Micro Projects Programme (MPP). The assessment was part of the recovery response to Tropical Cyclone Winston that caused widespread damage in Fiji in 2016. All assessment work was undertaken in sugar cane farming communities that were affected by the cyclone. These rural communities have historically relied on creeks, springs and rainwater harvesting for their domestic water needs, and have been prone to the adverse impacts of droughts. Geophysical techniques were used to assess the hydrogeology and to identify groundwater-bearing zones suitable for drilling of water supply bores to provide a secure and resilient water supply. A number of proposed targets were drilled, and successful water supply bores have been installed providing water security to the affected communities.

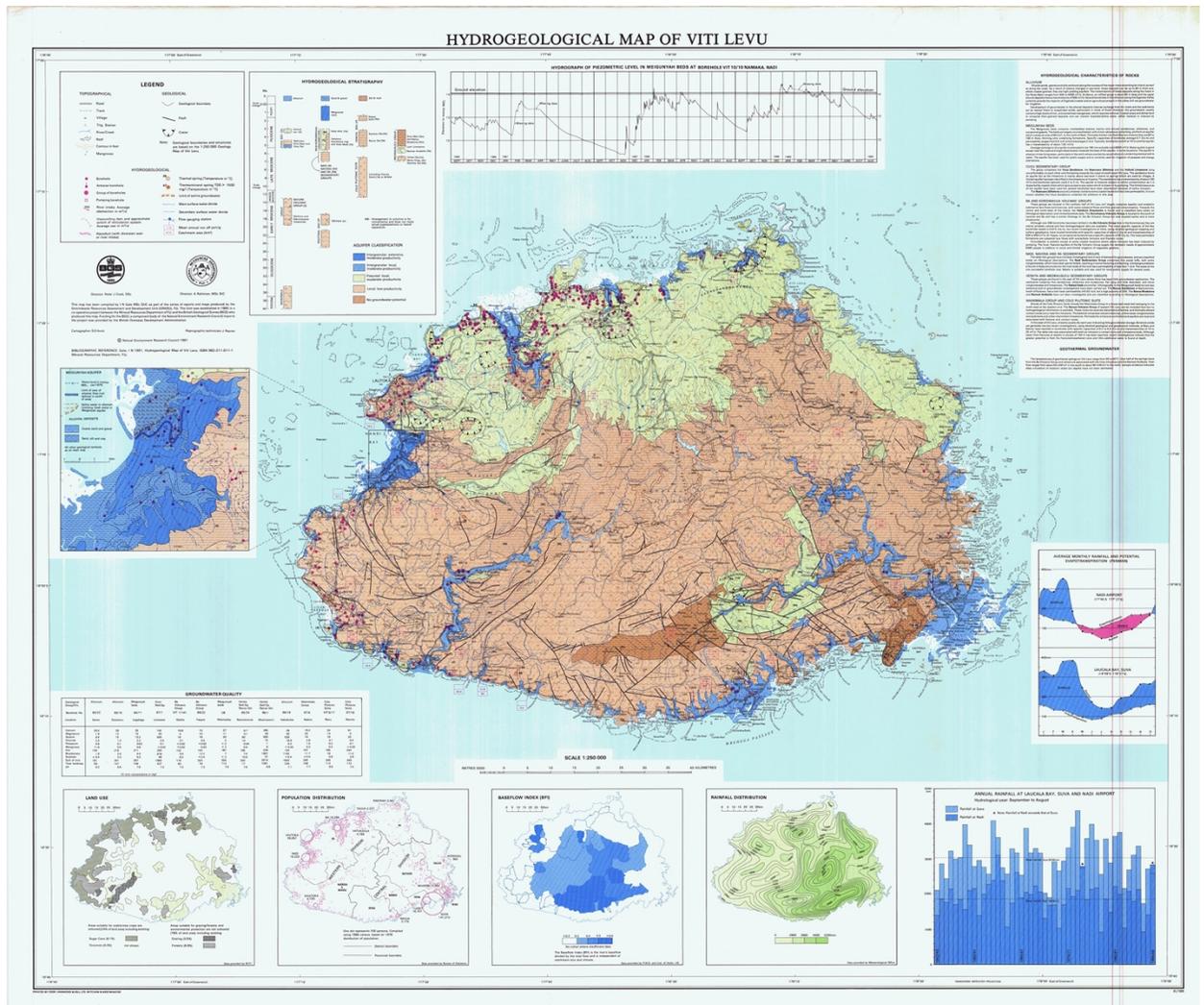


Figure 8. Hydrogeological map of Viti Levu, Fiji (Gale, 1991).

Previous GEF IW investments in Fiji identified a number of issues including the vulnerability to floods and droughts, the deterioration of water quality due to urbanization and industrial developments, conflicting use of water sources, fragmented responsibilities of Government Departments over water resources, and the lack of capacities at national level. The two projects, GEF IWRM and GEF Ridge to Reef, executed by SPC, focused on addressing catchment vulnerabilities through the establishment of dedicated catchment committees, the development of catchment management plans, the development of capacities at the national level to undertake surveys, mapping, and planning, and the demonstration of flood mitigation structures. As shown in Table 4, the focus of both IW projects was on introducing IWRM policies and practices, and an intersectoral approach in the management of the two main river basins of Viti Levu, the Nadi Basin, severely impacted by recurring flood events, and the Waimanu catchment. While this work has been successful in building a sound knowledge and policy framework for surface waters and dependent ecosystems, groundwater resources, in spite of being a major source

of high-quality freshwater and of income (export of bottled water), have been only marginally addressed, both in terms of assessment and governance.

**Table 4.** Results of previous GEF IW investments in Fiji

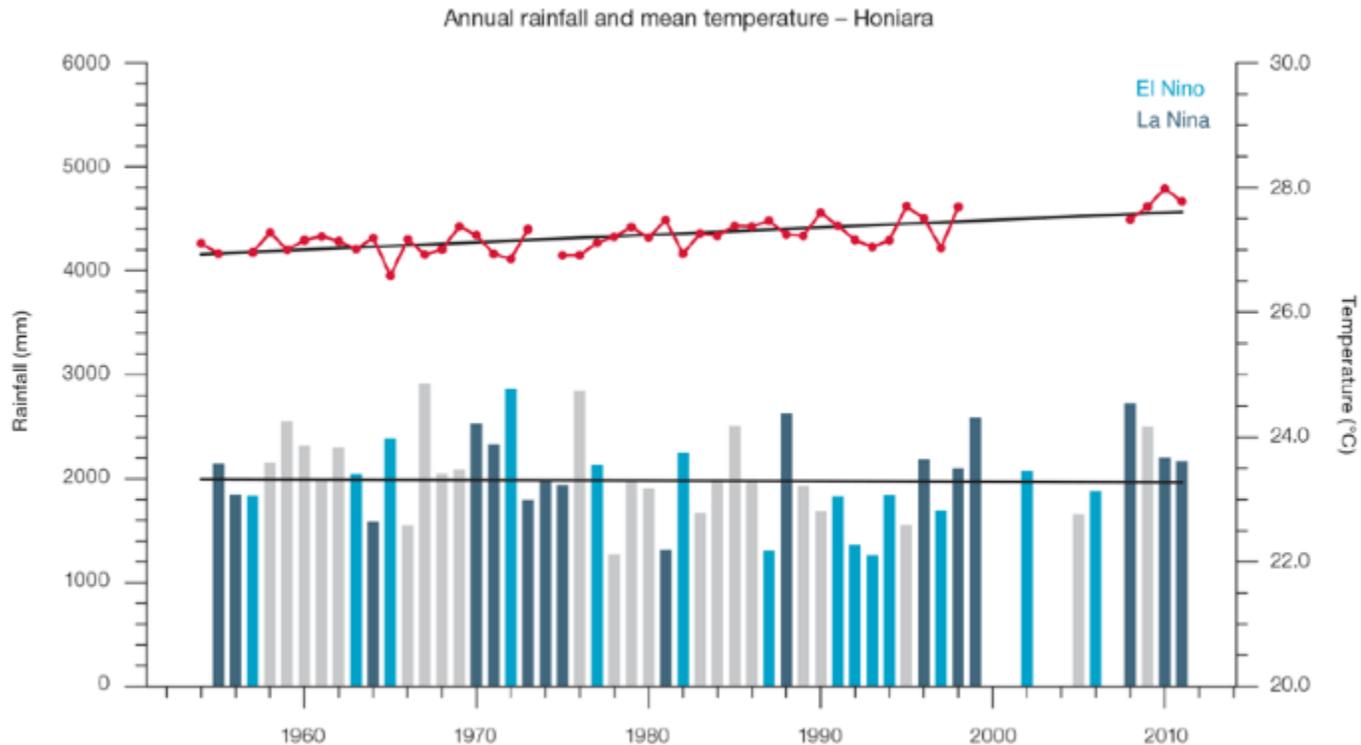
Issues identified prior to IWRM project	<ul style="list-style-type: none"> <li>? Vulnerability to floods and droughts.</li> <li>? Water quality deterioration due to catchment development, forestry, agriculture, and the growth of urban areas.</li> <li>? Commercial use of water and competition for resources, conflicting use of rivers and other sources, impacts of upstream industries on catchment areas and landowner demands are on the increase and current legislative instruments that are in urgent need of revision and updating.</li> <li>? Responsibility for water resources is shared between Ministries and Departments based on the different uses and users of water.</li> <li>? Although the National Water Committee has been established there needs to be a higher level coordinating mechanism that has the authority to support the development of water resource strategies and policies.</li> <li>? Nadi Basin identified as the most urgent hotspot due to its vulnerability to flooding.</li> </ul>
IWRM project results	<ul style="list-style-type: none"> <li>? Establishment of the Nadi Basin Catchment Committee.</li> <li>? Nadi Basin Integrated Flood Management Plan.</li> <li>? Biophysical survey of Nadi Basin catchment conducted.</li> <li>? Construction of flood mitigation structures (retention dams).</li> </ul>
Issues identified prior to R2R Program	<ul style="list-style-type: none"> <li>? Capacity for watershed assessment, mapping, planning needs to be strengthened.</li> <li>? Stress on vulnerable freshwater resources to be reduced through the development and implementation of watershed management plans and the development of the enabling environment for the replication and scaling-up of best practices in watershed management planning.</li> </ul>

R2R Program goals and results (still ongoing)	?	Inter-ministerial Committee established.
	?	Development and adoption of a Waimanu River Integrated Watershed Management Plan.
	?	Priority measures identified and agreed for watershed management.
	?	Strengthening capacity for watershed assessment, mapping and planning.
	?	Reducing environmental stress targets on municipal waste and aquifer pollution, terrestrial and wetland habitats, catchment protection measures by implementation of priority measures and best practices reflected in the Watershed Management Plan.
	?	Developing the enabling environment for the replication and scaling-up of best practices in watershed management as set out in the Watershed Management Plan.

### Solomon Islands

Solomon Islands is a sovereign country consisting of six major islands and over 900 smaller islands. The country lies to the east of Papua New Guinea and northwest of Vanuatu and covers a land area of 28,400 km<sup>2</sup>. The major islands are Guadalcanal (5120 km<sup>2</sup>) where the capital Honiara is located, Malaita (4310 km<sup>2</sup>), Makira (San Cristobal) (3190 km<sup>2</sup>), Santa Isabel (3000 km<sup>2</sup>), Choiseul (2970 km<sup>2</sup>) and New Georgia (2037 km<sup>2</sup>). These islands vary in length from 145 to 190 km and in width from 35 to 50 km.

Climate: The islands' ocean-equatorial climate is extremely humid throughout the year, with a mean temperature of 26.5 °C and few extremes of temperature or weather. White (2015) carried out a 'hot-spot' analysis using annual rainfall recorded in the Solomon Islands and identified that on an annual basis the urban and peri-urban area around Honiara and the east Guadalcanal plain require careful management. On an annual basis all other regions with rainfall stations have adequate rainfall for recharging large groundwater systems and supplying large streams even through the worst El Niño event on record. According to the Pacific-Australia Climate Change Science and Adaptation Planning Program (2014), the annual and half-year minimum temperatures have been increasing in Honiara since 1953 while the number of rainy days has been decreasing. According to the same study, for the period to 2100, the latest global climate model projections and climate science findings indicate that annual mean temperatures will continue to rise (very high confidence) and that extreme rain events will increase (high confidence). Annual rainfall is projected to slightly increase (low confidence) and the incidence of droughts is projected to slightly decrease (low confidence). Projections also indicate with very high confidence that sea level will continue to rise.



**Figure 9.** Mean air temperature (red dots and line) and total rainfall (bars) in Honiara. Light blue, dark blue and grey bars denote El Niño, La Niña and neutral years respectively (Australian Bureau of Meteorology and CSIRO, 2014)

The availability of water resources in the Solomon Islands varies considerably. It ranges from rivers and small streams present in the high mountainous islands to harvested rainwater and thin fresh groundwater lenses in the low-lying coral atolls and islands. In 1986, flooding during Tropical Cyclone Namu in Malaita and Guadalcanal claimed about 100 lives. In 1995, drought severely affected most parts of the country causing severe food shortages.

Volcanic geology: The geology of the Solomon Islands is the result of a complex tectonic history taking place at the southwestern boundary of the Pacific plate in contact with the Australian plate and their associated subduction movements. According to Coleman (1965), the Solomon Islands group can be subdivided into three provinces based on rock type and structure (Volcanic, Central, Pacific). All recent and active volcanoes belong to the Volcanic province which extends along the New Georgia island group as an assemblage of volcanic cones, their associated extrusive features and fringing and barrier reefs. Common rocks in this province include olivine basalts and pyroclastics as well as basaltic andesites. Currently, most of the volcanic activity is on Bougainville Island where the Volcanic and Central provinces overlap. The Central province is composed of a Mesozoic basal complex consisting of chloritic greenstones and amphibolitic schists, as well as less altered basic lavas. This basal complex is intruded and covered by Upper Eocene - Oligocene intrusive rocks, lavas, and volcanic agglomeratic and pyroclastic layers. The thickness of these lavas may be up to 1000 meters thick, and is overlain by

reef sediments, pyroclastics, and sediments. The sediments were deposited in subsiding fault-bounded troughs from early Miocene through to Recent age and their thickness can reach up to 5000 meters (eastern Guadalcanal). It is suggested that Guadalcanal's block-mountain spine has resulted from uplift which took place in the Quaternary. The Pacific province extending along the northern islands of Santa Isabel and Malaita, is composed of the oldest rocks characterized by basic basal lavas overlain by deep-water foraminiferal oozes of Upper Cretaceous age and by approximately 1300 meters of Cainozoic foraminiferal calcilutites.

Similar to Vanuatu, only local-scale hydrogeological assessments have taken place in the Solomon Islands mostly aiming at guiding drilling operations for water supply schemes. Although no regional assessments have taken place, it is suggested that groundwater occurs under variable settings, including perched, fractured, and basal aquifers, typical of volcanic and complex island settings.

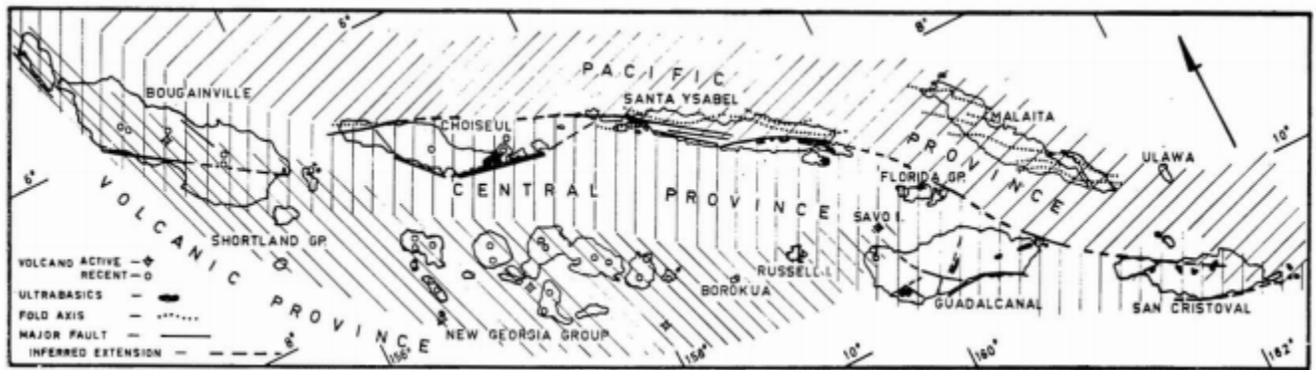


Figure 10. Geological provinces in Solomon Islands.

Socio-economic data: Drinking and household use in both rural villages and in urban centres account for the largest water withdrawal in the country. There is limited agricultural water demand because most crops are rainfed. The industrial sector withdraws water for fish processing cannery, palm oil factory, mining operations and some small manufacturing industries. Although the demands for industry are still relatively small there is considerable potential for future growth. On the larger islands, surface water in the form of streams, springs or rivers is the main source of drinking water. Some communities on the higher volcanic islands also use groundwater for domestic purposes. The major users of groundwater resources (coastal aquifers) are the capital city Honiara and the Guadalcanal Plains.

Table 5. Solomon Islands 2009 Census - WASH data

	Main source of drinking water (%)	Main source of washing water (%)

Province	Number of households	Metered SIW Drinking water	Communal standpipe	Private water tank	Communal water tank	Well/borehole	River / stream	Bottled water	Other	Piped private	Piped shared	Communal standpipe	Well/borehole	Private water tank	Communal water tank	Sea water	River / stream	Other
<b>Total</b>	<b>91251</b>	<b>9</b>	<b>35</b>	<b>12</b>	<b>11</b>	<b>4</b>	<b>25</b>	<b>1</b>	<b>4</b>	<b>11</b>	<b>12</b>	<b>27</b>	<b>11</b>	<b>4</b>	<b>1</b>	<b>1</b>	<b>32</b>	<b>1</b>
Choiseul	4712	0	30	24	18	0	25	0	2	2	6	39	10	6	5	1	0	34
Honiara	8981	75	4	10	1	3	5	1	1	61	26	2	3	2	2	0	0	5
Western	13762	0	30	33	18	0	14	1	3	8	8	36	10	2	11	1	0	26
Isabel	5143	0	64	10	11	1	11	0	2	8	17	48	1	1	1	0	0	24
Central	4905	1	39	19	18	1	18	2	2	6	16	24	37	27	2	1	0	13
Rennell-Bell	688	0	0	80	13	2	0	3	2	0	0	0	5	4	67	3	0	22
Guadalcanal	17163	6	27	5	7	12	38	0	4	5	12	15	13	5	1	1	0	52
Malaita	24421	2	45	5	8	2	33	1	4	7	11	31	9	4	1	1	0	38
Makira-Ulawa	7173	0	50	3	8	1	34	0	3	7	11	35	4	4	0	0	0	41
Temotu	4303	0	38	10	24	8	8	0	11	1	3	34	24	20	7	5	9	13

**Table 6.** Solomon Islands 2009 Census - WASH and agriculture data

Province	Number of households	Main type of toilet facility (%)								Growing food crops			
		Flush toilets private	Flush toilets shared	Water sealed toilets private	Water sealed toilets shared	Pit latrines private	Pit latrines shared	Other	No toilets	Subsistence only	Salable only	Subsistence and sale	Not growing food
<b>Total</b>	<b>91251</b>	<b>10</b>	<b>2</b>	<b>7</b>	<b>2</b>	<b>12</b>	<b>9</b>	<b>24</b>	<b>33</b>	<b>36</b>	<b>1</b>	<b>48</b>	<b>10</b>
Choiseul	4712	4	1	5	1	3	1	13	73	35	0	56	6
Honiara	8981	54	9	13	6	11	3	2	1	33	1	7	54
Western	13762	11	2	12	2	3	1	25	44	34	1	56	7
Isabel	5143	3	0	7	5	23	3	57	1	30	0	62	4
Central	4905	6	1	2	1	0	1	27	62	24	0	73	2
Rennell-Bell	688	2	0	22	1	58	15	2	0	70	0	22	4
Guadalcanal	17163	5	4	7	2	20	5	25	31	39	1	46	8
Malaita	24421	4	0	5	1	16	27	26	21	38	1	51	5
Makira-Ulawa	7173	3	1	3	4	2	1	37	49	46	1	44	4
Temotu	4303	2	1	2	2	1	0	11	80	28	0	65	3

The Honiara urban water supply system, managed by the Solomon Islands Water Authority (Solomon Water) is sourced from multiple spring and groundwater sources and services 55% (approximately 8,500) of households (in 2017) while the remaining receive water from rainwater tanks, streams, communal standpipes and unprotected wells. 58% of water derives from three springs with the Kongulai Spring providing the largest proportion (38%) of the supply. 42% of the supply is extracted through 27 bores spread across the city area. 16 of these bores were drilled in 2013 as part of the JICA-funded 'JICA Project for the Improvement of Water Supply Systems in Honiara and Auki' project.

According to a survey undertaken by the Pacific Regional Infrastructure Facility in 2016 (Heslop, 2016), 87% of the surveyed formal households were connected to the public water supply network with the percentage dropping to 50% for informal households. 78% of these households used the water as their primary source of drinking water and 90% as a source of domestic water (Washing, bathing, flushing toilet). The reasons reported by the remaining 22% of households for not using the piped water as a drinking water source were poor quality, frequent disconnection, and unreliability of the supply. The same survey concluded that the proportion of formal housing not connected to the water supply network sourced their drinking water from unauthorized connections whereas informal households primarily sourced their drinking water from neighbors, unauthorized connections, and rivers/streams.

Table 7. Honiara Water Supply ? Existing Water Sources (Solomon Water, 2017)

Type	Source	No. of Bores	Avg Production (2015/16) (ML/d)	Estimated Reliable Yield (ML/d)	Approx. Water Level (m)
Spring	Kongulai Spring Gravity	-	2.8	12.5	100
	Kongulai Spring Pumped	-	9.4		
	Rove Spring Pumped	-	0.1	1.5	35
	Rove Spring Gravity	-	3.0		
	Kombito Spring Gravity	-	3.5	1.7	90
Bore	Kombito (Gilbert Camp) bores	3	1.5	1.5	42
	Mataniko JICA bores	3	1.8	1.8	-2
	Tuvaruhu SW bores	2	1.5	1.5	-15
	Panatina bores	3	1.9	2.0	-2
	Tasahe bores (JICA, 2013)	4	2.5	2.5	50
	Titinge bores (JICA, 2013)	4	0.2	2.5	45
	Skyline bores (JICA, 2013)	4	1.6	2.5	40
	Borderline bores (JICA, 2013)	4	2.6	2.5	45
<b>TOTALS</b>		<b>27</b>	<b>32.5</b>	<b>32.5</b>	

The Kongulai Spring is situated within customary land leased by the government from local landowners. On average 12.2 ML/d of water are extracted via a combination of gravity and pumped systems. Occasional disputes with landowners over the land and water resource and high water turbidity (150-200 NTU) following periods of intense rainfall forcing frequent system shutdowns, highlight the vulnerability of the resource and the water insecurity of Honiara considering the large proportion deriving from this particular spring. A water treatment plant, expected to become operational in late 2023 at the earliest, is expected to lift production by 3 ML/d and reduce the system shutdowns caused by turbidity. An additional 6.6 ML/d of water is extracted from the Rove and Kombito Springs (soon to increase to 9 ML/d through ongoing upgrades) while 13.6 ML/d of groundwater is extracted through the various bores.

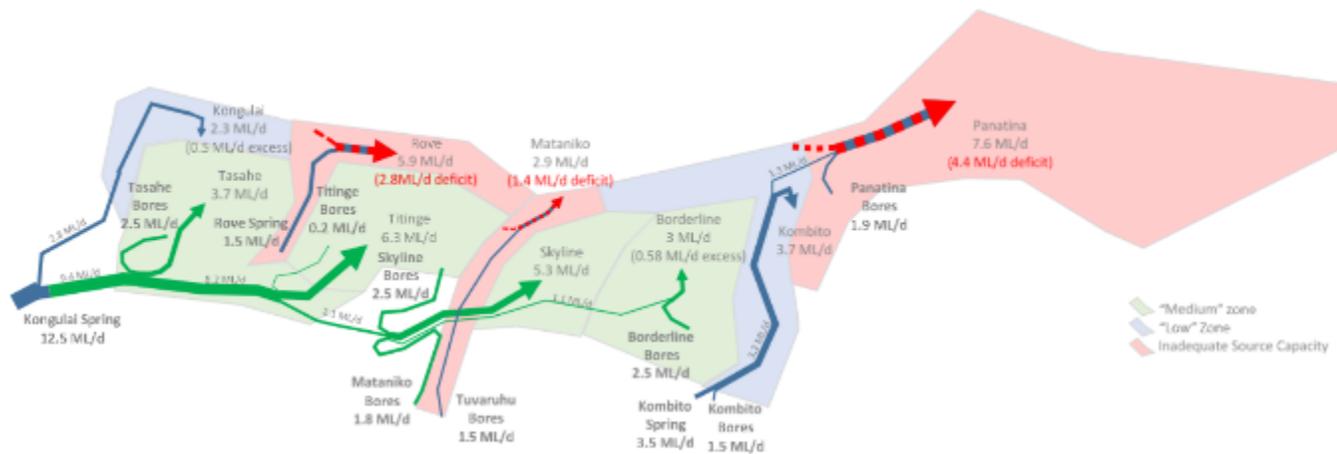
The majority of water supply sources only have chlorination facilities for basic treatment, which occasionally are offline for maintenance, compromising the supplied water quality. Leakage from sewers and drains and effluent from poorly maintained septic systems in combination with low or negative pressure conditions in parts of the water system during outages, present the main risk for contamination of the supplied water. According to Solomon Water, "the high proportion of small diameter pipes is a key reason for poor supply pressures across much of the Honiara water supply system. This is further exacerbated by inadequately sized trunk mains across most areas". Groundwater extracted from bores is generally of good quality albeit having a relatively high hardness due to high carbonate content deriving from limestone dissolution.



customers in 2017. The total average daily water demand in 2021 would therefore amount to 42.2 ML (peak demand 45.1 ML). The projected average daily demand is expected to increase to approximately 60 ML/day in 2037 and 80 ML/d in 2047 (Solomon Water, 2017).

It becomes clear that new water sources will be required in the future to address this long term growth in population and water supply demand, especially considering the vulnerability of the existing water sources. This will need to be accompanied by reduction in non-revenue water losses and demand management measures. It should also be highlighted that the physical and hydraulic condition of the network will likely prevent the generation of sufficiently high pressures to feed all required areas which could cause extensive damage to the aging pipes.

A key future challenge for Solomon Water is the vulnerability of key water and wastewater assets to extreme weather events and climate change. According to the Solomon Islands National Infrastructure Investment Plan (2013), the identification of new water supplies and source diversification can address coastal erosion and saltwater intrusion in coastal areas. Reducing pressure on coastal aquifers and undertaking regular water quality assessments were identified as necessary complementary measures. Rainfall variability may cause a number of issues related to water shortages and changes in water demand patterns, create conflict between different users, and cause increased runoff resulting in reduced groundwater recharge. Increasing the available water resources, improving natural and artificial water storage, and ensuring aquifer recharge zones were identified by Solomon Water as suitable measures addressing this particular hazard.

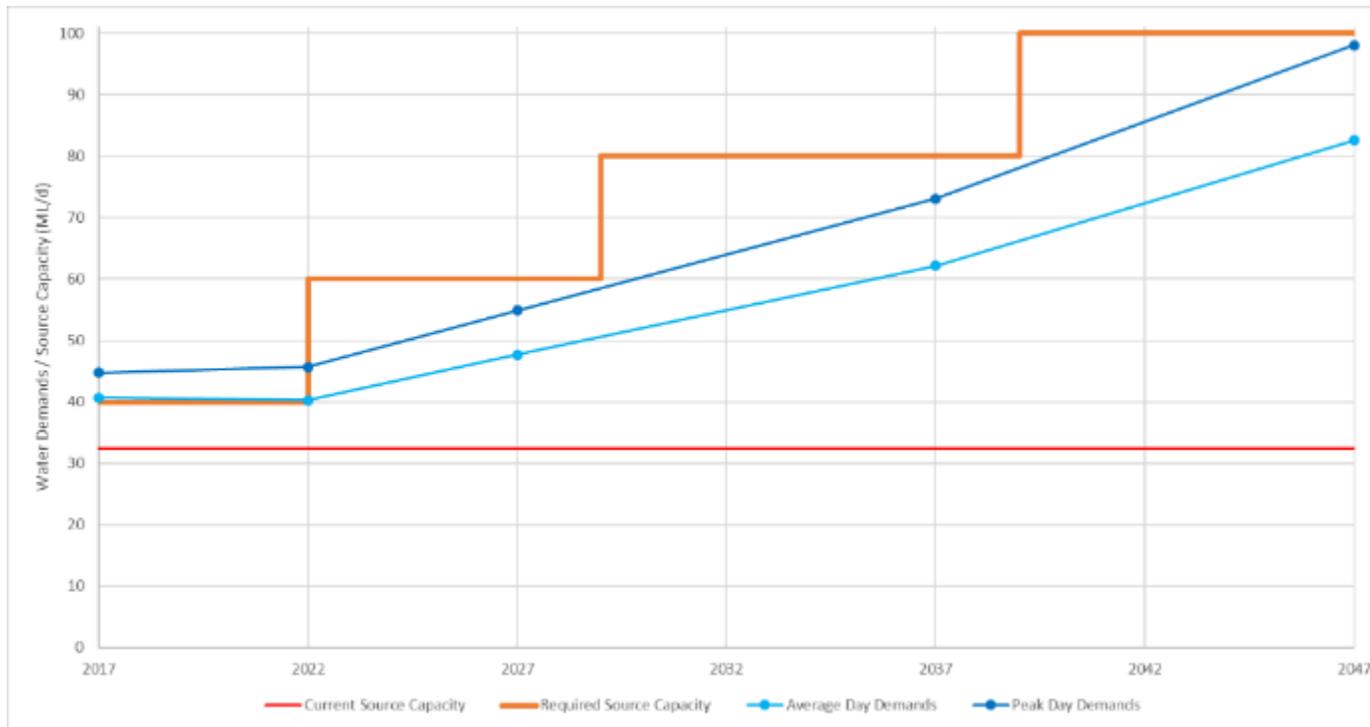


**Figure 12.** Existing Honiara Water Supply System Bulk Capacity Assessment (Solomon Water, 2017)

Figure 13 presents an overview of the existing water supply network with the bulk production volumes at each source and allocation to the immediate downstream supply zone with any excess being transferred to subsequent zones. In general, the green zones currently have adequate source capacity whereas the coastal level zones are more susceptible to insufficient source capacity.

While the current source yield is around 32.5 ML/d, already below the current water demand, future source capacities will need to progressively increase to around 100 ML/d over the next 30 years to cater for future population / demand growth (Figure 14). A number of potential new source options are being considered by Solomon Water to increase the total source capacity. Of these options, the Lungga River is considered as the most viable option as a long-term supply source for Honiara due to its size (the largest river on Guadalcanal) and proximity to Honiara. Key challenges in selecting this source would be the need for a high-capacity water treatment plant and the fact that the river intake pump station would have to be located within customary land.

Around 7.5 ML/d of additional source capacity would be immediately required to satisfy existing demands. In 2017, Solomon Water was considering re-establishing the White River bores and expanding the borefields in the Mataniko area (subject to field investigations) to increase source capacity. Demands however are projected to rapidly increase after 2022, which cannot be met without significant additional sources. Solomon Water expects by 2047 to develop the Lungga River source covering the water requirements of the lower Honiara areas, whereas the Kongulai source will still continue to supply water to the higher elevation areas of the city. Until such time, Solomon Water's capacity to provide water through bores will have to increase, particularly in the eastern part of Honiara where more than 3,200 new connections are currently installed as part of an ongoing Australian DFAT-funded vulnerable communities project. A number of recent and ongoing efforts (White River bores, Kombito bores, Rove source upgrade) are expected to increase overall capacity by 3.3 ? 4 ML/day. The Kongulai spring water treatment plant will also increase capacity (3 ML/day) and reduce water outages related to turbidity but it is not expected to be operational until late 2023 at the earliest. A deficit in water supply still remains and with the increased difficulty in managing the surface water catchments, borehole production in the eastern part of Honiara is going to be critically important. Groundwater investigations and targeted drilling for groundwater development are expected to be required around the Gilbert Camp, Panatina, Henderson, and Lungga areas. Generally, there is a poor understanding of the Honiara aquifer and the groundwater component at catchment level (e.g. Kongulai). There is a need for scientific insights regarding the interconnectivity between the various aquifer units and between different bore fields to help Solomon Water futureproof their current and future water sources.



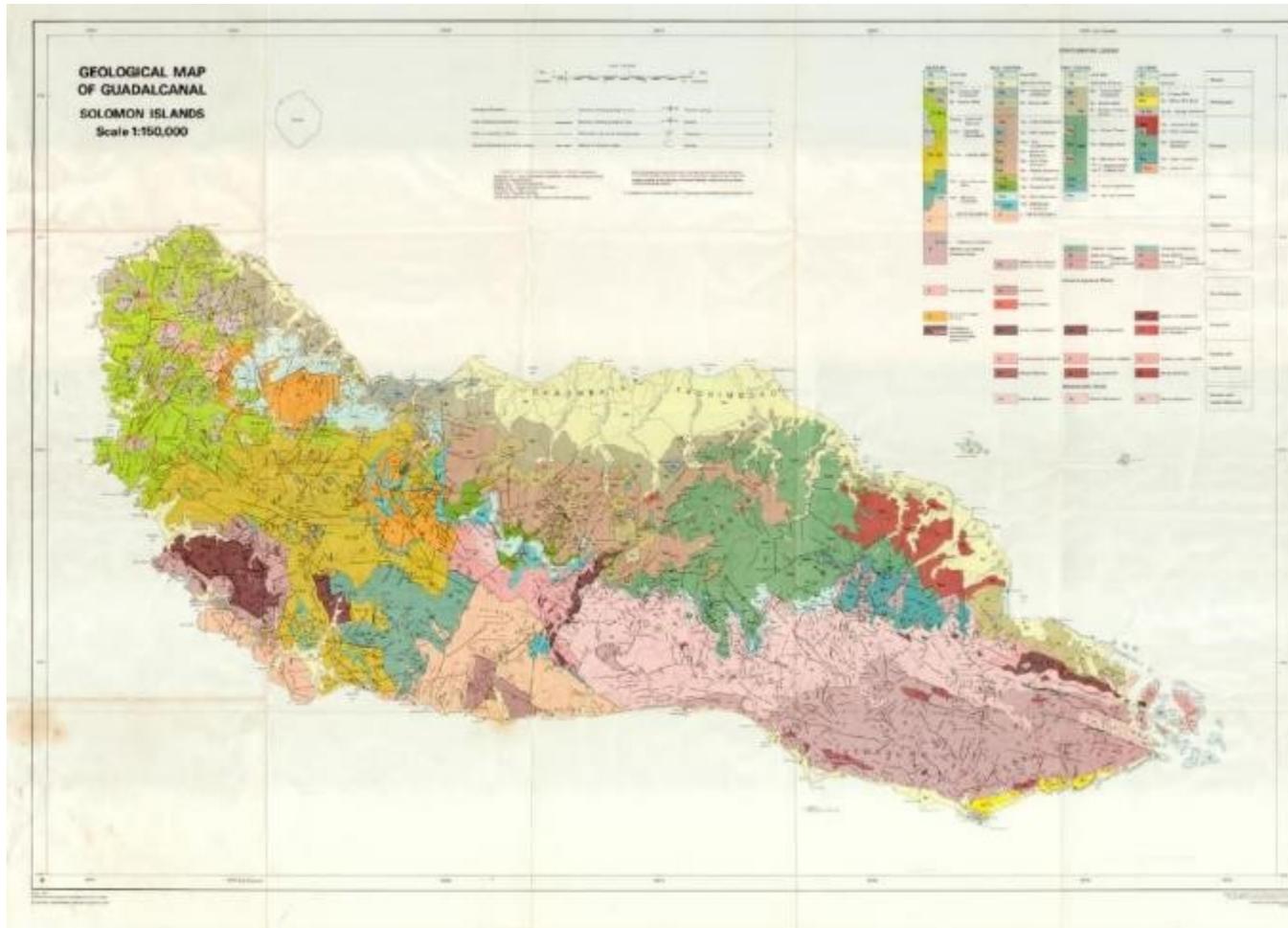
**Figure 13.** Future Water Demand Projections vs Source Capacity (Solomon Water, 2017)

Water regulation and governance: In the Solomon Islands there are three different ministries taking care of water regulation aspects. The Solomon Islands Environment Act 1998 mandates that pollution of the environment must be prevented and minimized. The Act regulates permits to discharge treated wastewater to the environment (Ministry of Environment, Climate Change, Disaster Management and Meteorology). The River Waters Act 1969 for surface waters only regulates extraction from rivers through a permit (Water Resource Division). The Environmental Health Act 1996 regulates activities to prevent pollution of water systems from resident and commercial activities (Ministry of Health & Medical Services). However, there are no clear mandates under these Acts to collect groundwater data. Furthermore, groundwater extraction is not regulated. The Government of the Solomon Islands has recently endorsed the formulation of a new Water Resources Legislation to mandate the implementation of the National Water Resources and Sanitation Policy and its Implementation Plan, prepared during the GEF IWRM project, to replace the outdated, limited and ineffective River Waters Acts 1969 (Cap 135). Even though the Policy and Implementation Plan were approved by Cabinet in 2019, most activities have not yet been implemented due to the need for such legislation. A draft legislation exists since 2006 (Water Resources Act 2006) and provincial consultations are currently taking place aiming for endorsement of the legislation by mid-2022. The Water Resources Management Division is currently seeking assistance to fully develop this new legislation, one of the country's prioritized policy objectives.

Groundwater monitoring is currently needs-driven and limited to locations where logistics and issues are anticipated. Efforts are currently planned to expand groundwater monitoring to more locations in

the Solomon Islands. Parameters measured are water levels, temperature and electrical conductivity. Groundwater assessments and aquifer mapping in the Solomon Islands are needed to allow the sustainable management of this potentially large resource, and the effective monitoring of mining activities, groundwater pumping, and seawater intrusion. Mining activities can result in groundwater contamination in the form of heavy metals (e.g. arsenic, cyanide). Production boreholes which are drilled within residential areas can face contamination threats from septic systems. Coastal aquifers can face salinity problems due to storm surges and sea level rise. Sea level rise, residential development and mining have been identified as the future threats to groundwater quality.

Associated baseline projects: Groundwater investigations in the Guadalcanal Plains, a 300 km<sup>2</sup> area on east of Honiara, the capital of the Solomon Islands, where important agricultural and other commercial activities are taking place, began in the 1980s with the Water Resources Division of the Ministry of Natural Resources conducting geophysical surveys, drilling boreholes and collecting information. Other investigations conducted in the 1980s by the Ministry included Ngalo Island (Temotu Province) and West Rennell Island (Renbel) to assess the possibility of drilling boreholes for drinking water supply. In 1995, a groundwater and water supply survey was conducted on Taro island (Choiseul province) by the Water & Mineral Resources Division of the Ministry of Energy, Water & Mineral Resources while in 1998, a groundwater availability guide was developed for the Guadalcanal Plains, collating all hydrogeological and drilling information up to date to assess the future potential of the aquifer system.



**Figure 14.** Geological map of Guadalcanal, Solomon Islands (1978).

In 2014, the 'Solomon Islands Water Sector Adaptation Program' implemented by the United Nations Development Program in partnership with the Solomon Islands Ministry of Mines, Energy and Rural Electrification, aimed to improve the resilience of water resources to the impacts of climate change and improve health, sanitation and quality of life, so that livelihoods could be enhanced and sustained in the targeted vulnerable areas. As part of the project, groundwater assessments were conducted for a number of islands including Ghizo Island (Western Province), Taro Island (Choiseul), Tuwo (Temotu), Rennell Island (Renbel), Santa Catalina Island (Makira), and Manaoba Island (Malaita).

The Solomon Islands Baseline Assessment Report prepared in 2011 under the ADB-funded Honiara Climate Change Adaptation Project included a baseline assessment of the potential climate change impacts on a number of strategic infrastructure sectors, including water. The study identified the following potential impacts on water infrastructure in Honiara:

- Water supply infrastructure is vulnerable to flood and storm damage (particularly pipelines exposed at waterway crossings and near the coastline).

- Metal pipelines and other water supply assets with metal components are also vulnerable to corrosion damage due to their coastal location (high salinity levels in the air and saltwater intrusion).
- Saltwater intrusion is also a common threat to water supply quality and may lead to water quality degradation of the water sources, especially groundwater sources on the low-lying coastal plain.

Previous GEF IW investments in the Solomon Islands identified issues related to improper development practices such as logging and the traditional slash-and-burn method of farming which have gradually destroyed the river water quality threatening water availability in many parts of the country. In urban areas, specific issues were related to contamination of groundwater resources by human activities, saltwater intrusion due to over-abstraction of coastal aquifers, and sea-level rise threatening the quality of coastal resources. Likewise in Fiji, previous IW work in the Solomon Islands has concentrated on introducing IWRM policies for basin management, with focus on the main island of Guadalcanal, on expanding the scope of basin management to the coastal areas and ecosystems, and on promoting a multi-sectoral approach to water management. The two projects, GEF IWRM and GEF Ridge to Reef, executed by SPC, focused on addressing these issues through cross-sectoral planning and management initiatives, through the establishment of monitoring programme, the mapping of pollution sources and their environmental impact, and the establishment of institutional and civil society awareness and capacity outreach. The specificities, potentialities and governance of groundwater have so far received little attention.

**Table 8.** Results of previous GEF IW investments in the Solomon Islands

Issues identified prior to IWRM project	? Improper development practices such as logging and the traditional slash-and-burn method of farming have gradually destroyed the quality and capacity of rivers and streams.
	? Threats to coastal aquifers due to human activities, saltwater intrusion, and sea level rise.
	? High pumping costs associated to supplementing water supply with groundwater.
	? Land tenure system (customary-owned) can cause complications in development (e.g. water resources are tied to land).
	? Need for basic information for water resources assessment and protection.
	? Integrated planning and management of watersheds and coastal areas is required.
	? Water demand and supply management and provision of water treatment.

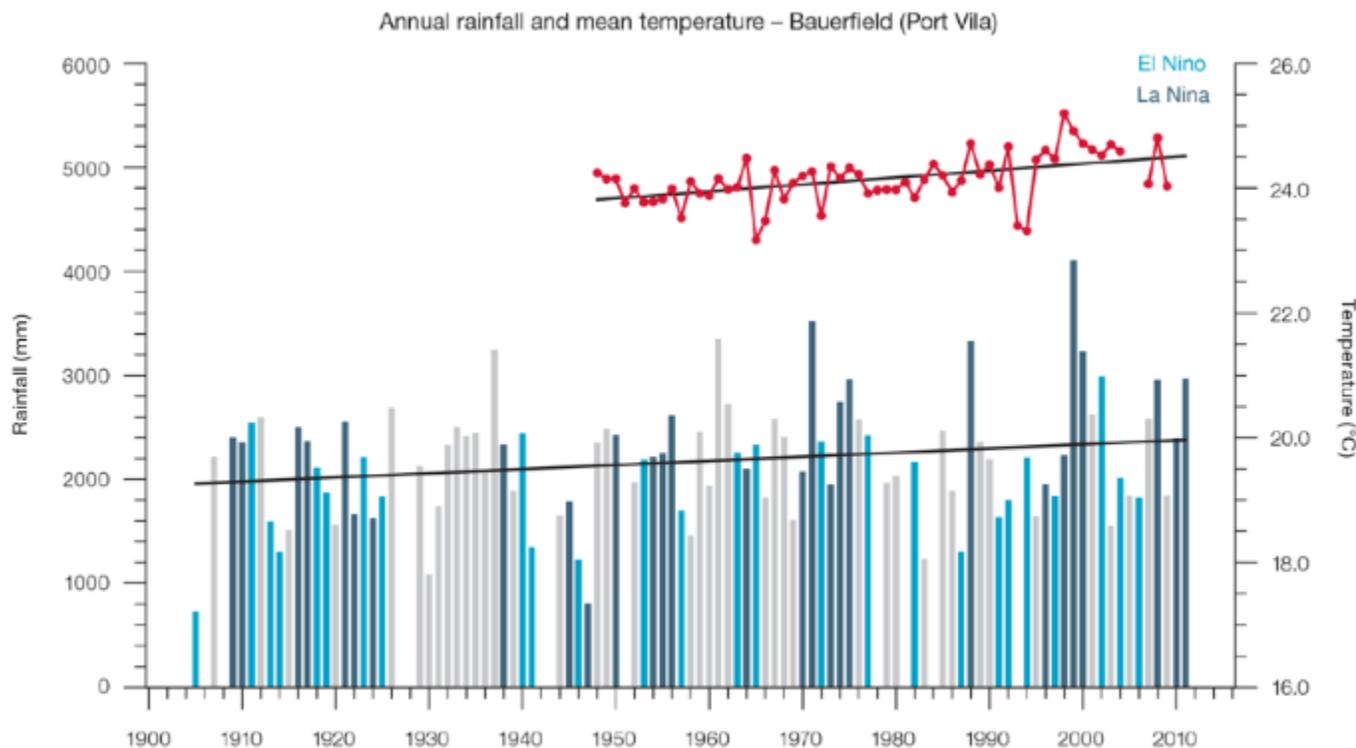
IWRM project results	<p>? Produced a draft IWRM Policy and Plan, under a concurrent funding, and resulting in a National WATSAN Policy and accompanying Implementation Plan prepared for government endorsement. This was a nationally implemented policy with lessons learnt from the project.</p> <p>? In terms of demand management, the project resulted in the reduction of water leakages and installation of water meters, both for supply mains and consumers, to monitor flow and non-revenue water at one the highest leakage areas of Honiara.</p> <p>? Formulation of the Honiara Water Safety Plan after consultations, training and assessments of sources to consumers? aspects of Honiara?s 5 main water sources.</p> <p>? Formulation of Kovi/Kongulai Catchment Management Plan to support water resources conservation and developments in the catchment.</p> <p>? Awareness raising on the IWRM approach to managing water supply for Honiara.</p>
Issues identified prior to R2R Program	<p>? Lacking monitoring programme for pollution and nutrients entering the Honiara Adjacent Coastal water.</p> <p>? Identification of pollution sources and environmental impact.</p> <p>? Lack of institutional and Civil Society awareness and capacity outreach.</p>
R2R Program results	<p>? Joint inter-ministerial Committee established in 2017.</p> <p>? Functional technical committee comprised of Honiara City Council (HCC), Water Resources Division (Mines and Energy), Environment and Conservation Division (MECDM), National Public Health Lab (MHMS), Environment Health Division (MHMS), Ministry of Lands and housing, Solomon Islands National University (SINU).</p> <p>? Site mapping and water and sediment quality monitoring program established along the Mataniko River and at the adjacent coastal sites.</p>

The ongoing ADB/EU funded ?Solomon Islands: Urban Water Supply and Sanitation Sector Project? is aiming to 1) improve urban water supply in Honiara through improved water supply infrastructure (trunk mains, reservoirs) and expanded surface water intake, 2) improve urban sanitation services, 3) enhance community awareness on water conservation, and 4) enhance the sustainability of Solomons Water through financial management policies, capacity building, and asset management. In 2021, the GEF-funded ?Strengthening Resilience of Water Supply in Honiara? project was approved to finance additional activities as part of the former ADB project. This GEF investment will focus on: 1) developing watershed maps and hydrological models to enhance the understanding of the biophysical environment of targeted watersheds, 2) building effective watershed-protection partnerships with communities to develop diversified and climate-resilient non-timber-based livelihoods, and 3) improving watershed governance by supporting improved interagency, intersectoral and community-inclusive communication, joint decision-making, and information-sharing. None of these projects is explicitly assessing the groundwater component or aiming at enhancing the understanding of the Honiara aquifer. The aquifer is only understood on a rudimentary level, however, population growth and unregulated access to groundwater continues to create competition for this resource. There is need

to assist with monitoring and management of the Honiara aquifer to better manage the growing issues into the future.

## Vanuatu

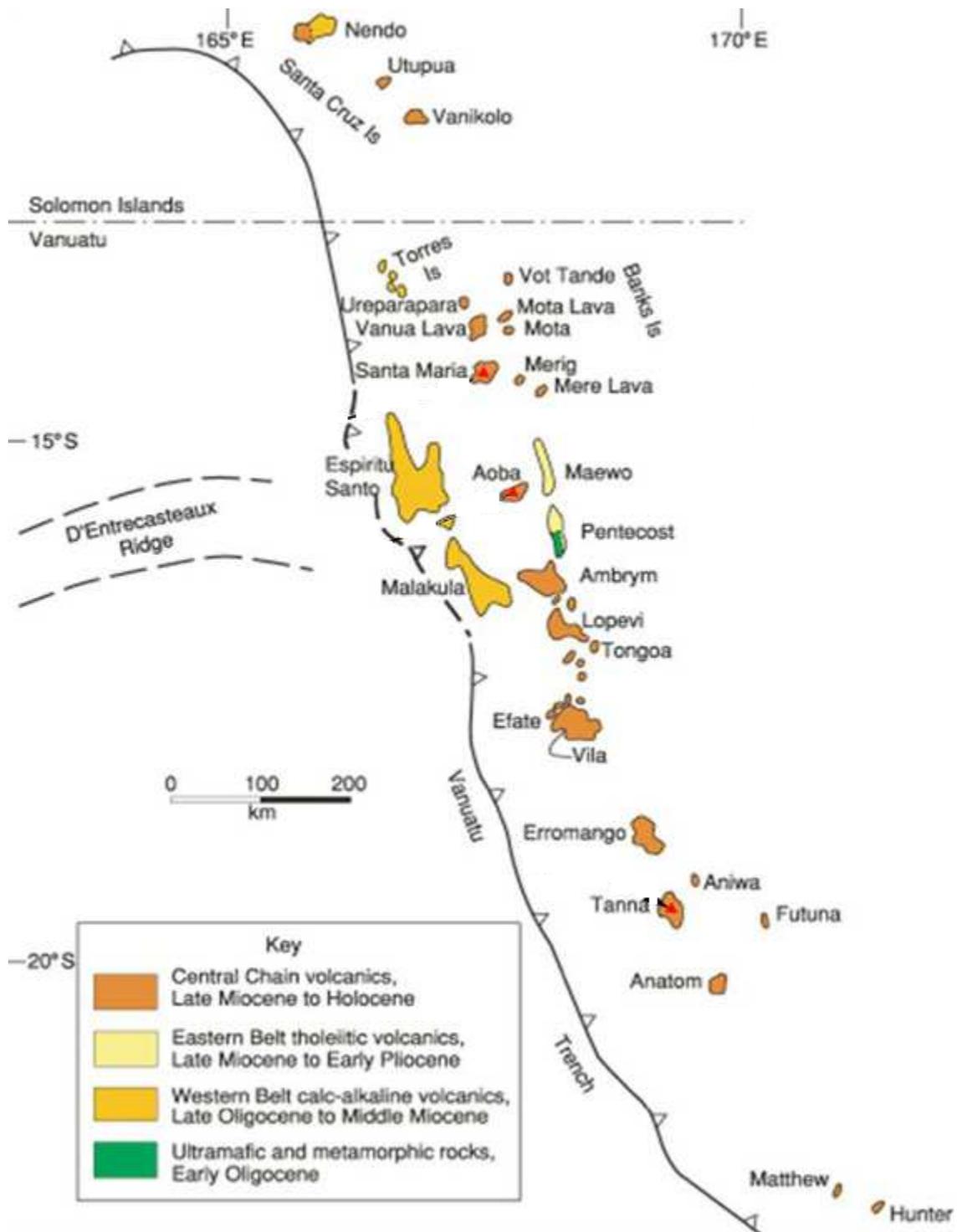
The archipelago of Vanuatu has about 74 populated islands. The country has total area of 12,190 km<sup>2</sup>. Only 12 islands are considered significant in terms of their economy and population. The largest are Santo in Sanma province (4010 km<sup>2</sup>), Malekula in Malampa province (2069 km<sup>2</sup>), Efate in Shefa province (980 km<sup>2</sup>), and Erromango in Tafea province (975 km<sup>2</sup>). The capital city is Port Vila and is located on Efate Island. Main islands are either mountainous or steeply undulating, covered by tropical forest. The highest peak in the country, located on Santo Island, is Mount Tabwemasana at 1879 m. The climate is tropical, with about nine months of warm to hot rainy weather and the possibility of cyclones and three to four months of cooler, drier weather characterised by winds from the southeast. The distribution of water in the country varies with the topography of the island. The high raised volcanic islands have rivers and streams and groundwater. Despite the high precipitation in the country, most of its territory does not have perennial streams, because of the islands size and rugged topography. River courses are short and the flows are short lived especially in dry periods. The only exception is on the main islands namely Efate, Malekula, Espiritu Santo and Pentecost. Vanuatu is ranked as the most vulnerable country globally to natural disasters, including droughts, floods, cyclones, earthquakes and volcanic activity, all which can impact on water and food security.



**Figure 15.** Mean air temperature (red dots and line) and total rainfall (bars) at Bauerfield Airport (Port Vila). Light blue, dark blue and grey bars denote El Niño, La Niña and neutral years respectively (AUSTRALIAN BUREAU OF METEOROLOGY AND CSIRO, 2014).

Rainfall in Vanuatu is seasonal although the intensity of seasons changes from northern to southern Provinces. The relative intensity of seasonality increases with increasing southerly latitudes with the central and southern stations of Bauerfield, Port Vila, Whitegrass and Aneityum having similar relative seasonal variation over the year which is significantly higher than Port Patterson?Sola. Despite these spatial variations, in general, there is a wetter period from about November to April across Vanuatu and a drier period from about May to October. According to the Pacific-Australia Climate Change Science and Adaptation Planning Program (2014), maximum and minimum air temperatures increased at Bauerfield Airport (Port Vila) from 1948?2011, consistent with global warming. For the period to 2100, the latest global climate model (GCM) projections and climate science findings indicate that El Ni?o and La Ni?a events will continue to occur in the future (very high confidence), but it is unclear whether these events will change in intensity or frequency. Annual mean temperatures and extremely high daily temperatures will continue to rise (very high confidence) as will the number of extreme rain events (high confidence). Projections also indicate with very high confidence that sea level will continue to rise.

Volcanic geology: According to Coleman (1965), the Vanuatu group of islands is composed of three areas of distinctive geology, the Western Belt, the Central volcanic chain, and the Eastern Ridge (Fig. 9). The Central chain consists of the Santa Cruz (Solomon Islands) and Banks groups in the north, Ambae, Ambrym and the Shepherd group in the center, and Efate, Erromango, Tanna, and Aneityum in the south. The larger islands belonging to this group are composed of volcanic effusives and reef sediments whereas the smaller islands are usually single volcanoes and consist entirely of subaerial extrusives. In the north, the volcanics are dominantly basaltic whereas in the central and southern part of the chain they are more variable including olivine basalts and basaltic and hypersthene andesites. At least eight volcanoes are active in the central chain which is also characterized by intense fracturing. The Western Belt consists of the Santa Cruz Island (Solomon Islands), the Torres group, Espiritu Santo, and Malekula. Santo, the largest island in the Archipelago is characterized by two distinctive tectonic elements. Western Santo is composed of pre-Miocene andesitic and basaltic lavas, flow breccias, pillow lavas, and occasional pyroclastics. These basal volcanics are overlain by a ~3,000 meter Miocene ? Quaternary sedimentary pile consisting of algal reef limestones, in turn overlain by Miocene wacke-type sediments and Miocene volcanics. Part of western and all of eastern Santo is covered by Plio-Quaternary coral reef limestone. The Eastern Ridge area consists of Maewo and Pentecost Islands, two narrow and elongate islands shaped by faulting and with the majority of their surface covered by Quaternary reef limestone. Basaltic lavas, breccias and pyroclastics of Miocene age are present in the southern half of the islands, suggested to be several hundred meters thick (Coleman, 1965).



**Figure 16.** Distinctive geological areas of Vanuatu (Herrick, 2011)

Although regional hydrogeological assessments have not been undertaken in Vanuatu, groundwater is expected to be present in various settings, typical of volcanic and complex island types. Perched, dyke-impounded groundwater aquifers, localized fracture zones, and freshwater lenses are known to be

present around Vanuatu suggesting a variety of storage and discharge settings. A broader basal aquifer is also expected to be present at depth, recharged by infiltrating rainwater through the deep-reaching vertical faulting of volcanic formations or through the high permeability uplifted limestone deposits present on most islands.

Socio-economic data: 81% of the population live in rural areas and are mainly occupied in subsistence and small holder farming with the remaining 19% of the population living in the two main urban areas of Port Vila on Efate and Luganville on Santo. Land ownership issues and conflict are dominant in the culture and also relate to the ownership of water, creating difficulties in many areas of water management. Difficulties lie in gaining access to water for supply, protecting water resources such as catchments, infrastructure maintenance and negotiating national projects such as hydropower generation. In Vanuatu, both surface water and groundwater are used for domestic purposes. In urban areas the main water source are shallow coastal aquifers whereas in rural areas various sources are used such as dug wells, springs, rivers and rainwater collection with storage in ferro-cement or polyethylene tanks. Urban water supplies are provided by private company UNELCO in Port Vila reaching over 90% of the population and by the Public Works Department in Luganville, Isangel and Lakatoro via a reticulation system servicing about 60% of the entire population. Rural water supplies are operated and managed by the local community. Rural water supply schemes are often characterized by intermittent supply due to droughts or damaged infrastructure, by contaminated water, and by community conflicts caused by competing uses for drinking water. The urban and rural tourism industry is serviced by the same water supplies as domestic users. Tourism is a fast-growing sector, with resort development occurring across Vanuatu, while industry is not significantly developed. Demand for irrigated water is extremely low and limited to a few small horticultural sites.

According to the Census data, 12% of the population relies on groundwater as a main source of drinking water supply, accessed through boreholes, hand-dug wells, and groundwater-dependent springs and streams. A substantial proportion of piped connections (e.g. Port Vila, Luganville) derives from groundwater too but the actual number is hard to quantify. Groundwater accessed directly becomes an important alternative source of drinking water, with 50% of the population relying on boreholes, hand-dug wells, and groundwater-dependent springs and streams. 21% of the population has access to flush toilets and 44% uses pit latrines. 89% of the population is involved in growing vegetables and cash crops and 69% owns livestock with 24% of the population owning cattle. Agriculture and livestock activities are concentrated in the outer islands other than Efate.

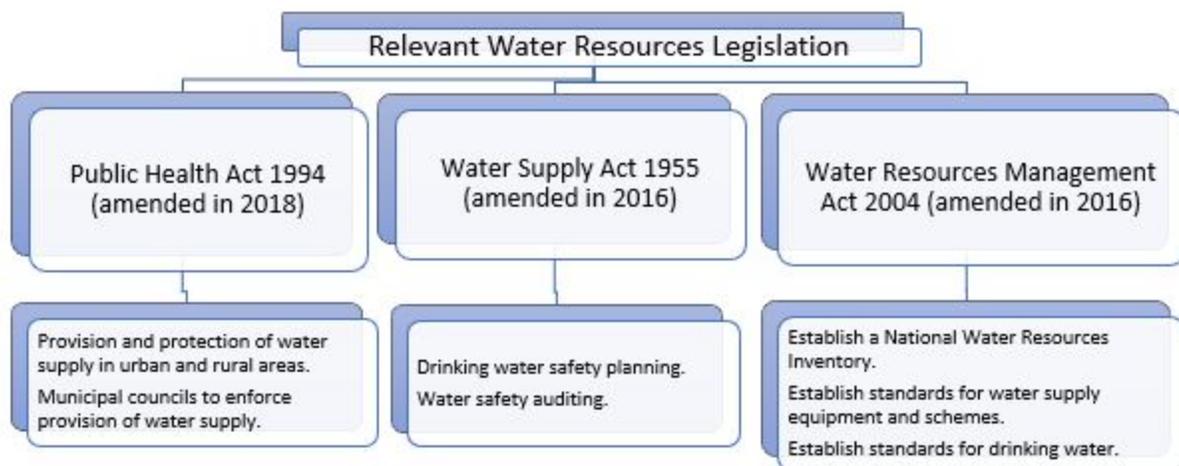
**Table 9.** Vanuatu 2016 Census - WASH data

	Main source of drinking water (%)	Alternative source of drinking water (%)
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<b>Total</b>	<b>55285</b>	<b>13</b>	<b>8</b>	<b>7</b>	<b>5</b>	<b>14</b>	<b>9</b>	<b>31</b>	<b>13</b>	<b>89</b>	<b>24</b>	<b>39</b>	<b>60</b>	<b>4</b>	<b>31</b>
Torba	1960	4	1	3	1	26	14	42	10	99	28	56	81	0	10
Sanma	10704	12	4	8	4	12	8	38	16	91	35	35	66	5	26
Penama	6959	2	1	0	0	20	16	45	16	99	31	65	85	2	6
Malama	8896	2	1	15	5	20	7	38	13	99	39	41	74	2	13
Shefa	19913	29	19	8	9	8	5	14	9	77	8	19	33	3	60
Tafea	6853	2	1	2	1	20	14	46	15	100	30	71	81	13	6

Water regulation and governance: Water supply services in Port Vila and part of surrounding area council regions are supplied by UNELCO, a private operator who operates under the Water Supply Act (1955). In Port Vila, there is a reasonably high service level, reliable water quality and a regulated tariff system that balances sound financial operations and fair pricing. For rural water supply, the lead agency is the Department of Water Resources (DOWR) within the Ministry of Lands and Natural Resources. The Department operates under the Water Resources Management Act 2004 (amended in 2016), the Water Supply Act 1955 (amended in 2016) and the Public Health Act 1994 (amended in 2018) and carries out the 2018-2030 National Water Strategy. The Department has the overall responsibility to ensure the sustainable use of the nation's water resources and is responsible for the monitoring, management and protection of groundwater and surface water resources.



**Figure 17. Water resources legislation relevant to the project, Vanuatu**

Figure 17. Water resources legislation relevant to the project, Vanuatu

Associated baseline projects: Previous GEF IW investments in Vanuatu identified issues related to vulnerabilities, uses, management, and knowledge gaps on water sources. In urban areas, specific issues were related to declining groundwater levels coupled with contamination from septic tank seepage and agricultural waste. The two projects, GEF IWRM and GEF Ridge to Reef, executed by SPC, focused on addressing catchment vulnerabilities through the development of catchment management plans (Sarakata and Tagabe catchment), sectoral engagement, monitoring of river water quality, establishment of conservation areas and water protection zones to maintain river water quality.

**Table 11.** Results of previous GEF IW investments in Vanuatu

Issues identified prior to IWRM project	?	Decline in groundwater levels in areas of high-density use.
	?	Contamination from septic seepage and agricultural wastes.
	?	Natural vulnerabilities.

IWRM project results	<p>? Establishment of the Sarakata Basin Integrated Flood Management Plan (feasibility studies, flood hazard maps), in Espiritu Santo island (Luganville).</p> <p>? Sectoral engagement: Directors meeting with all Directors of Departments involved in the project ? MoA signed between the IWRM Project Focal Point and each Director, outlining the responsibilities of each partner inside the project. PMU participated in quarterly meeting of the National Water Resource Advisory Committee and gained support from other Departments not represented on the IWRM steering committee.</p> <p>? Increase in population with access to safe water supply: routine monitoring of river water quality was strengthened, increased outreach to areas that were more reliant on rainwater, establishment of rainwater catchment systems, increased community awareness around the links between unsuitable sanitation systems and groundwater contamination.</p> <p>? Established conservation areas on the upland catchment to minimize the effect of logging on the Sarakata River and maintain water quality (with Dept of Environment and Dept of Survey).</p>
Issues identified prior to R2R Program	<p>? Strengthening coordination in support of the development and implementation of the Tagabe catchment R2R Management Plan.</p> <p>? Strengthening the capacity for participatory monitoring and evaluation of the Tagabe catchment R2R Management Plan.</p> <p>? Establishing partnerships for sustainable coastal area development.</p>
R2R Program results	<p>? Tagabe river (Efate island, Port Vila) catchment management plan 2017-2030.</p> <p>? Management plan officially launched by Minister of Lands, Natural Resources, and Water on World Water Day 2018.</p> <p>? Declaration of water protection zones within Tagabe catchment under Water Resource Management Act by Minister of Lands.</p>

GEF IW investments in Vanuatu have been concentrated on the two most critical basins supplying water to the main urban centers of Luganville and Port Vila, to protect the quality and quantity of the catchments waters as the only current water source for both urban centers and the nearby settlements, and to create a sustainable multi-purpose land use management water catchment model to be replicated in other watersheds in Vanuatu. The groundwater resources of these basins, as well as of the whole islands of Efate and Espiritu Santo, have not however been fully assessed, likewise the broader aspects of the governance, environmental and strategic uses of groundwater.

More recently (2017), a hydrogeological assessment of West Ambae island and North and Central Tanna was undertaken by SPC as part the ?Recovery Support for Tropical Cyclone Pam?, funded by the German banking group KfW, to support the recovery needs of Vanuatu after the damage caused by category 5 TC Pam in 2015. Drilling operations undertaken in West Ambae, following the investigation, were unsuccessful due to many reasons, including site accessibility, lack of drilling capacity by the Government drilling team, and the low number of potential drilling targets identified

during the survey. Drilling operations in Central Tanna, conducted in 2019, were more successful and led to the development of 5 community water supply boreholes.

Water supply recovery and improvements after Tropical Cyclone Pam and in preparation for El Niño seasons has led Vanuatu Government adopting Drinking Water Safety and Security Planning (DWSSP), an internationally recognized approach for achieving safe drinking water for all. The approach is aiming to achieve 100% of community water supply systems (over 2000 systems) with a DWSSP by 2030. Recognizing that there is not the capacity (workforce or funds) to support every community at the same time, a National Implementation Plan for Safe and Secure Community Drinking Water (the National DWSSP) was developed to provide a service delivery approach that focusses coordinated support where it is most needed, targeting the most at-risk or vulnerable communities.

Other relevant projects which are currently underway or in the process of being designed include 1) the ADB-funded 'Luganville Urban Water Supply and Sanitation' which is aiming to improve access to integrated and resilient urban water supply and sanitation services in greater Luganville, Vanuatu, 2) The GCF-funded 'Climate Information Services for Resilient Development in Vanuatu' project, currently being implemented in Santo, and 3) the GCF-funded 'Enhancing Adaptation and Community Resilience by Improving Water Security in Vanuatu' executed by UNICEF and SPC, which will be focusing on drinking water safety and security planning aspects.

### **3) Proposed alternative scenario with a brief description of expected outcomes and components of the project and the project's Theory of Change**

The development challenge that this project seeks to address is the lack of knowledge and information on the status and potential of major aquifers in volcanic island countries of the Pacific, which hinders the sustainable development, management, and governance of these aquifers and their incorporation into applicable national water policies. As a result, the majority of volcanic aquifers in the Pacific remain largely unknown and therefore under-developed. This has resulted in the over reliance and in some cases overexploitation of a few specific aquifers, especially coastal ones and aquifers underlying urban centers, to cover ever-increasing water demands (e.g. Honiara, Solomon Islands). It has also resulted in uncertainties regarding the sustainability of industrial and commercial groundwater uses (e.g. Nadi basin and Yaqara aquifer, Fiji), and in competing groundwater uses (e.g. Sarakata, Vanuatu). Increasing urbanization is also putting a lot of pressure to underlying aquifers in terms of pollution control. This project aims at expanding the available groundwater reserves by proving and promoting the exploitability of volcanic aquifers, and at providing the foundation required to support improved aquifer management/governance and decision-making processes in the project countries.

<p><b>In Honiara</b>, increasing water demands due to increasing population has resulted in an alarming increase in groundwater bore development and groundwater extraction, both legal and illegal. The</p>
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absence of groundwater allocations and aquifer management in general has resulted in declining groundwater levels promoting concerns over saltwater intrusion and contamination of bores along the coastal areas.

**In Sarakata**, Vanuatu, a number of users including the farming/livestock sector, hydro-power, communities, and the environment are competing for groundwater. The knowledge around the availability, yield, quality and sustainability of groundwater present in the Sarakata aquifer is limited, posing challenges around the sustainable management of groundwater.

**The Nadi basin and Yaqara aquifer** are both located on Viti Levu in Fiji. Bottling water industries operating in these two areas abstract substantial volumes of groundwater, an important resource upon which communities and the environment rely.

Immediate causes responsible for this development challenge include the nature of volcanic aquifers and of groundwater in general being 'invisible' and therefore hard to visualize, monitor, and manage. In many cases, aquifers are only accessed for industrial purposes (e.g. agriculture, bottled water industry, fish processing industry) through private boreholes and as a result the behavior of these aquifers to external influences (incl. climate change) is largely unknown. The development of 'new' aquifers remains limited due to limited data and understanding on aquifer characteristics and on groundwater processes such as aquifer recharge, discharge, and changes in storage. The effect of climate variability on groundwater in the Pacific also remains largely unknown. Groundwater demand patterns may also be affected by climate variability, spatially and temporally, for example due to population migration from coastal areas towards island interiors or due to changes in rainfall frequency and intensity and aquifer recharge processes. These knowledge gaps also impede the development of targeted management interventions for the few high-value aquifers (coastal and urban) which are developed more intensively. Indications, usually incomplete, of groundwater contamination due to substandard drilling techniques for example allowing the ingress of pollutants have in various instances led to the conclusion that aquifers are unsuitable for use and their management and protection are therefore irrelevant. This in turn has resulted to a biased public perception against groundwater. In other cases, there is the perception that the use of surface water sources should be prioritized as the use of precious groundwater resources should be reserved for future generations. In many instances, this perception is based on the false understanding that groundwater resources in volcanic aquifers are non-renewable.

**Table 12.** Barriers and gaps identified by project countries during national design workshops

Knowledge/ understanding	Governance	Water/food security	Institutional capacity
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<p>Limited knowledge/data on the availability, yield, quality, and sustainability of volcanic aquifers and their groundwater resources which limits their development.</p> <p>Limited knowledge on the effects of climate variability on aquifer recharge, changes in storage, and groundwater demand.</p>	<p>Lack of regulatory framework to administer and regulate the development, management, and protection of groundwater resource.</p> <p>Limited water resources monitoring infrastructure limiting aquifer understanding and management.</p> <p>Lack of facilitated data sharing (abstraction records, groundwater quality) to strengthen groundwater resources management.</p> <p>Lack of groundwater allocation frameworks as a means of determining the volumes and conditions under which groundwater can be extracted from aquifers.</p> <p>Lack of aquifer management planning and coordinated and consultative approach from all stakeholders.</p>	<p>Inefficient land management practices leading to land degradation.</p> <p>Unreliable water supply in urban centers.</p> <p>Limited access to alternative water resources is a barrier to social and economic development.</p> <p>Low level of engagement by women as primary water users and decision-makers at household level</p> <p>Lack of suitably resourced and skilled drillers capable of accessing groundwater resources.</p> <p>Need for development of standards in the drilling industry to guide the quality of the service and the longevity of the infrastructure</p>	<p>Limited capacity of Government staff to implement and enforce drillers licensing and permits, in aquifer management, in community engagement, and in data management techniques.</p> <p>Limited capacity of Government and private industry in drilling techniques.</p>
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		that is provided to the communities and households.	
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The root causes and barriers need to be identified to address the development challenge and design appropriate activities and interventions. The obvious barrier limiting the generation of knowledge and data on aquifers and groundwater is the limited capacity and resources at local and national level to assess and monitor volcanic aquifers and their groundwater resources. The absence of dedicated monitoring infrastructure and human capacity impedes the generation of data that is required to support aquifer development and management. The lack of data is also caused by the limited appreciation on the value of monitoring and the benefits of long-term data curation in decision making. As a result of this data and knowledge gap, there is also a lack, or in the best cases the presence of weak decision-making tools and suitable governance mechanisms at local and national level that could support incorporation of groundwater into applicable national water policies and legislations. Further, the low level of engagement by women as primary water users and decision-makers at household level is a key barrier to change.

As shown in the description of the baseline situation, substantial progress has been achieved, thanks also to the GEF IW investments in the past decade, in the rationalization of water management policies and practices in the project island states. Three major achievements are highlighted:

1. The adoption of the "river basin" as the coherent hydrological entity for surface water resources management,
2. The recognition of the need for a multi-sectoral, integrated approach to water management within the "source to sea" environmental continuum embracing mountain ranges, alluvial plains, coastal areas and the continental shelf,
3. The realization of the existing and potential conflicts at the water nexus among competitive water uses and users.

Within this context however, and in spite of their critical and growing role in providing freshwater for domestic and agricultural uses and mitigating the impacts of climate change, only limited attention has been so far paid to groundwater resources, in terms of modern assessments of economically exploitable reserves, and of the management requirements for their sustainable use. With a long-term view to ensuring water and food security, it is an objective of the present project to fill this gap, building on the aforementioned achievements and moving the main emphasis away from the highly vulnerable and often over-exploited coastal aquifers to the aquifers present at various depths in the volcanic edifices that constitute the bulk of the geological structure of the major islands in the three countries (Component 1). At the same time, to address existing issues related to high value aquifers of national importance which will likely exacerbate in the future, the project will conduct diagnostic studies of the current conditions of these aquifers aiming at developing new groundwater legislations/policies and

aquifer management plans to improve groundwater management and ensure the longer term integrity of high value aquifers (Component 2).

To achieve these broad objectives, the project will adopt a three-pronged approach:

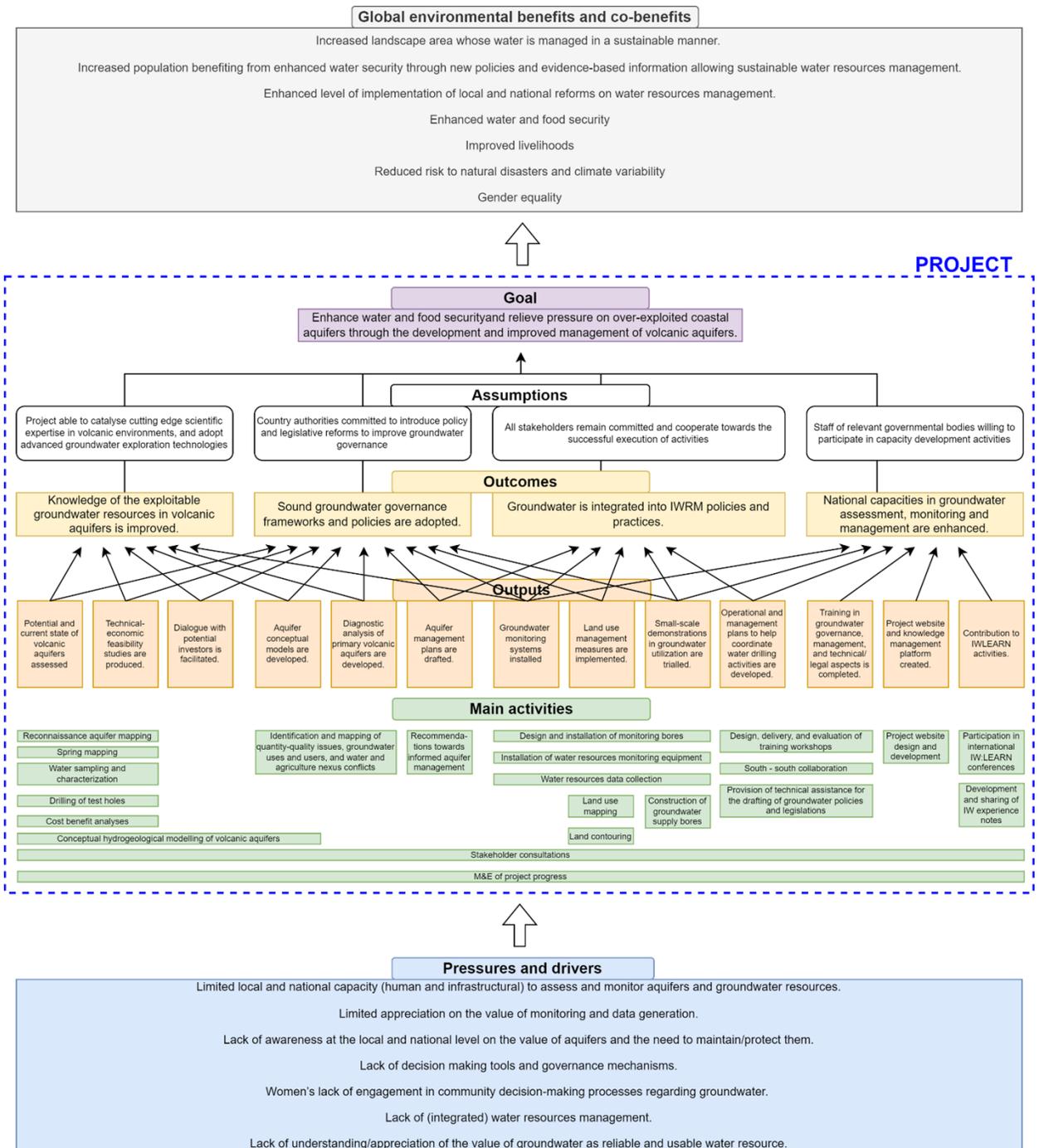
1. Produce an overall assessment of the aquifers present in the major volcanic islands of the three countries, identifying those that are technically and economically exploitable.
2. Promote the adoption ? within the context of IWRM and of soil conservation policies, and in coordination with existing ?Catchment Management Plans? - of sound groundwater governance frameworks (developed by the GEF-FAO Global Groundwater Governance project), structured around ?aquifers? as groundwater management hydrogeological units.
3. Implement ?on the ground? actions to address groundwater related issues identified by the countries as requiring urgent attention, introducing innovative practices and solutions while considering the Water-Energy-Food Nexus principles to ensure a more integrated and sustainable use of natural resources that can be applied and replicated at all scales.

Alongside these three mutually reinforcing lines of action, the project will contribute to institutional strengthening in the three countries, and to the dissemination of the results achieved and of the experiences gained within the Pacific region and beyond.

### **Theory of Change**

The Theory of Change was developed in close consultation with the three implementing countries during national design workshops and bilateral meetings with the relevant stakeholders. Feedback from the countries helped refine the project activities and outputs to ensure that they are aligned with the selected outcomes but also that they are aligned to their countries needs and national priorities. In developing the Theory of Change, there was consideration of synergies with other relevant projects within SPC and the region to minimize duplication and maximize complementarity.

The project goal is to enhance water and food security and climate resilience, sustain ecosystem services, and relieve pressure on over-exploited coastal aquifers by expanding and assessing the role of volcanic aquifers and by introducing sound groundwater governance frameworks in selected volcanic island states of the Pacific. A range of cross-cutting considerations including gender equality and social inclusion, and participatory planning and decision-making mechanisms will inform how this goal is achieved. The Theory of Change diagram describes the activities under each component that will be implemented in the 3 countries. In the short-term, Project Outputs are shown as early project results forming the pathways of change towards achievement of the Project Outcomes. The Theory of Change articulates 4 Project Outcomes that show change in knowledge (Outcome 1.1), change in governance (Outcome 2.1), change in the level of groundwater integration into IWRM practices (Outcome 3.1), and change in institutional capacity (Outcome 4.1). While the Theory of Change illustrates the broader change process it is noted that a phased approach will be used during project implementation to inform further actions.



**Figure 18.** Theory of Change diagram

As depicted in the Theory of Change diagram, under the current project, the countries recognize the need to further explore the potential of groundwater resources held within volcanic aquifers, for future industrial (farming, mining, water bottling) and public investments (water supply) (Outcome 1.1).

Technical activities such as drilling of test holes, spring surveys and sampling, groundwater characterization, etc. will produce the knowledge required to assess the potential and the current state of volcanic aquifers (Output 1.1.1) and to allow assessing the technical and economic feasibility of developing newly identified volcanic aquifers (Output 1.1.2). Presenting the results of these studies to potential investors is expected to draw some interest in developing these newly assessed aquifers with various socio-economic benefits for the project countries (e.g. alleviation of over-exploited coastal aquifers, employment generation, income generation through tax, water security, introduction of new farming practices, etc.).

The countries also recognize the need for improved national policies and legislations which directly address groundwater to ensure its sustainable development and protection (Outcome 2.1). Providing specialist technical assistance to the project countries to support currently ongoing efforts in reviewing existing legislations and developing new policies (Output 2.1.1) is expected to fast track these national processes which are often delayed due to lack of capacity and resources. The identification and mapping of groundwater quantity/quality issues, groundwater users, and water/agriculture nexus conflicts in the areas overlying high-value aquifers will contribute to the development of diagnostic analysis and conceptual models of these important aquifers identified by the countries (Output 2.1.2). All this information collected for the specific aquifers will contribute to providing recommendations to country governments, public/private stakeholders operating in the area, and communities, with regards to informed aquifer management. These recommendations will be provided in the form of aquifer management plans (Output 2.1.3).

The drafting of aquifer management plans, along with a series of on-the-ground demonstration activities, will also contribute to the integration of groundwater into IWRM policies and practices (Outcome 3.1). The Theory of Change indicates that a series of technical activities such as the installation of monitoring networks for the collection of data on water resources (Output 3.1.1), the implementation of land management measures such as land contouring and land use mapping (Output 3.1.2), and the construction of groundwater supply bores to demonstrate groundwater utilization for water/food security (Output 3.1.3) will all contribute to the realization of Outcome 3.1 and will also support achievement of other project Outcomes, as depicted in the TOC diagram.

The countries finally recognize the need for capacity building of Governmental and private industry staff in various disciplines related to groundwater assessment, monitoring, management and protection (Outcome 4.1). Project interventions including the design and delivery of training workshops on groundwater assessment, monitoring, and protection, the development and implementation of a knowledge management and communications strategy, and the participation of project and country staff in IW:LEARN activities will help achieve Outcome 4.1 and contribute to the desired project goal.

In summary, the countries have decided to achieve the project goal by following these four main logical pathways described above towards enhanced water and food security. In the section below, the strategy above is translated in detail into the work that will be done through the project. A description is given of the project components and expected outcomes and outputs and justification is given as to why the proposed activities were selected. The assumptions to achieving each individual Output are also presented.

## **COMPONENT 1: Expanding and assessing the role of groundwater resources.**

**Outcome 1.1:** The knowledge of the exploitable groundwater resources is improved in the three project islands states.

The first project outcome is aiming at improving the knowledge of the major aquifer systems and of their exploitable groundwater resources. When available, knowledge around groundwater and aquifers is mainly focused around coastal areas where population is mainly concentrated and where drilling and groundwater development is generally easier. This project outcome is proposing to strengthen this knowledge at island-wide level, to identify important aquifer units present including in the island interior. This achievement could represent a turning point in the progress towards improved water security and sustainability in volcanic island countries. In fact, there is a likely outcome that the results of the assessments conducted under this Component will promote and enable the strategic utilization of economically important groundwater sources present in the complex volcanic island settings in the project countries. Project Component 1 will help address the understanding of groundwater potential at the island scale for development planning purposes and identify potential environmental concerns including the presence and the socio-economic importance of springs, for improved decision making and identifying management deficiencies identified in the Strategic Action Programme (SAP) of the Pacific Small Island Developing States and further highlighted during the SAP Implementation Project and the GEF Pacific IWRM Project through the various national demonstration projects. The three project Outputs constitute a sequential process during which the results from Output 1.1.1 will inform the direction (aquifer selection) under Output 1.1.2 and consecutively the audience and presentations conducted under Output 1.1.3. Outcome 1.1 will be focused on one major island in each project country, as identified by the project countries during the national design workshops.

The island/site selection process followed an objective prioritization process presented during the national design workshops to derive a list of islands/sites with the highest need for the proposed project interventions. The following objective criteria were considered to shortlist a number of islands/sites in each country:

- Total beneficiaries: the total population of an island benefitting indirectly from the project interventions as well as the direct project beneficiaries.
- Baseline information: the availability of baseline data and information such as geological maps, the presence of boreholes, the existence of drilling logs and groundwater quantity/quality data.
- Existing groundwater-related issues: the presence of natural and anthropogenic threats to groundwater, groundwater reliance and management issues, etc.
- Existing and potential beneficial uses applicable to groundwater (domestic water supply, industrial water supply, agricultural water supply, groundwater recharge).
- The current vulnerability to droughts reflected by the proportion of the population relying on rainwater.
- The timing and location of other relevant activities taking place in the countries.
- The alignment with national strategic priorities.

The process then allowed for all participants to vote for the top priority site/island among the shortlisted ones considering more subjective criteria which may be site-specific and which the prioritization process may have missed. The proposed activities were also assessed in relation to the available budget for each of the three countries. A final selection of prioritized sites was then made.

In Fiji, the island of Viti Levu was prioritized under Component 1 due to the large population present and potentially benefiting from the project outcomes under this component. The presence of baseline information in the form of geology maps, borehole information, and groundwater quantity/quality data will substantially aid with the proposed macro-scale aquifer assessments and feasibility studies while the increasing interest on groundwater resources from potential investors makes it as relevant as ever to improve the understanding of aquifer systems on Viti Levu to ensure their sustainable exploitation, management, and protection.

In the Solomon Islands, the island of Guadalcanal was prioritized due to the large population present and the major groundwater-related issues faced particularly around the capital of Honiara. It is expected that identifying and assessing new groundwater resources present on the island has the potential to address in the long term the increasing demand for domestic water supply in Honiara which is already hard to match. The presence of substantial baseline information and the alignment with other relevant activities (GEF7 project) initiating in the short term can additionally support the activities proposed under project component 1 if these are conducted on Guadalcanal.

In Vanuatu, priority was given to the island of Espiritu Santo due to the presence of the second largest urban center in the country (Luganville) which is currently facing water supply issues, the higher vulnerability to droughts compared to Efate, and the high potential for groundwater use in the agricultural sector.

**Table 13.** Site (island) selection - Project Component 1

<b>Major islands selected under Component 1</b>			
	<b>Fiji</b>	<b>Vanuatu</b>	<b>Solomon Islands</b>
Shortlisted islands	Viti Levu Vanua Levu Taveuni	Efate Espiritu Santo Malekula Ambae	Guadalcanal Choiseul Isabel Western Malaita
Final selection	<b>Viti Levu</b>	<b>Espiritu Santo</b>	<b>Guadalcanal</b>

The obvious barrier in achieving this project outcome is the lack of national technical capacities (human and infrastructure) in advanced groundwater exploration and monitoring and the lack of access

to advanced technologies to facilitate this task. In achieving this outcome, it is assumed that the project will be able to catalyse cutting edge scientific expertise in volcanic environments, and to adopt advanced groundwater exploration technologies. Opportunities will be explored to collaborate with top research institutes and consultancies active in the region which could bring in the expertise required to realize the proposed outcomes. Knowledge created will be capitalised in Component 4 to increase national capacities in groundwater assessment, monitoring and management (Outcome 4.1).

*Output 1.1.1: An assessment of the potential and current state of the groundwater resources in the three project islands is produced.*

It is proposed that macro-scale, island-wide groundwater potentiality mapping is conducted covering one major volcanic island in each country. This will be conducted through multi-disciplinary field reconnaissance surveys (volcanological, hydrogeological, hydrogeochemical) coupled with and supported by remotely sensed information. Building on existing geological knowledge, satellite imagery (e.g. LANDSAT, SPOT, RADARSAT, LIDAR, ASTER) processing and interpretation will be used to map lithological boundaries, structures, fracture densities, humid zones, and other geological and morphological features of interest. National capacities on water resources assessment will be developed through the participation of country counterparts and other key staff from relevant government Departments in relevant surveys and investigations (e.g., geophysical surveys, spring surveys and sampling, etc.). It is expected that the proposed assessments will generate a wealth of new knowledge and help identifying areas with as yet untapped groundwater resources. This information will drastically improve the overall ability of countries to understand, protect and strategically develop and manage their groundwater resources (Outcomes 1.1 and 2.1), particularly in cases of extreme climatic conditions (Climate Risk Assessment, Annex I3). In achieving this Output it is assumed that the project countries will share all existing baseline information with the project team.

*Output 1.1.2: Technical-economic feasibility studies of the exploitation of volcanic aquifers and of their strategic uses are produced.*

The reconnaissance ?aquifer mapping? effort conducted under Output 1.1.1 will be followed by investigation into the technical and economic feasibility of the exploitation of the groundwater resources present within the identified volcanic aquifer units, further contributing to Outcomes 1.1 and 2.1. The feasibility studies will consider the costs of surface and sub surface investigations, accessibility, logistics, drilling techniques, including directional drilling, etc. The information will be packaged and delivered to Governments for use with potential investors and for replication in other areas. This information will allow Governments to make informed decisions with regards to groundwater allocations to ensure groundwater withdrawals are maintained within sustainable limits while at the same time benefitting from suitable taxation schemes. The feasibility studies may be supported by the drilling of investigation holes, serving to verify the interpreted hydrogeology and groundwater conditions. These test bores will be strategically located and, if appropriate, constructed as monitoring bores for inclusion into the existing national monitoring network operated by Government. The actual drilling activity forms part of project Component 3. In achieving this Output it is assumed that the assessment conducted under Output 1.1.1 identifies a number of high prospect aquifer systems for the feasibility studies to be conducted.

Output 1.1.3: The dialogue with potential public and private investors is facilitated by presenting Outputs 1.1.1 and 1.1.2 to Governments.

Finally, the project will facilitate the dialogue between governments and public and private investors (e.g. BOT schemes) on the exploitation of the most attractive 'prospects' emerging from the feasibility studies produced under Output 1.1.2. An example of this may include the identification of development opportunities of groundwater resources for commercial ventures; including improved livestock farming, aquaculture, high value crop irrigation, and high value mineral water bottling. State owned water authorities (such as Water Authority of Fiji and Solomon Water) could benefit from the knowledge provided through these feasibility studies and direct their interventions more effectively. These investors may for example finance the establishment of groundwater development infrastructure, for commercial or public water supply, with potentially socio-economic benefits (employment, income generation through tax, water security, introduction of farming practices, etc.). Engagement with potential public and private investors is expected to solidify the efforts made on improving the knowledge of the exploitable groundwater resources in volcanic aquifer settings (Outcome 1.1) and on adopting sound groundwater governance frameworks and policies (Outcome 2.1). In achieving this Output it is assumed that the assessments and feasibility studies identify the presence of high prospect exploitable aquifers and that the project countries are willing to engage in these dialogues.

## **COMPONENT 2: Introducing sound groundwater governance frameworks**

**Outcome 2.1:** Sound groundwater governance frameworks and policies are adopted.

Any plan to manage groundwater must address aquifer systems as whole entities. To achieve this, management approaches should address both the aquifer and the groundwater resources present within: in other words, both the container (the aquifer and its connected landscape) and its content (the availability, quality and use of groundwater). It is important that aquifer systems be preserved in good condition, so that recharge is optimized, storage is maximized and quality is not jeopardized. At the same time, groundwater resources should be managed to avoid serious long-term depletion and to minimize the risk of serious pollution.

While Component 1 is focused on identifying new groundwater resources for future development, Component 2 will focus on existing highly developed aquifers with multiple groundwater users and will aim to identify and address the existing issues. A drastic improvement of groundwater management policies and practices will be required in all three countries if progress towards water and food security as well as climate resilience is to be achieved. At the same time, groundwater governance frameworks need to be developed and brought forward for consideration by Governments at the respective project countries. In response to this critical need, Component 2 will aim to support ongoing national efforts to review and update existing legislations and to develop new groundwater policies. This will in turn facilitate, as part of IWRM policies and in coordination with existing 'Catchment Management Plans', the development and adoption of 'Aquifer Management Plans', following the recommendations and methodologies of the 'Groundwater Governance Project' (GEF/FAO/World

Bank/UNESCO IHP), further supporting the implementation of key priority areas of the Strategic Action Programme (SAP) of the Pacific Small Islands Developing States, including the sustainable exploitation of freshwater resources and the maintenance of critical habitats, such as dry weather stream flows. To achieve that and in line with the GEF approach, a diagnostic analysis of primary aquifers of national importance will be required through which the water-related environmental issues and problems are identified and quantified, their causes analyzed and their impacts, both environmental and economic, assessed.

In Vanuatu, both the Tagabe and Sarakata catchments (and associated aquifers) were initially shortlisted as primary aquifers to be addressed under this project component due to the high population residing in these two areas (particularly around the Port Vila and Luganville urban areas), the high reliance on the two catchments for various needs including water supply, the increasing number of competing groundwater users and the potential to build on work conducted during previous GEF investments. The alignment with an existing ADB-funded project aiming at improving the Luganville water supply and the fact that the Tagabe catchment continues to receive major attention by donors, resulted in selecting the Sarakata catchment as the priority aquifer for this work.

In the Solomon Islands, the Honiara aquifer and the Guadalcanal plains aquifer, both located on Guadalcanal island, were shortlisted as aquifers with a high need for improved understanding and management, due to their strategic location and potential to provide water for Honiara and the high population residing and relying upon those aquifers. Ultimately, the Honiara aquifer was prioritized due to the alarmingly increasing need for groundwater management, the multiple natural and anthropogenic threats to the aquifer and the alignment with Government's and Solomon Water's strategic priorities.

In Fiji, a number of catchments were initially shortlisted after the first selection round. For the Nadi basin, comprehensive baseline data are available from past research (high concentration of boreholes, high meteorological and hydrological data availability) and there is a high rate of economic development increasing the pressures on water demand (including existing water bottling companies and domestic users). The Yaqara catchment hosts a major water bottling company and sees an increasing interest from other investors within the water bottling and other industries (agriculture, livestock, tourism) which will increase the need for aquifer management. The catchment itself while large in area has a narrow discharge point and is located in one extremely dry part of Fiji (Climate Risk Assessment, Annex I3). The Vatukaceveva and Barotu catchments in Ra have the potential for water bottling industry developments and share similar geomorphological characteristics as the Yaqara catchment. Finally, the Nakama catchment in Labasa hosts large farming and residential areas and existing boreholes supplemented by WAF mains which are usually inconsistent.

**Table 14.** Site selection - Project Component 2

<b>Priority aquifers selected for diagnostic analyses and management planning</b>			
	<b>Fiji</b>	<b>Vanuatu</b>	<b>Solomon Islands</b>

Shortlisted aquifers	Nadi basin Yaqara catchment (Tavua) Vatukacevaveva Catchment (Ra) Barotu Catchment (Ra) Nakama Catchment (Labasa)	Tagabe catchment Sarakata catchment	Honiara aquifer Guadalcanal plains aquifer
Final selection	Yaqara aquifer	Sarakata aquifer	Honiara aquifer

The main barriers in achieving this Outcome are the lack of institutional capacity, the lack of decision-making tools and governance mechanisms in the countries, and the lack of awareness at the local and national level on the value of aquifers and the need to maintain/protect them. In achieving this Outcome, it is assumed that the country authorities are committed to introducing policy and legislative reforms to help them improve their governance capacity around groundwater resources.

**Output 2.1.1:** A common issue identified among the three countries was the lack of policy and legislation to adequately address all aspects of groundwater development, management, and protection. Groundwater exploitation activities generally take place (especially in the Solomon Islands and Vanuatu) with no consideration of consequences/impacts or enforcement of management controls. Project Output 2.1.1 will provide the required technical assistance to support the countries progressing their ongoing national efforts in reviewing existing legislations and developing new groundwater policies addressing issues related to groundwater pollution and over-abstraction and establishing, where possible, permit and enforcement systems. Support under this project will be focused on the finalization of the draft ?Groundwater Resources Development and Management Policy? for Fiji and on the finalization of the new national water resources legislation to replace the outdated River waters Act in the Solomon Islands, as indicated in the Table below.

**Table 15. National water resources legislation needs**

Fiji	Vanuatu	Solomon Islands
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Finalization of draft ?Groundwater Resources Development and Management Policy?	Revision of national water resource legislation (Water Resources Management Act)	Finalization of new national water resources legislation to replace the outdated River waters Act
Revision of national water resources legislation (Rivers and Streams Act)	Development of groundwater-specific policy	Development of a groundwater-specific policy
Development of ?Groundwater Management Act?		

**Output 2.1.2** Aquifer conceptual models and diagnostic analyses of the current state of one selected ?primary aquifer? in each of the project countries are developed.

A ?priority aquifer? has been selected by each project country during the national project design phase. These aquifers were selected in areas of high and competing groundwater uses and where countries have indicated the potential of conflicts in the near- or longer-term future. Prior to developing Aquifer Management Plans for these primary aquifers,

conceptual models need to be developed and diagnostic studies of the current conditions and uses of the groundwater resources present within each selected aquifer and in the related catchment areas need to be prepared. The approximation of the aquifer?s three-dimensional geometry, geological characteristics, geographical scale and size of its storage reserve will determine, amongst others, recharge and discharge processes, awareness levels of local stakeholders and how amenable it will be to self-regulation. The diagnostic studies will focus on quantity-quality issues, groundwater uses and users, and water and agriculture nexus conflicts. They are also aimed at enhancing the understanding and recognition of the interdependence between water, energy, food and ecosystems.

Following are the key features of the aquifer system that need to be considered when preparing the diagnostic study:

- the degree of connectivity with surface water, which will indicate whether conjunctive management of surface and groundwater is essential to achieve the productive use and improved conservation of both resources.
- the degree of connectivity between different aquifer layers and between existing boreholes.
- the determination of recharge processes and estimates to provide guidance on the sustainable development of groundwater.
- the identification of potential interference impacts between existing users, including community and town water supplies, agriculture, environment and industry.
- aquifer susceptibility to irreversible degradation and groundwater vulnerability to pollution, which together will determine the urgency for action and the degree and nature of action that will be needed.

- future climatic scenarios to identify potential impacts to aquifer recharge and guide adaptation strategies for water security of communities.
- community focused, culturally inclusive, GESI island-based management plans and communications.

In achieving this Output which contributes to both Outcomes 1.1 and 2.1, it is assumed that collected and available data allows the derivation of aquifer hydrogeology and the development of aquifer conceptual models. It is further assumed that a broad range of stakeholders participate in the development of the diagnostic studies to ensure all the key features of the aquifer systems are taken into account.

**Output 2.1.3:** Aquifer management plans are drafted to complement existing catchment plans where available, and address groundwater issues where they exist.

Integrating the diagnostic results with information on current land use, customary practices, and the distribution of economic activities throughout the aquifer area should result in a set of recommendations towards informed management of groundwater resources. A land use capability map or matrix relating groundwater vulnerability to pollution and the existing and planned land uses, will also be produced for the aquifer/catchment area. A consultative, participatory process will be required to reach consensus on which aquifer services should be prioritized. The priority services could include water supply security for domestic, agricultural or other purposes, guaranteed access for private users, sustaining dependent ecosystems and dry weather river flows. The consultative participatory process will facilitate dialogues between stakeholders and the public entity mandated to manage groundwater. Governance structures developed and trialed during the national demonstration projects of the GEF IWRM will be adopted and expanded/improved to account for the linkages with groundwater. During the consultations, particular attention will be devoted to informing stakeholders about the current state of the groundwater resources including quality concerns and any related trends; the potential consequences and costs of 'no management action'; and the options regarding management measures. Consultations will follow a GESI sensitive and participatory approach to engage with representatives of all beneficiary groups. This will ensure that aquifer management plans will also consider the needs of women and of marginalized groups.

The drafting of Aquifer Management Plans, as a complement of the broader Catchment Plans developed during the IWRM project, will consist of the following elements:

- A technically and economically sound array of demand-side and supply-side management measures to achieve re-balancing of groundwater withdrawals with average recharge, such that the risk of irreversible damage to aquifers such as salinization - and ecosystems is avoided. Such measures would include the development of groundwater allocation systems as part of the licensing process for groundwater extraction, enhancing the long-term sustainability of aquifers and the security of future investors (e.g. water bottling companies);
- Prioritization of water uses on the basis of social, economic, and environmental priorities;

- Identification of stakeholder roles and institutions and specification of how those roles will be factored in to planning and management, and how stakeholder institutions and gender equality will be supported;
- Planning for conjunctive surface and groundwater management measures and nature-based solutions (e.g.: Managed Aquifer Recharge);
- Pollution abatement or control measures in the aquifer recharge zone (erosion, deforestation) such that the risk of groundwater quality and quantity deterioration is managed;
- Regulatory measures, economic incentives and policy changes to address groundwater management needs, balancing between top-down administration and bottom-up stakeholder engagement participation;
- Working on the essential linkages to other sectors, be they land use planning, agriculture, energy provision, trade or other policies.

In achieving this Output which contributes to Outcome 2.1 and 3.1, it is assumed that national and local administrators are committed to the adoption and implementation of the proposed aquifer management plans, including the required policy and legislative reforms identified during the project design phase. These aquifer management plans will also form a necessary step to further developing evidence-based policy (bottom-up approach) and provide the necessary guidance to Governments to derive the required legislation changes.

### **COMPONENT 3: Tackling hot spots**

**Outcome 3.1:** Groundwater is integrated into IWRM policies and practices.

This Component, in addition to addressing and potentially resolving priority issues of concern related to groundwater, including groundwater development infrastructure for agricultural and drinking water purposes, will demonstrate on-the-ground ways to integrate groundwater governance principles and methodologies within the context of IWRM policies and practices, and address the root cause of governance deficiencies and information gaps limiting the sustainable exploitation of groundwater resources or the degradation of groundwater, as identified in the SAP. Over the course of the project design phase, a number of 'hot spots' were identified, where countries are experiencing serious development constraints due to increasing water scarcity (Climate Risk Assessment, Annex I3), increasing water nexus conflicts, or lack of technical experience in groundwater management and extraction. Hot spots were selected within the 'primary aquifer' areas identified by the countries to further support activities associated with the diagnostic studies and the development of aquifer management plans, as well as outside these areas to support specific development needs associated with water and food security. The Component thus consists of targeted on-the-ground interventions necessary to achieve specific Outputs under Components 1 and 2 as well as other specific objectives.

**Table 16.** Site selection - Project Component 3

<b>Hot spots identified for demonstrating small scale groundwater utilization to address water and food security</b>		
<b>Fiji</b>	<b>Vanuatu</b>	<b>Solomon Islands</b>
Yaqara catchment  Nadi basin	East Santo (Natawa, Kole, Bene, Sara, Lathi communities)  West Ambae (Ndui, Walaha communities)	Honiara  Guadalcanal Plains

The main barriers in achieving this project outcome is the lack of understanding/appreciation of the value of groundwater as a reliable and usable water resource, the lack of (integrated) water resources management, and the limited appreciation on the value of monitoring and data generation.

**Output 3.1.1:** Groundwater and water resource monitoring systems to assess the impacts from competing groundwater uses and to improve water resource management are installed in selected developed aquifers.

Water resource monitoring systems will be installed in strategic locations to support progress towards all project Outcomes. Test holes and monitoring bores will support aquifer assessments and groundwater monitoring for improved aquifer management. The design of suitable monitoring bores will be informed by the aquifer conceptual models and diagnostic study conducted under Component 2 and, if required, by targeted geophysical investigations to identify optimal drilling locations. Existing and newly drilled monitoring bores will be equipped with suitable instrumentation to allow for real-time or near time monitoring of important groundwater parameters, including groundwater levels, salinity (Electrical Conductivity), temperature and pH. Groundwater monitoring networks will be coupled with rainfall and stream gauges to allow for a holistic monitoring approach that will provide insights into the surface water - groundwater interaction and the water balance characteristics of the project sites. Groundwater resources monitoring, in conjunction with surface water and rainfall monitoring, is expected to enhance water resources management and support the development of informed Aquifer Management Plans under Component 2.

**Output 3.1.2:** Land use management measures to demonstrate improved environmental and water resources benefits and management in selected hot-spots are integrated into existing practice.

The implementation of land use management measures will strengthen environmental and water resources sustainability and will thus contribute to improved management of groundwater resources. This output will be contributing directly to project Outcomes 2.1 and 3.1. Land use management measures will include land use mapping for the identification of potentially aquifer polluting and land degrading activities, the demarcation of selected sensitive areas for the protection of recharge areas and of stream water quality, and land contouring or other practical measures to reduce land degradation and

soil erosion, and improve overall land management. Land use management interventions will serve to demonstrate the land use management recommendations incorporated in the Aquifer Management Plans, developed under Component 2.

**Output 3.1.3:** Small-scale demonstrations in groundwater utilization to address water and food security are trialed in selected hot-spots.

This Output aims at demonstrating the value of small-scale groundwater development infrastructure to address agricultural and domestic water needs. Groundwater production bores will be installed in optimal locations determined through the diagnostic analysis conducted under Component 2 and through targeted geophysical investigations to provide additional freshwater supplies to communities identified as high-priority. This project Output aims to practically demonstrate the value of tapping into fresh groundwater supplies present in unexplored volcanic aquifers to address water supply issues, enhance agricultural activities, and strengthen water and food security. This Output will contribute to the achievement of project Outcomes 2.1, 3.1, and 4.1.

In achieving these three project outputs it is assumed that land ownership and site accessibility issues are resolved, that the project countries are committed to maintain the installed monitoring and groundwater production systems to ensure their long term sustainability, and that the aquifers in selected hot spot areas yield adequate volumes of groundwater to address water/food security issues.

**Output 3.1.4:** Operational and management plans to help coordinate water drilling activities.

All project countries have identified the need to address the limited drilling capacity, substandard drilling techniques, and reduced efficiency and sustainability of drilling unit operation and water supply and monitoring infrastructure. Fiji has identified the need for Government to be able to enforce the completion of boreholes to sanitary standards across the entire drilling industry to reduce the risk of groundwater contamination. Both Vanuatu and Solomon Islands have identified the need for standardization of drilling practices across the drilling industry and the need for a drillers registry and bore database. In order to address these issues, this project Output will 1) support the drafting of national operational plans to better coordinate the management and operation of nationally owned drilling operations 2) foster south - south collaboration through regional training workshops encouraging knowledge transfer and through consultations with government and private industry and 3) promote micro accreditation of industry (private and government) best practice techniques. This Output will contribute to the achievement of Outcomes 3.1 and 4.1. To the extent possible, the proposed drillers training programmes will be combined with the drilling of groundwater monitoring and/or production bores, identified under project Outputs 3.1.1 and 3.1.3. This model has been successfully used in the past whereby national drilling teams under the guidance of a drilling expert developed water supply bores with direct application for remote, water-scarce communities.

In achieving this output, it is assumed that the entire drilling industry (national and private) participates in the proposed activities and that agreement is reached between the private industry and the national authority tasked to enforce the proposed policy and the application of the national drilling standards.

#### **COMPONENT 4: Reinforcing institutional capacity**

**Outcome 4.1:** Enhanced national capacities in groundwater assessment, monitoring and management.

As already mentioned, a major barrier in achieving the development challenge that this project seeks to address is the limited technical and institutional capacity at local and national levels to assess, monitor, and manage aquifers and groundwater resources. The limited institutional capacity characterized by information and responsibilities fragmented among different Ministries and Departments has resulted in often unclear roles, in incomplete policies and legislations, and consecutively in weak decision making. This is often at the cost of groundwater resources being exploited in unsustainable manners. This project outcome aims at addressing these issues through inter-ministerial dialogue and collaboration, through multi-disciplinary training approaches, and through knowledge exchanges between the project countries and with other relevant regions globally. The main assumption underlying this causal pathway is full engagement and participation of relevant governmental bodies in the proposed capacity development activities. In developing national capacities, the project will ensure that gender equality and social inclusion are fully mainstreamed across all capacity building activities.

**Output 4.1.1:** Capacities of water and land administrators are strengthened through training in groundwater management and technical aspects, and knowledge exchanges with similar contexts in small volcanic islands of the Mediterranean, the Atlantic, and the Caribbean.

This project output will be focusing on enhancing the institutional capacities in groundwater assessment, management and monitoring in the three island countries, and beyond, in the high volcanic Pacific SIDS. Technical capacities will be strengthened through the participation of national staff from relevant ministries in groundwater investigations, reconnaissance surveys, and remotely sensed data analysis conducted under the various project components. Institutional capacities in groundwater monitoring and management will be further developed through the active participation of stakeholders in the development of Aquifer Management Plans and their application. Capacities will be further developed on specific subjects (standardization of drilling techniques, community engagement, data management) through 1) ad hoc trainings organized at regional level replicating previous successful training models 2) knowledge exchanges at regional and global level (North-South and South-South Cooperation), 3) dissemination of project progress and results within the Pacific communities and beyond. In achieving this it is assumed that the government representatives attending the training and knowledge exchange events represent key technical and management roles in their countries. The project will ensure that gender equality and social inclusion are fully mainstreamed across all capacity building activities (e.g., workshops are attended by a relatively equal number of women and men of different ages, and inclusive of people with disabilities).

To support the M&E activities related to this project, harmonized templates based on the existing results framework will be developed for use by the three project countries in tracking the progress towards achievement of project results. Monitoring and evaluation will be done annually, and training workshops will be conducted for the national project managers to ensure a smooth and harmonized use of reporting templates. Additional national planning exercises will also be conducted to explore the alignment of national indicator sets and to investigate the inclusion of gender-responsive indicators. The project will ensure that GESI is fully mainstreamed in M&E activities through use of specific targets and indicators. For example, GESI inclusion in staffing will be monitored and a staff code of conduct for all project staff will be developed and enforced. GESI training will be provided at

appropriate levels to all project staff to build competence and confidence with the goal of ensuring adequate understanding, knowledge and skills to successfully implement the project GESI plan. The results framework indicators will be monitored annually for evidence-based reporting and for risks that could constrain the implementation of the project's Gender Action Plan. National planning exercises will also be conducted to explore the alignment with national indicator sets and investigate the inclusion of gender-responsive indicators.

**Output 4.1.2:** Project website and knowledge management platform created.

A communication and visibility action plan will be developed and implemented early during project implementation. The plan's purpose is to detail the approach and strategy to effectively communicate results, and deliverables to the different stakeholders, including project beneficiaries and donors. Key to effective communication will be the development of a dedicated project website upon project initiation to host all project-related updates and products and to act as the main communication channel. The website will be regularly updated with short articles summarizing the activities taking place in the three project countries and providing media highlights. Upon project completion, the website will be housed under SPC's website to ensure its long-term viability. The visibility plan will also include the development of communication material such as logos, reporting templates and layouts, and audiovisual promotional material in accordance with project and donor requirements. Key assumption is achieving this output is that the project coordination unit is able to devote specialist to facilitate interaction between countries and to ensure the quality and timeliness of online content and online events.

A particular focus will be placed on ensuring that all information, education and communication material produced by the Project is GESI-sensitive, user-friendly, and accessible to people with limited literacy, technical knowledge, and internet access. This means that all materials go beyond technical issues and include messaging on the need for whole of community participation in water planning and management, impacts of water problems on different groups of people, and the need for equitable access.

To further support knowledge management, a data visualization tool will be developed to support future growth and understanding of volcanic aquifers. This will form the basis of a volcanic groundwater dashboard that will be built upon as more data from other projects is made available to develop a comprehensive digital tool to support informed decision-making. This will be housed on SPC's Pacific Data Hub (<https://pacificdata.org>). Targeted users of this tool include the national government departments with the mandate of monitoring groundwater resources.

**Output 4.1.3:** Contribution to IWLEARN activities, including sharing of results globally focusing on SIDS.

This project Output will support stakeholder participation in IW:LEARN activities, including participation in regular international conferences (including the biennial IW Conferences) and sub-regional workshops, preparation of at least 3 IW experience notes, and the establishment of linkages between project website and IW:LEARN website. The project will also explore opportunities to link with other institutions through the organization and/or participation in seminars and short courses of

relevance to volcanic SIDS. It is expected that countries will develop experience notes on successfully integrating groundwater into IWRM and Water-Food Nexus policies and practices, for sharing during IW conferences and more broadly. Key assumption is that project staff and country focal points are able to travel.

#### **4) Alignment with GEF focal area and/or Impact Program strategies**

The project objective is fully aligned with the third key objective of the GEF-7 International Waters focal area Strategy on 'enhancing water security in freshwater ecosystems'. It also responds to the call for action of the GEF funded Transboundary Waters Assessment Program (TWAP): 'The situation that emerges from the analysis of the groundwater resources of SIDS calls for immediate attention. In the absence of coordinated, sustained remedial national and international action, the inhabitants of the Pacific islands, highly dependent on scarce, polluted and growingly saline coastal groundwater resources, and impacted by climatic variability and change, are facing dramatic choices. In many islands, degradation of groundwater quality and growing demands are posing short-medium term threats to human health and impairing the provision of ecosystem services of great economic relevance.'

The present GEF investment, targeting mountainous volcanic islands of the Pacific, will stimulate additional public and private sector investments and engagement towards reducing dependency on over-exploited coastal aquifers through the exploitation of alternative groundwater resources contained in upstream deeper volcanic aquifers. This GEF investment will further contribute in de-risking innovative approaches through suitable testing and piloting. The project components will support 1) exchange of sound data and information on the groundwater potentialities of volcanic aquifers, (Component 1), 2) national cooperation in groundwater basins through improved policy formulation processes (Component 2) and capacity building efforts (Component 4). Water security will be enhanced through piloting of innovative integrated catchment and aquifer management and sustainable land management approaches to increase water efficiency, reduce pressures on ecosystems, and improve aquifer recharge and surface/groundwater quality.

#### **5) Incremental/additional cost reasoning and expected contributions from the baseline, the GEFTF, LDCF, SCCF, and co-financing**

The project will build on previous GEF investments in the three countries which have set the foundation for sustainable watershed governance and has two major objectives:

1. Develop new knowledge on volcanic aquifers in the target islands, and catalyse investments for their sustainable exploitation, thus relieving pressure on highly vulnerable coastal aquifers;

2. Facilitate the updating of national water legislations and the drafting of groundwater exploitation policies and implementation plans which the countries have indicated as being part of their current national priorities.

The present GEF investment will ensure that the best available science on the hydrogeology of volcanic environments is applied in the project islands, and that the much-needed groundwater related legislative and policy reforms are implemented. In the absence of the present GEF investment, an opportunity to assess and develop new groundwater resources present in unexploited volcanic aquifers will be lost. As a result, the continuing exploitation of coastal groundwater resources will likely cause the irreversible salinization of the aquifers, putting at risk human and ecosystem health, jeopardizing current efforts to consolidate sustainable water resources management, and exacerbating existing conflicts between industrial, agriculture, and domestic water users. The Strategic Action Programme (SAP) of the Pacific SIDS prepared in 1997 identified priority concerns including 1) pollution, 2) long term sustainable use of freshwater resources, 3) physical, ecological, and hydrological modification of critical habitats, 4) unsustainable exploitation of non-living resources. The root causes which threaten water resources, identified in the SAP, included deficiencies in management specifically with regards to governance and understanding. In the absence of the proposed intervention, progress towards the implementation of key priority areas of the SAP will be slow. The current investment is expected to substantially contribute in placing volcanic island countries of the Pacific in better position in terms of achieving water and food security, and resilience to climate change. This example will be replicable in all other volcanic and mountainous SIDS of the world.

**Table 17.** Summary of incremental cost reasoning by project Component

Project Component	Baseline	Project increment	Contribution from co-financing
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1	<p>Fiji, Vanuatu, and the Solomon Islands currently have limited knowledge on their volcanic aquifers and relevant groundwater resources. The increasing interest from bottled water industries to operate in Fiji, and the increasing water demands in urban centers in Vanuatu (Luganville) and Solomon Islands (Honiara), are putting pressures on groundwater resources. The absence of relevant knowledge and information complicates and limits the management of these resources.</p>	<p>This project will support actions to improve the knowledge and understanding of major aquifer systems and of their exploitable groundwater resources. These actions will also help identifying potential environmental concerns for improved decision making and identifying management deficiencies identified in the Strategic Action Programme (SAP) of the Pacific Small Island Developing States. Such dedicated aquifer assessments may otherwise not be undertaken by the countries.</p> <p><i>GEF Investment USD 1,368,903</i></p>	<p>National operational budgets of country ministries for drilling activities and hydrogeological assessments will support the objective of project Component 1.</p> <p><i>Total co-financing: USD 8,520,940</i></p>
2	<p>Previous investments (incl. GEF) in the three project countries have supported the development of catchment management plans and the development of capacities at the national level to undertake planning. While this work has been successful in building a sound knowledge and policy framework for surface waters and dependent ecosystems, groundwater resources have received little attention in terms of assessment and governance.</p>	<p>The proposed investment will support a drastic improvement of groundwater management policies and practices in all three countries to enhance water and food security and climate resilience. Through diagnostic analyses of primary aquifers of national importance, water-related environmental issues will be identified and quantified, their causes will be analysed and their economic and environmental impacts will be assessed. In the absence of the proposed intervention, progress towards the implementation of key priority areas of the Strategic Action Programme (SAP) of the Pacific SIDS will be slow.</p> <p><i>GEF Investment: USD 984,604</i></p>	<p>This Component will be further supported through activities undertaken under the ADB/EU-funded ?Solomon Islands: Urban Water Supply and Sanitation Sector Project?, the ADB-funded ?Luganville Urban Water Supply and Sanitation? project, and current efforts of Fiji Government to improve the national legislation on groundwater development.</p> <p><i>Total co-financing: USD 8,849,980</i></p>

3	<p>All project countries have identified hot-spots where serious development constraints due to increasing water scarcity, increasing water nexus conflicts, or lack of technical experience in groundwater management and extraction are being experienced. Developments are many times proceeding without the adequate information being collected or studies being conducted.</p>	<p>The current project will address and potentially resolve priority issues of concern related to groundwater. The proposed interventions in identified hot spots will support integration of groundwater governance principles and methodologies within the context of IWRM policies and practices, and will address the root cause of governance deficiencies and information gaps limiting the sustainable exploitation of groundwater resources or the degradation of groundwater, as identified in the SAP.</p> <p><i>GEF Investment: USD 2,286,332</i></p>	<p>Activities contributing to the delivery of this Component are identified under the ADB/EU-funded ?Solomon Islands: Urban Water Supply and Sanitation Sector Project?, the GCF-funded ?Climate Information Services for Resilient Development in Vanuatu? project and the WMO/UNDRR/WB ?Strengthening Hydro-Meteorological and Early Warning Systems in the Pacific? project implemented in Fiji.</p> <p><i>Total co-financing: USD 2,428,000</i></p>
4	<p>All project countries suffer from limited technical and institutional capacity at local and national levels to assess, monitor, and manage aquifers and groundwater resources. Institutional capacities are characterized by information and responsibilities which are fragmented among different Ministries and Departments. This has resulted in often unclear roles, in incomplete policies and legislations, and consecutively in weak decision making.</p>	<p>This project will address issues related to limited institutional capacity through inter-ministerial dialogue and collaboration, through multi-disciplinary training approaches, and through knowledge exchanges between the project countries and with other relevant regions globally. In the absence of the proposed investment, capacities of water and land administrators would remain weak, at the cost of groundwater resources being exploited in unsustainable manners.</p> <p><i>GEF Investment: USD 1,075,496</i></p>	<p>Activities conducted under the GCF-funded ?Climate Information Services for Resilient Development in Vanuatu? Project, related to the delivery of targeted trainings and on-the-job support for application of Climate Information services, will further contribute to the delivery of Project Component 4.</p> <p><i>Total co-financing: USD 1,544,000</i></p>

PMC		<p>The GEF support towards project management costs (5%) will cover the costs associated with the unit</p> <p>executing the project on the ground.</p> <p><i>GEF Investment: USD 284,666</i></p>	<p>Co-financing to support the project management costs was identified in staff salaries (incl. ICT and facilities costs) of the Fiji Mineral Resources Department, estimated for their expected involvement in this project. Additional co-financing was identified in salaries of SPC staff (e.g. Programme Director, Divisional Director, Deputy Director General) expected to dedicate a certain number of days towards project implementation (e.g. Steering Committee Meetings, etc). A similar co-financing was identified for FAO.</p> <p><i>Total co-financing: USD 1,808.669</i></p>
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#### 6) Global environmental benefits (GEFTF) and/or adaptation benefits (LDCF/SCCF)

International Waters are defined, in accordance with GEF's Operational Strategy (1995), as oceans, large marine ecosystems, enclosed or semi-enclosed seas and estuaries as well as rivers, lakes, groundwater systems, and wetlands with transboundary drainage basins or common borders. The 1995 GEF IW Operational Strategy, that defined the mandate of the focal area, also includes SIDS, as they share common environmental problems and solutions to those problems that reflect the partnership between their representative regional organizations and the capacity and institutional building needed on each island state to more comprehensively address these problems. The transboundary issues then involve international cooperation among sovereign island states as well as transborder issues among the many islands of individual states as they utilize measures to protect their water resources. With their special conditions and needs, SIDS require more integrated approaches to improved land and water management in order to address threats to their water resources. In particular, projects in this component stress integrated freshwater basin - coastal area management as key elements to ensure a sustainable future for these island states. As noted in the GEF Operational Strategy, (GEF funded) activities are typically targeted to six major issues SIDS have in common (protection and expansion of water supplies, coastal area management and biodiversity, sustainable management of regional fish stocks, tourism development, land and marine-based sources of pollution, and vulnerability to climate change).

For the purposes of the present project, progress will be tracked through Core Indicator 4 reflecting the total area of landscapes under improved practices, including in the agricultural and possibly forestry and extractive sectors, that lead to improved environmental conditions and for which management plans will be developed and endorsed. More specifically, the project deliverables will be linked to Sub-indicator 4.3 which captures the landscape area that is in production and whose soil and water are managed in a sustainable manner.

Additionally, as reflected in Core Indicator 11, the GEF investment is expected to directly benefit approximately 150,000 people (52% male / 48% female), being the total population living in the target sites where on-the-ground interventions will be implemented. The entire population of these islands (approximately 795,600 people) will indirectly benefit from enhanced water security through new policies and evidence-based information allowing sustainable water resources management.

Even though the project is not expected to directly contribute to Core Indicator 7, links exist with Sub-indicator 7.3 which rates the level of implementation of local and national reforms and the active participation of inter-ministerial committees. The level of engagement of project staff and country reps in the International Waters Learning Exchange and Resource Network (IW:LEARN) will also indirectly contribute to Core Indicator 7.

## **7) Innovativeness, sustainability, potential for scaling up and capacity development**

The project will build on the outcomes and lessons learned from previous GEF and other non-GEF investments as highlighted under the project description section but is also expected to create an enhanced knowledge base and enabling environment for its longer term sustainability, replicability, and upscaling. Components 1 and 2 will support the development of an updated national level information baseline and governance framework which in turn will allow for more informed decision making and a more effective management of water resources.

More specifically, the proposed national reconnaissance mapping of major aquifer systems for the three countries, the assessment of their groundwater development potential, and the drafting of technical-economical feasibility studies will help prioritizing the strategic use and development of the primary identified aquifers and encourage private and governmental investments, while taking environmental considerations into account. A particular innovation under this major activity will be the groundbreaking combination of volcanology, remote sensing, spring mapping, and fracture analysis as part of the reconnaissance mapping of major volcanic aquifers. Specific governance reforms with regards to groundwater are proposed under Component 2. These reforms will require commitment by the countries and active involvement of counterpart agencies in each country to ensure their broader adoption and enforcement. The diagnostic analysis of selected primary aquifers and the drafting of aquifer management plans will support land use planning and sustainable management of groundwater resources in areas with multiple competing users from different sectors. In turn, these diagnostic studies

will form the evidence-based foundation for developing sound policies on groundwater allocation and management.

The value of these investments and their replicability and upscaling potential will be demonstrated through their on-the-ground application in specific hot-spot areas, identified by the countries, under Component 3. The proposed "hard investments" under this Component will demonstrate new approaches and will de-risk innovations to groundwater management, integrated catchment management, and sustainable land management with the goal of enhancing water and food security. Examples of innovative applications include the use of telemetered processes for the monitoring of climatic and anthropogenic stresses on groundwater in the identified hot-spot areas. Fostering country ownership of project interventions, from governance reforms to on-the-ground investments, will ensure and enhance their long-term sustainability.

The high potential of volcanic aquifers in further supporting livelihoods from the inherent risks associated with island vulnerabilities, creates the need for the generation of best practices that can be replicated and scaled-up. The high profile of land and water in island communities, coupled with the limited policy and legal frameworks for the integration of protection and management of these resources, creates significant opportunities for the successful uptake of best practices and lessons learned.

Capacities will be developed on specific subjects (standardization of drilling techniques, community engagement, data management) through 1) ad hoc trainings organized at regional level replicating previous successful training models 2) knowledge exchanges at regional and global level (North-South and South-South Cooperation), 3) dissemination of project progress and results within the Pacific communities and beyond. Previous successful models (trialled under the EU-funded "Building Safety and Resilience in the Pacific" project) on combining regional drilling training activities with the development and construction of water supply bores for drought-prone communities and/or smallholder farmers will be adopted under Component 4 to strengthen resilience capacities. These efforts will be coupled with the development of operational management policies of national drilling units to ensure financial sustainability, equitable and transparent process in work scheduling, and standardization of drilling practices across the drilling industry.

Micro-accreditation will be applied in the development of capacity in specific skills relevant for the country and participants needs. The micro accreditation approach includes training in a modular or an abbreviated format targeting the specific needs of the countries, and the function. It has the advantage of providing participants with a formally recognized accreditation in a specific skill, e.g.: monitoring, rainfall analysis, drillers offsider, which is motivating to the participant, without the expense and time commitment of a fully accredited course.

Working in different dimensions across countries and sectors and lead by an established and capacitated regional entity will provide not only for an innovative implementation process but will also ensure the long-term sustainability of these efforts. SPC has a long-term commitment to maintain, through an ongoing programmatic support to its member countries, the sustainability and strengthening of their institutions. Through this broader programmatic support, lessons that have been identified through projects benefit other efforts beyond the life of each project. Essentially, SPC is not just a

project implementer but responds to country requests for support and accommodates the required technical backstopping. At the same time, lessons learned from previous projects in the region will help SPC supporting a process that is established with the island governance mechanisms to allow them take on sustainability issues. Therefore, strong commitment is also necessary on behalf of the beneficiaries to sustain the work in the long term.

In response to the current COVID-19 pandemic and the continuation of limited travel likely extending into the project implementation, a modified approach to implementation will need to be considered. Greater use of remote guidance and communication using appropriate online platforms, engagement of in-country consultants or project staff to undertake specific tasks and guide the in-country implementation, the need for inherent flexibility within the project to modify or adjust proposed activities to accommodate to the local situation, and the use of online training platforms are some of the approaches that will be required. Face to face meetings will be reduced and some of the costs for travel will be redirected to supporting these remote capacity building and communication needs. Maintaining motivation of the beneficiaries and support staff in the project areas will also be an important consideration, especially in the absence of regular in country presence and physical contact. It is suggested that to counter this, increased engagement and ownership, through ensuring shared outcomes, and goals will be more important than ever. Conscious effort will be required during the project proposal development phase and the implementation to promote and support the adoption of a common vision, increase local empowerment, and provide a mechanism for technical support and communication.

**8) Summary of changes in alignment with the project design with the original PIF**

<b>Change</b>	<b>Justification for change</b>
Output 4.1.2 removed (Manuals and products for managing groundwater in smallholder farming systems are developed)	This project output was initially included in the project framework presented in the PIF to consider the development of products relevant to groundwater management in smallholder farming systems, specifically aiming at Vanuatu. During the project design phase and the relevant visits to the project sites, it was realized that livestock holdings are not well structured and non-commercial creating uncertainty with regards to the development and application of such guideline documents.

<p>A new Output 2.1.1 was created  ?Ongoing national efforts in reviewing existing legislations and developing new groundwater policies are supported?.</p>	<p>This change was made as a response to the GEF recommendation to include new Outputs/activities under Component 2 addressing the need to develop or strengthen governance frameworks and to bring these forward for consideration in the respective government systems.</p>
<p>The old Outputs 2.1.1 and 2.1.2 were merged to create a new Output 2.1.2 (Aquifer conceptual models and diagnostic analyses of the current state of one selected ?primary aquifer? in each of the project countries are developed).</p>	<p>This change was made to maintain the number of Outputs (3) after the creation of the new Output and also considering that aquifer conceptual models and the diagnostic analyses are part of the same process.</p>

Output 4.1.1

?Capacities of water and land administrators are strengthened through training in groundwater governance, management, and technical/legal aspects, and knowledge exchanges with similar contexts in small volcanic islands of the Mediterranean, the Atlantic, and the Caribbean?  
was renamed to  
?Capacities of water and land administrators are strengthened through training in groundwater management and technical aspects, and knowledge exchanges with similar contexts in small volcanic islands of the Mediterranean, the Atlantic, and the Caribbean?

We realized that whilst the project will support countries with their efforts to update and develop new legislations and groundwater policies, capacity building will focus on technical aspects (aquifer and water resources assessments, spring surveys and water sampling, water resources monitoring, data analysis and interpretation) and on groundwater management (through the participation in design workshops of aquifer management plans).

<p>Target contributions to GEF-7 Core Indicators</p>	<p>Contribution to Core Indicator 4 (Area of landscapes under improved practices (excluding protected areas) was reduced from 2,722,470 hectares to 35,358 hectares. In the absence of an island/site selection process, the initial estimate during project concept stage was based on the total area of the two major islands in each country. During project design phase and as part of the national design workshops, island/site prioritization processes were followed leading to the identification of islands and hot spot sites that could benefit the most from the proposed activities. As such, the contribution to Core Indicator 4 was reduced to match the total land area of the selected sites.</p> <p>Similarly, contribution to Core Indicator 11 (Number of direct beneficiaries disaggregated by gender as co-benefit of GEF investment) was reduced from 1,104,264 to 150,588 reflecting the total population living around the project sites.</p> <p>It should be noted here that, even though project interventions under Component 3 will be limited to the areas of the identified project sites, the aquifer management plans which will be developed based on information collected predominantly through these interventions, will actually be covering the entire area of the aquifer system where the project sites belong to. In other words, the land area with improved management (and the direct beneficiaries) could eventually be larger.</p>
<p>Co-financing</p>	<p>Co-financing in PIF (23,400,000 USD) was very slightly reduced to 23,151.489</p>

**1b. Project Map and Coordinates**

**Please provide geo-referenced information and map where the project interventions will take place.**

The three maps below illustrate the locations of the three priority aquifers identified by the countries for improved understanding and management of their groundwater resources, and where most of the activities/interventions under Components 2 and 3 will be focused on, while Component 1 will involve the whole island. Maps of the hot-spot areas outside these priority aquifers where additional project interventions will be taking place are presented in Annex E.

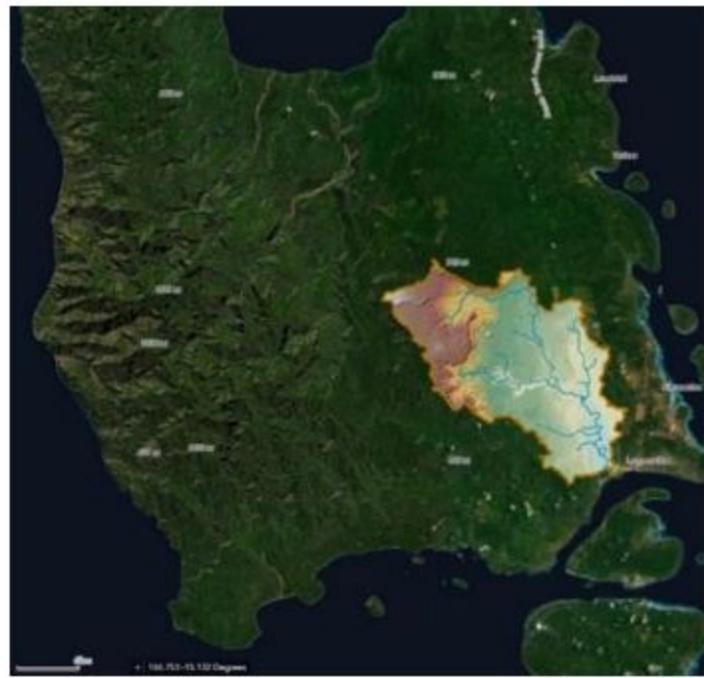
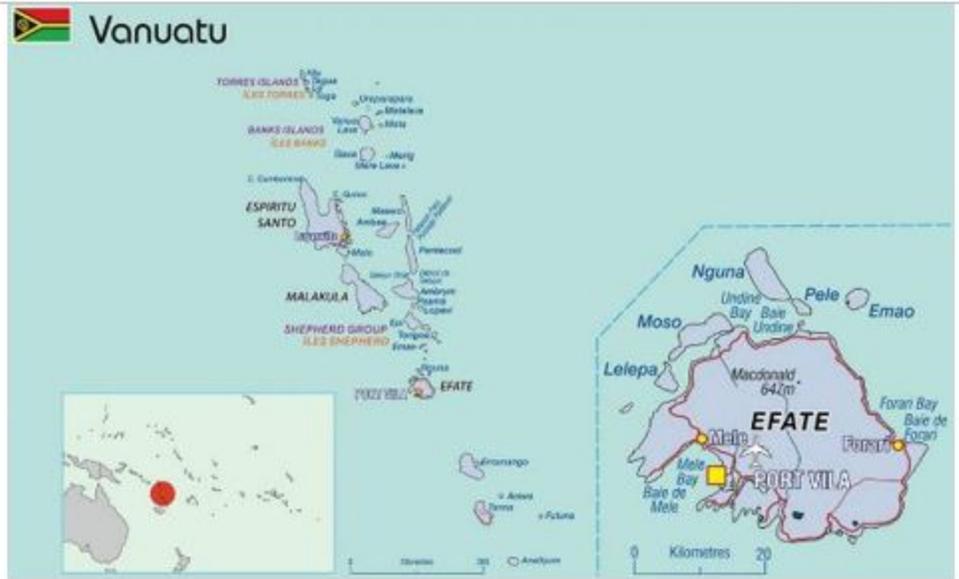


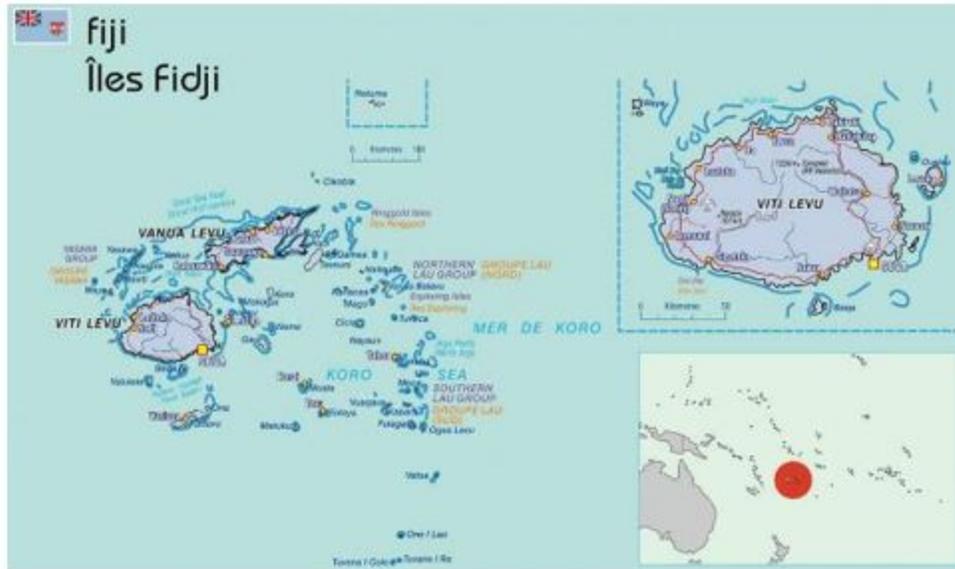
Figure 19. Map of Vanuatu and Sarakata catchment, Santo Island, Vanuatu

Figure 19. Map of Vanuatu and Sarakata catchment, Santo Island, Vanuatu



Figure 20. Map of Solomon Islands and Honiara Aquifer, Guadalcanal Island, Solomon Islands

Figure 20. Map of Solomon Islands and Honiara Aquifer, Guadalcanal Island, Solomon Islands



Yaqara valley aquifer, Viti Levu, Fiji



Figure 21. Map of Fiji Islands and Yaqara valley aquifer, Viti Levu Island, Fiji

Figure 21. Map of Fiji Islands and Yaqara valley aquifer, Viti Levu Island, Fiji.

1c. Child Project?

If this is a child project under a program, describe how the components contribute to the overall program impact.

NA

## 2. Stakeholders

Select the stakeholders that have participated in consultations during the project identification phase:

**Civil Society Organizations** Yes

**Indigenous Peoples and Local Communities**

**Private Sector Entities** Yes

If none of the above, please explain why:

Please provide the Stakeholder Engagement Plan or equivalent assessment.

The initial stakeholder engagement plan is presented in Table 18 while the detailed planning process and results from stakeholder consultations during the project design phase in the three countries are described in **Annex I2**.

**Table 18.** Initial stakeholder engagement action plan

<b>SPECIFIC ACTIONS REQUIRED</b>	<b>RESPONSIBLE PARTIES</b>	<b>TIMELINE</b>	<b>EXPECTED OUTCOMES</b>
1. Conduct a stakeholder analysis and mapping exercise to identify key stakeholders/contacts in relevant agencies and communities	<ul style="list-style-type: none"><li>• PMU staff</li></ul>	Within 3 months after project initiation	<ul style="list-style-type: none"><li>• Project has good understanding of key stakeholder groups, including project impacted communities and vulnerable groups of people, and understand the correct protocols/ procedures for consultation and feedback processes</li></ul>
2. Plan and carry out project orientation and planning workshop(s) with relevant stakeholders	<ul style="list-style-type: none"><li>• PMU staff</li><li>• Project Steering Committee</li></ul>	Within 6 months after project initiation	<ul style="list-style-type: none"><li>• Project stakeholders, including affected communities and vulnerable groups of people, have good knowledge about project goals, objectives, activities and timelines</li><li>• Project stakeholders are aware of how to contact the PIU/IA for further information or to raise concerns</li><li>• Key stakeholders and PMU/IA have established good rapport and have a clear understanding of how they will be involved in activity design and implementation.</li></ul>
3. Develop Activity-Specific Stakeholder Engagement Plan	<ul style="list-style-type: none"><li>• PMU</li><li>• Project Steering Committee</li></ul>	Within 6 months after project inception	<ul style="list-style-type: none"><li>• The project has a clearly defined strategy to manage stakeholder engagement, including identified environment or social risks, on an activity-by-activity basis informed by the results of stakeholder mapping and orientation and planning workshop outcomes.</li></ul>

Even though COVID-19 related travel restrictions are globally beginning to ease off, restrictions still apply in several Pacific Island Countries. In Fiji, stakeholder engagement during project execution is not expected to be substantially disrupted given the current situation which is not expected to worsen. Nevertheless, even in the unlikely scenario of new restrictions, activity implementation and project

execution are expected to be able to progress given the local presence of SPC supporting coordination and providing technical assistance and the technical capacity of the lead national agency in delivering most of the proposed work. The situation in Vanuatu and the Solomon Islands may be more complex due to the international travel required for technical experts to reach these countries and the slower progress of these countries in reopening their borders.

National project coordinators engaged for the duration of the project in each country, will play an essential role in facilitating communication and engagement with relevant stakeholders at national, island and community level. The national project coordinator will be supported by SPC to ensure relevant and appropriate information on the project is effectively communicated to the stakeholders in accessible formats. The coordinators will play a key role in maintaining country engagement, leading face-to-face consultations with key stakeholder groups, and driving national project activities. Other national consultants based in the three project countries may be additionally contracted on a needs basis to support the national project coordinators implementing some of the more technical activities at the national level, especially if travel restrictions are still limiting international (and even domestic) travel. Finally, if international travel is limited, alternative forms of engagement including phone and virtual consultations will be adopted to conduct participatory workshops and stakeholder discussions in each country.

In addition, provide a summary on how stakeholders will be consulted in project execution, the means and timing of engagement, how information will be disseminated, and an explanation of any resource requirements throughout the project/program cycle to ensure proper and meaningful stakeholder engagement

A summary of these consultations and expected consultation methodology and timing during project implementation is presented in Table 19.

**Table 19.** Stakeholder engagement matrix

Stakeholder Name	Stakeholder Type	Stakeholder profile	Consultation Methodology Project Design	Consultation Findings	Consultation Methodology Project Implementation	Expected timing
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Fiji Mineral Resources Department (MRD)	Direct beneficiary	National Government Institution body	Face to face meetings, teleconferences, national design workshop	<p>The MRD is managed by the Ministry of Lands and Mineral Resources and regulates the mineral sector and environment division (as mandated under the sustainable development policies). MRD also manages the effective development of groundwater resources and the provision of clean, safe drinking water through its reticulation programs. MRD carries out annual monitoring of selected monitoring boreholes and receives funds to undertake scientific groundwater surveys for borehole drilling. MRD also assists WAF with surveys and other tasks associated with development of groundwater for town water supply schemes (e.g. Navua, Sigatoka, Labasa).</p> <p>Under this project MRD represents the lead national agency for Fiji and as such constitutes one of the main stakeholders with direct benefit from the project outcomes. MRD has fully supported the project design from the inception stage and has provided valuable advice to</p>	<p>Technical and institutional capacity of MRD will be developed through the project and in turn, MRD will be supporting project operations through their existing capacity and regulator role with the development of groundwater resources. Strong engagement will be maintained with MRD throughout the entire project duration to ensure successful project delivery.</p>	Bi-annual
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				ensure the project design is aligned with country and Department priorities.		
Fiji Ministry Commerce, Trade, Tourism and Transport (MCTTT)	Direct beneficiary	National Government Institution body	Face to face meetings, teleconferences	The MCTTT is responsible for formulating and implementing policies and strategies that create and facilitate growth in industry, investment, trade, tourism, transport, co-operative businesses, micro and small enterprises and enhancing metrology, standards, and consumer protection. During consultations it was discovered that MCTTT oversees the licencing of bottled water industries in Fiji and as such constitutes an important stakeholder who should be regularly consulted. MCTTT has acknowledged the value of improving the coordination with the Fiji Revenue and Custom Service and the MRD, all involved in the management of the bottled water industry in Fiji.	Engagement will be strengthened through a MoU with MRD and FRCS to improve collaboration during the monitoring and regulation of groundwater extraction operations in the country (incl. the bottled water industry).	Annual

Fiji Ministry of I-taukei Affairs	Indirect Beneficiary	National Government Institution body	Teleconferences	The Ministry of I-taukei Affairs is responsible for the preservation of Fijian culture. It also keeps official records relating to i-Taukei land and fishing grounds and handles disputes arising over these matters.	Stakeholder will be periodically consulted to ensure alignment of activities for mutual benefit.	Annual
Fiji Ministry of Youth	Indirect beneficiary	National Government Institution body	Teleconferences	The Ministry of Youth and Sports has responsibilities for facilitating youth and sports development through the establishment of a conducive policy environment that provides strategic support systems, initiatives for personal development, character building, sports policy implementation and community-based youth-led programs	Periodical consultations will be maintained to ensure involvement of youth groups during project activities.	Annual
Fiji Department of Women	Indirect beneficiary	National Government Institution body	Teleconferences	Ministry for Women, Children and Poverty Alleviation (MWCPA) is responsible for supporting families and communities through social welfare and gender mainstreaming programs. Its vision is inclusive of women and other disadvantaged persons	Periodical consultations will be maintained to ensure alignment with national GESI principles during project implementation.	Annual

Fiji Ministry of Agriculture (MoA)	Direct beneficiary	National Government Institution body	Face to face meetings, teleconferences, national design workshop	The Ministry of Agriculture represents another important stakeholder with who close collaboration needs to be maintained. The MoA oversees the use of springs for multi-purpose irrigation schemes with assistance from MRD, though it is unclear how these schemes are monitored in terms of yield and usage. As such MoE will be directly involved in certain project components with direct benefit.	Stakeholder will be periodically informed of project updates and collaboration should be constantly sought to ensure alignment of activities for mutual benefit (e.g. development of springs for domestic and agricultural purposes)	Bi-annual
Fiji Revenue and Custom Service - Tariff and Trade Section (FRCS)	Direct beneficiary	National Government Institution body	Teleconferences	During project design consultations it was discovered that FRCS is responsible for taxation for industrial abstraction of groundwater bores and springs. As such FRCS constitutes an important stakeholder who should be regularly consulted. FRCS has acknowledged the value of improving the coordination with the MCTTT and the MRD, all involved in the management of the bottled water industry in Fiji.	Engagement will be strengthened through a MoU with MRD and MCTTT to improve collaboration during the monitoring and regulation of groundwater extraction operations in the country (incl. the bottled water industry).	Annual

Fiji Department of Water & Sewerage	Indirect beneficiary	National Government Institution body	Teleconferences	The Department of Water & Sewerage, under the Ministry of Infrastructure and Transport, is responsible for formulating policies and regulatory frameworks for providing a sustainable water and sewage sector, technical advice, monitors, inspections of rural and urban water and sewerage projects.	Stakeholder is expected to have interest in the project and therefore needs to be informed of project updates.	Annual
Fiji Department of Environment (DoE)	Indirect beneficiary	National Government Institution body	Teleconferences	The DoE promotes the sustainable use and development of Fiji's environment and efficient implementation of policies, legislation, and programs. Monitoring and management of water quality for freshwater and marine ecosystems. During project design consultations, it was communicated that groundwater extraction is required to go through the EIA process.	Engagement will be maintained to ensure groundwater development activities will follow the national EIA process.	Need-based

Water Authority of Fiji (WAF)	Indirect beneficiary	Commercial Statutory Authority	Teleconferences	The WAF is providing access to quality drinking water and wastewater services to over 150,000 residential and non-residential metered customers residing mostly in urban areas and is also setting up water supply systems in rural schemes, which together reach over 800,000 people nationwide.	Stakeholder is expected to have interest in the project and therefore needs to be informed of project updates.	Annual
Fiji representative for water bottling companies	Indirect beneficiary	Private sector and CSOs	Teleconferences, national design workshop	Groundwater supply is also central to the bottled water industry (BWI) which continues to see increasing interest from local and foreign investors. Currently four BWI companies operate in Fiji, and two additional companies are in the process of setting up. Engagement with their representative took place during the national design workshop.	The BWI, being part of the main groundwater users form part of the group of main project beneficiaries. As such, engagement efforts should be increased to ensure alignment of activities for mutual benefit. Face to face meetings with the BWI of Fiji will be organized in the early stages of project implementation.	Annual

<p>Solomon Islands Ministry of Mines, Energy and Rural Electrification</p>	<p>Direct beneficiary</p>	<p>National Government Institution body</p>	<p>Face to face meetings, teleconferences, national design workshop</p>	<p>The management of natural surface and groundwater sources to ensure availability of water supply to urban and rural communities in the Solomon Islands is the mandate and responsibility of the Water Resources Division (WRD) of the MMERE. Moreover, the newly-established Drilling Section of the Water Resources Division is the lead Government Section responsible for promoting the implementation of community water supply developments in the Solomon Islands. Under this project the WRD represents the lead national agency for Solomon Islands and as such constitutes one of the main stakeholders with direct benefit from the project outcomes. The WRD has fully supported the project design since the inception stage and has provided valuable advice to ensure the project design is aligned with country and Department priorities.</p>	<p>The technical and institutional capacity of WRD will be developed through the project and in turn, WRD will be supporting project operations through their existing capacity and mandate around the development of groundwater resources. Strong engagement will be maintained with WRD throughout the entire project duration to ensure successful project delivery.</p>	<p>Bi-annual</p>
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Solomon Islands Ministry of Provincial Government and Institutional Strengthening Division	Indirect beneficiary	National Government Institution body	Face to face meetings, teleconferences, national design workshop	It is a recommendation to work in partnership with MPGIS which helps coordinate, oversee, guide and train provincial governments on Provincial Capacity Development Fund (PCDF) projects (regarding governance, financial and now project management areas).		Annual
Solomon Islands Ministry of Health and Medical Services (RWASH unit)	Indirect beneficiary	National Government Institution body	Face to face meetings, teleconferences, national design workshop	The Ministry of Health and Medical Services (MHMS) is responsible to lead, improve and strengthen the Solomon Islands health system and essentially leads rural WASH services. RWASH view that investment in groundwater development by industry could be strategic to help establish the necessary skills and knowledge in-country that could then be utilised later by rural communities.	Stakeholder will be periodically consulted to ensure alignment of activities for mutual benefit.	Annual

Solomon Islands Ministry of Agriculture and Livestock (Research Division)	Direct beneficiary	National Government Institution body	Face to face meetings, teleconferences, national design workshop	The Research Division of the MoAL operates a number of experimental farms around the country which are currently rainfed and could benefit from irrigation systems. MoAL see the development of groundwater resources or potential of groundwater as feeding into aspirations to trial sustainable irrigated crop development. This has potential to create greater income generation opportunities.	Opportunities to demonstrate agricultural benefits through groundwater supply will be explored during project implementation and as such, engagement with the stakeholder will be maintained.	Bi-annual
Solomon Water	Direct beneficiary	State Owned Enterprise	Face to face meetings, teleconferences, national design workshop	The supply of water to urban areas is the responsibility of the Solomon Islands Water Authority (SIWA) which is a Statutory Authority that operates under its own Act. Solomon Water has fully supported the project design and has provided valuable advice to ensure the project outcomes are aligned with their priorities.	Considering this project will be focussing on Honiara, close collaboration needs to be maintained with the stakeholder throughout the entire project duration to ensure successful delivery of project activities for mutual benefit.	Bi-annual
Honiara based water bottling/ carting companies	Indirect beneficiary	Private sector	None			Annual

<p>Vanuatu Department of Water Resources (DoWR)</p>	<p>Direct beneficiary</p>	<p>National Government Institution body</p>	<p>Face to face meetings, teleconferences, national design workshop</p>	<p>The Department has the overall responsibility to ensure the sustainable use of the nation's water resources and is responsible for the monitoring, management and protection of groundwater and surface water resources. DoWR has fully supported the project design from the inception stage and has provided valuable advice to ensure the project design is aligned with country and Department priorities.</p>	<p>The technical and institutional capacity of DoWR will be developed through the project and in turn, DoWR will be supporting project operations through their existing capacity and mandate around the development of groundwater resources. Strong engagement will be maintained with DoWR throughout the entire project duration to ensure successful project delivery.</p>	<p>Bi- annual</p>
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<p>Vanuatu Department of Environmental Protection and Conservation (DEPC)</p>	<p>Indirect beneficiary</p>	<p>National Government Institution body</p>	<p>Face to face meetings, teleconferences, national design workshop</p>	<p>The DEPC is responsible for assessing the environmental impact of proposed developments; working with communities to establish Community Conservation Areas; working with researchers to learn more about our unique environment; protecting internationally endangered species; controlling ozone depleting substances; and working with municipal and provincial governments to manage waste and pollution.</p>		<p>Annual</p>
<p>Vanuatu Department of Agriculture and Rural Development</p>	<p>Indirect beneficiary</p>	<p>National Government Institution body</p>	<p>Face to face meetings, teleconferences, national design workshop</p>	<p>The Ministry of Agriculture, Livestock, Forestry, Fisheries and Biodiversity (MALFFB) ensures that Vanuatu's agricultural, forestry and aquatic resources are sustainable and managed efficiently.</p>		<p>Bi- annual</p>

Vanuatu Department of Climate Change and National Advisory Board (NAB)	Indirect beneficiary	National Government Institution body	Face to face meetings, teleconferences, national design workshop	Engagement with the Department was realized through the process of having the project endorsed by the National Advisory Board (NAB) on climate change and disaster risk reduction, chaired by the Director General of the Ministry of Climate Change. The project design took into consideration the NAB Project Screening Committee recommendations and thus secured the support of the NAB during project implementation.	The NAB and the DCC will be kept informed of project progress throughout the entire project implementation phase.	Annual
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**Select what role civil society will play in the project:**

**Consulted only; Yes**

**Member of Advisory Body; Contractor;**

**Co-financier;**

**Member of project steering committee or equivalent decision-making body;**

**Executor or co-executor;**

**Other (Please explain)**

The stakeholder analysis included an extensive literature review and stakeholder consultation process involving discussions at community, district, national and regional level with water users, private sector operators, area/district and provincial administrators, civil society organizations (CSOs) including women, youth and disability organizations, and government agencies with water and GESI mandates. These consultations provided valuable insight into water and food security issues in 'hot spot' areas identified by project governments for groundwater assessment and utilization demonstrations.

COVID-19 restrictions meant the design team was unable to undertake regional travel, and in the case of Fiji, even domestic travel. To compensate for this, a range of quantitative and qualitative information sources were used, including secondary sources to supplement official statistics. Extensive use was also made of online meeting platforms to conduct participatory inception workshops and follow-on discussions in each target country. In addition, local consultants were engaged in the Solomon Islands and Vanuatu to lead face-to-face consultations with key stakeholder groups, with mentoring support provided by the Fiji-based GESI Specialist and other members of the design team. This approach was highly effective in fostering local ownership, and in opening up the space for resident PIC consultants to take a more leading role in project development in their countries.

### **3. Gender Equality and Women's Empowerment**

#### **Provide the gender analysis or equivalent socio-economic assessment.**

The gender analysis was undertaken from a human-rights perspective using a GESI lens to examine water and food security variables based on best available SAAD (sex, age, area, and disability) data across the three project countries. It focuses primarily on issues related to access, use and management of groundwater and the impacts of WASH (water, sanitation, and hygiene) issues on women, families, and communities. It also considers the needs and concerns of people who are especially vulnerable or marginalized, including people with disabilities (PWD), those living in impoverished conditions, and climate migrants.

The analysis included an extensive literature review and stakeholder consultation process involving discussions at community, district, national and regional level with water users, private sector operators, area/district and provincial administrators, civil society organizations (CSOs) including women, youth and disability organizations, and government agencies with water and GESI mandates. These consultations provided valuable insight into water and food security issues in 'hot spot' areas identified by project governments for groundwater assessment and utilization demonstrations. Building on the results of this analysis, a GESI Action Plan (GAP) was prepared in compliance with GEF Gender Policy requirements, and in keeping with Project IA/EA GESI standards and target government guidelines. The complete Gender Analysis and Action Plan are included in **Annex L**.

#### **Key Findings**

Inequitable and inadequate access to clean water caused by a combination of climate factors - including draught and erosion, and human factors - including unsustainable use patterns, absent or malfunctioning infrastructure, contamination, cost and migration, has resulted in a number of serious consequences including:

- Food insecurity caused by decreased yields of high-quality subsistence crops, loss of livestock, depleted fisheries stocks and invasive pests have increased the burden of work for rural families, and especially women and is leading to malnutrition ? a situation made worse by the impacts of the COVID-19 pandemic.

- Health problems caused by consuming and bathing in contaminated water and malnutrition have resulted in increased prevalence of diarrhea, dehydration, skin diseases, eye infections and communicable diseases, which can have long-term impacts.
- Loss of livelihoods caused by reduced yield from cash crops and associated agricultural products (such as handicrafts) and livestock, has led to reduced family income and created hardship and added stress on families, which in turns leads to increased gender-based violence.
- Disruptions in education caused by absenteeism when children are kept home from school to assist with subsistence and livelihood tasks, including carrying water, or stay home due to poor sanitation and hygiene resources at home or school, all of which reduces academic outcomes and increasing drop-out rates.
- Poor hygiene and sanitation caused by water shortages for bathing and cleaning and non-functioning toilets, is resulting in health issues, including complications due to lack of menstruation hygiene management opportunities, and is also linked to increased gender-based violence.
- Household and community conflict caused by disputes over access to and use of limited water supply during drought conditions has resulted in the breakdown of family and community cohesion. In some cases, there are physical confrontations over water, and women have ?left home? due to inadequate water as to care for themselves and their children.
- Water-driven migration caused by the impacts of climate change including reduced access to basic WASH services required for daily life, has resulted in people relocating, often to already crowded urban located, which serves to increase socio-economic, housing and public infrastructure stressors in areas that are already struggling to provide efficient and reliable water and sanitation services.

Research also revealed that women are, for the most part, significantly under-represented in community and district level planning and decision-making processes regarding the use and management of water and other natural resources. This is of particular concern given that women are the primary users of water at householder level, yet do not have direct voice beyond family level. Further, water engineers and technicians are primarily male, with women not encouraged to take up these occupations as they are seen as ?men?s work.?

Community consultations also revealed that public understanding regarding ?ownership? of groundwater - which varies from country to country, island to island and community to community - can be a sensitive subject given the common customary belief in Melanesia that people who own the land also own what lies beneath it, even if this position is not supported in domestic law or policy.

### **Conclusions and Recommendations**

GESI Assessment findings support the Project Theory of Change (ToC) assertion that groundwater plays a critical role in water security in identified areas and that current levels of freshwater are inadequate to meet people?s basic needs especially during extended dry periods. In addition, communities do not understand how aquifers work or how to care for them, often believing they

are an inferior and unreliable source of quality water. It is expected that project supported water assessments, combined with distribution of user-friending education and communication (IEC) materials and training for women and men on proper groundwater management, will lead to improved water quantity and quality in targeted areas, create more equitable access to water for vulnerable groups, improve health and education outcomes, enhance livelihoods and reduce household and community level conflict caused by water shortages.

These outcomes will be achieved by strengthening monitoring and maintenance of groundwater sources using citizen science approaches, training young women and men as water monitors (or in other roles appropriate to the in local context), and by working in close collaboration with state and non-state agencies and networks engaged with WASH sector work at community, district and provincial level. The Project could also target local schools, youth groups and women's organizations to teach young people and mothers about groundwater and how best to manage this resource; develop aquifer educational information suitable for different audiences, and engage with PWD and their associations to improve water access and ensure their views and needs are heard and incorporated in WASH planning.

The Project will make a significant contribution to achieving SDG Goal 5 (Gender Equality), SDG 6 (Clean Water and Sanitation), and SDG 10 (Reduced Inequalities) while contributing to the implementation of existing domestic water policies, climate change frameworks, disaster preparedness, response and recovery plans, and GESI policies and plans of action.

The following list provides a summary of recommendations which form the basis of the Project GESI Action Plan (the GAP) contained in Section 5, which will be implemented through Country GESI Work Plans.

1. Gender equality and social inclusion are fully mainstreamed across all Project components and activities, and the Project takes every opportunity to strengthen women's voice and influence in groundwater planning, management, and governance.
2. Country-level GESI Work Plans are designed and implemented in alignment with the Project-wide GESI Action Plan (the GAP) and adjusted to the local context.
3. GESI capacity is increased within Country Project Management Units (PMUs), Implementing Agencies (IAs) and Project Steering Committees (regional and country level) to ensure there is a whole-of-project commitment to achieving GESI outcomes and to sustaining GESI-responsive management practices beyond the life of the Project.
4. Information, education and communications (IEC) materials produced by the Project are GESI-sensitive, user-friendly, and accessible to people with limited literacy, technical knowledge and internet access.
5. GESI factors are considered in the selection of Project infrastructure and technology, and in training stakeholders in, monitoring, repair and maintenance functions.

6. Community assessments are undertaken in all Project sites prior to any drilling or other works, to understand the effectiveness of existing water management/governance structures (i.e., Community Development, Water and Project Committees) as the basis for improving inclusive groundwater management.
7. Land access and use issues are fully assessed and addressed prior to any Project interventions to ensure adherence with established procedures and protocols and minimize any risk of potential conflict.
8. GESI audits of national and subnational WASH policies, and plans are conducted to provide a basis for institutional strengthening work under the Project or by other parties.
9. GESI is fully mainstreamed in the Project M&E system through the use by specific SAAD targets and indicators that capture qualitative and quantitative outcomes.

**Does the project expect to include any gender-responsive measures to address gender gaps or promote gender equality and women empowerment?**

Yes

**Closing gender gaps in access to and control over natural resources; Yes**

**Improving women's participation and decision making Yes**

**Generating socio-economic benefits or services or women Yes**

**Does the project's results framework or logical framework include gender-sensitive indicators?**

Yes

#### **4. Private sector engagement**

**Elaborate on the private sector's engagement in the project, if any.**

Considering the cross-cutting nature of water and the nature of investigations and infrastructural interventions planned for this project, properly designed engagement plans will be required to ensure the flow and exchange of relevant information and to encourage support and active engagement of all private sector groups who may either benefit or be affected by the project activities and findings. Opportunities exist for private sector engagement, ideally through industry recognised bodies. An example of this may include the identification of development opportunities of groundwater resources for commercial ventures; including improved livestock farming, aquaculture, high value crop irrigation, and mineral water bottling. Depending on the results emerging from the feasibility studies and detailed assessments, it is likely that private investors may for example finance the establishment of groundwater development infrastructure, for commercial or public water supply, with potentially socio-economic benefits (employment, income generation through tax, water security, introduction of farming practices, etc.).

It will be essential that clear communication strategies, including participatory exercises and engagement plans, be established in an inclusive and collaborative manner. These consultation activities will be designed to promote collaboration between private and public sectors, enhance relationships through information exchange during and beyond the project period, and importantly to safeguard the interests of the different sectors.

It is envisaged that the mapping of primary aquifers and the associated feasibility studies may also attract private investors for water supply or commercial development. It is expected that these new findings will provide a suitable platform for the national governments to either ramp up their investments in groundwater development or to market the new information to attract private investors and generating further economic benefits.

A first engagement between the Mineral Resources Department (MRD) of Fiji and the drilling industry took place in 2020 to agree on the industry's responsibilities and requirements related to drilling regulation, as proposed in the draft 'Groundwater Resources Development and Management Policy' that has recently been submitted to Cabinet for approval.

During the project's national design workshop conducted on 17 August 2021, a number of issues related to groundwater drilling were raised by various stakeholders. It was recognized that:

- There is a need to address substandard groundwater drilling and construction and enforcing the completion of boreholes to sanitary standards across the entire drilling industry. MRD should be able to enforce sanitary standards to all completed boreholes to reduce the risk of groundwater contamination.
- There is a need for MRD to be able to issue drillers' licensing to existing and new drilling companies and application of bore construction standards, bore location criteria and other regulatory requirements of similar drilling controls internationally (links exist with draft 'Groundwater Resources Development and Management Policy').
- There is a need for a national drilling registry including all bore locations, drilling logs, success rates, etc.
- There is a need for capacity building in advanced drilling techniques.

A follow up meeting was organized to evaluate the issues identified and to give an opportunity to the drilling companies operating in Fiji to share their views, also on the direction the Government is taking in relation to the draft policy and how the compliance issues may be addressed. It was agreed that there is a need for standard designs to be developed and shared with drilling companies and a common bore protection approach. Considerations include the fact that clients are many times low-income farmers and can't afford high quality materials. Standards should reflect that and strike the right balance that ensures a certain lifetime of the infrastructure. All companies agreed with the importance of a national drilling licensing due to the presence of various drilling companies following substandard techniques. This issue has been captured in the draft policy which is currently awaiting endorsement from Fiji Government. Based on the draft policy the Ministry is trying to establish a new dedicated monitoring unit separate from the current drilling and hydrogeology units. Opportunities will be explored to additionally support this initiative through a national drillers federation/association where all drillers self-regulate, receive training, and encourage to to elevate the quality and standards of drilling

companies and water supply infrastructure installed and it includes all interest parties including suppliers of materials etc. Alternatively, opportunities will be explored to create a 'Fiji chapter' of the Australian or New Zealand national association. It was additionally agreed that establishing a drilling registry would be aligned with MRD's licensing effort, through the establishment of a platform for all data to be stored within MRD. Drilling companies generally supported the idea of having a common GIS database with restricted access to registered members. Finally, all companies welcomed the opportunity for knowledge learning and sharing through participation in regional training events which could have direct benefits for communities (water supply bores).

Although not all aspects could be fully addressed, the meeting was valuable in that it brought the main drilling companies of Fiji together with MRD and a general agreement was reached to work towards addressing these issues for the benefit of the industry. Additional consultations will be conducted, and the drilling industry will be fully engaged during project implementation phase.

Representatives from the BWI have been contacted during the project design (national design workshop), and their views in regard to groundwater resource allocation and development were identified and expressed. This engagement will be further developed during the project implementation.

#### 5. Risks to Achieving Project Objectives

**Elaborate on indicated risks, including climate change, potential social and environmental risks that might prevent the project objectives from being achieved, and, if possible, the proposed measures that address these risks at the time of project implementation.(table format acceptable):**

Description of risk	Impact	Probability of occurrence <sup>3</sup>	Mitigation actions
Lack of engagement on behalf of private industry (bottling water industry)	L	H	Communication with private industry will be developed early in the project to ensure their cooperation through demonstrated value of groundwater monitoring and informed aquifer management planning.
No suitable land areas are made accessible for water monitoring and water supply infrastructure	H	L	To the extent possible, infrastructure will be installed within Government owned/leased land to avoid issues. If specific installations need to take place within private or customary-owned land, suitable consultations with landowners will take place to reach agreement.
Long term access to sites not guaranteed	H	L	To the extent possible, sites will be selected within Government owned/leased land. Good communications strategies through consultation with communities, local governments and landowners will help to ensure commitment to project interventions.

Vandalism of installed monitoring infrastructure	H	L	Asset protection measures (fencing, housing, etc.) will be put in place.
Data needed for feasibility studies and conceptual models not sufficient	H	M	Remote sensing information will be used to complement spatial data gaps where they exist. The project is also proposing collection of new in-situ information in strategic locations.
Inability to establish groundwater production and monitoring boreholes due to difficulties of mobilizing conventional drilling rigs to remote locations.	H	M	Various options exist in regard to borehole construction and drilling technology. Appropriate technology and construction techniques will be applied, albeit this may affect the number of bores that are able to be constructed.
Provincial and local governments may perceive infrastructural developments as being driven by central government.	M	L	Good communications strategies through consultation with communities, local governments and landowners will help to ensure commitment to project interventions.
Absorptive capacity for knowledge transfer at the sub-national governance level may be inadequate and unsustainable.	M	L	It is recommended to assess the absorptive capacity in the identified area before committing to any interventions; maximise opportunities to employ local staff in the activity.
Possible lack of national and local buy-in for the development and adoption of aquifer management plans.	M	L	Communication with local and national governance structures will be developed early in the project to ensure their cooperation through demonstrated value of aquifer management planning. National and local governments have identified risks to groundwater and addressing these risks by the project have direct benefits to the communities.
The project could potentially pose risks related to OH&S due to physical hazards during project construction.	M	L	As drilling of production and monitoring boreholes is foreseen, these activities could potentially pose OH&S related risks. Strict OH&S procedures will be imposed to prevent physical hazards.
The proposed project interventions will potentially result in the generation of non-hazardous waste.	L	L	The installation of groundwater development and monitoring infrastructure will potentially result in the generation of non-hazardous waste, including PVC pipes. A disposal plan for the material brought onsite (PVC pipes etc.) will be developed to ensure that the environmental and social impact are minimized.

<p>The identification and feasibility assessment of new groundwater resources could potentially further support uncapped groundwater development while failing to assure there is a balance between recharge and withdrawals.</p>	<p>H</p>	<p>L</p>	<p>Through the governance reforms proposed under Component 2 (development and updating of groundwater legislation and policies) it is expected that a suitable evidence-based permitting system will be established and enforced, and groundwater development will be monitored through suitable infrastructure and coordination between relevant Government Departments and Ministries (proposed inter-ministerial committees). Specific measures such as groundwater allocation schemes, zoning, and incentives to enhance efficient water use will additionally be explored to ensure groundwater withdrawals are maintained within sustainable limits.</p>
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<p>COVID-19 containment measures extend into or are re-instated during project implementation phase.</p>	<p>H</p>	<p>H</p>	<p>Currently, containment measures in Fiji are gradually being lifted and travel/work around the country is expected to be fully normalized by project initiation. However, a new COVID-19 wave could result in new containment measures being re-instated. International travel to Vanuatu and Solomon Islands is currently restricted, with quarantine requirements in place. While it is likely that international travel will have resumed by project initiation, this remains uncertain, and it might affect the availability of project capacity, project timelines, the stakeholder engagement process, and the enabling environment.</p> <p>SPC has been successfully managing regional projects during 2020-2021 while all Pacific Island countries had their international borders closed (e.g. GEF - Managing Coastal Aquifers in Selected Pacific SIDS). This has been achieved through enhancing national capacities through targeted recruitment of full-time project staff in the project countries to allow for national project activities to be closely managed and ensure their timely delivery. Currently, the project design considers the contracting of national project coordinators (one per country) to oversee national activities on a contract basis according to the proposed work plan. If border restrictions prevent quarantine-free technical expertise to travel to the countries, the situation will be managed through remote support whenever possible (e.g. technical assistance required for the drafting/review of groundwater policies/legislations) and through the contracting of Chief Technical Adviser additional technical support. If the expertise cannot be found in-country, options including internationally recruited expertise will be considered, with quarantine costs borne by the project. Provisions have been made in the project budget to allow for these increased costs, if required.</p> <p>In addition, SPC has been managing the situation by modifying project workplans to accommodate, where possible, all project activities that can be delivered remotely or without the need for physical presence (e.g. desktop work, modelling, trainings) early during implementation phase with the expectation that restrictions will gradually ease off. However, if certain activities have to initiate before a specific time to ensure their timely delivery, then these will have to be delivered locally by a suitable consultancy, NGO, or Government Department. In most cases, virtual trainings may be required to increase the chances of successful delivery of the specific activities. These trainings are mainly focussing on allowing national project counterparts to successfully collect data which are subsequently sent to SPC for analysis and interpretation. Over the last 2 years, SPC has gained significant experience in facilitating virtual training of national counterparts in data collection and technical work delivery.</p>
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			Domestic travel restrictions can substantially affect the enabling environment and cause serious impacts on project delivery. In such situation, the proposed workplan will have to be modified accordingly and priority will be given to all activities that can be delivered remotely.
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## 6. Institutional Arrangement and Coordination

**Describe the institutional arrangement for project implementation. Elaborate on the planned coordination with other relevant GEF-financed projects and other initiatives.**

### 6a) Institutional arrangements for project implementation and execution.

The Pacific Community (SPC) will act as the Executing Agency, with FAO providing oversight as GEF Implementing Agency as described below. SPC will have the overall executing and technical responsibility for the project execution and will be responsible for the day-to-day management of project results entrusted to it in full compliance with all terms and conditions of the Operational Partnership Agreement (OPA) signed with FAO. As Operational Partner (OP) of the project, SPC, will be responsible and accountable to FAO for the timely implementation of the agreed project results, operational oversight of implementation activities, timely reporting, and for effective use of GEF resources for the intended purposes and in line with FAO and GEF policy requirements.

#### Project Steering Committee

The Project Steering Committee (PSC) will be established to provide strategic guidance to the PMU and take decisions related to the project implementation including approval of project plans, budgets and revisions. The PSC will be comprised of representatives from the Implementing Agency (FAO), the Operational Partner (SPC) and the Beneficiaries (designated National Beneficiary Representatives in project countries). The three countries will co-chair the PSC. The members of the PSC will each assign a Focal Point for the project. Hence, the project will have a Focal Point in each concerned institution. The Chief Technical Adviser will be the Secretary to the PSC. The PSC will meet at least once per year to ensure:

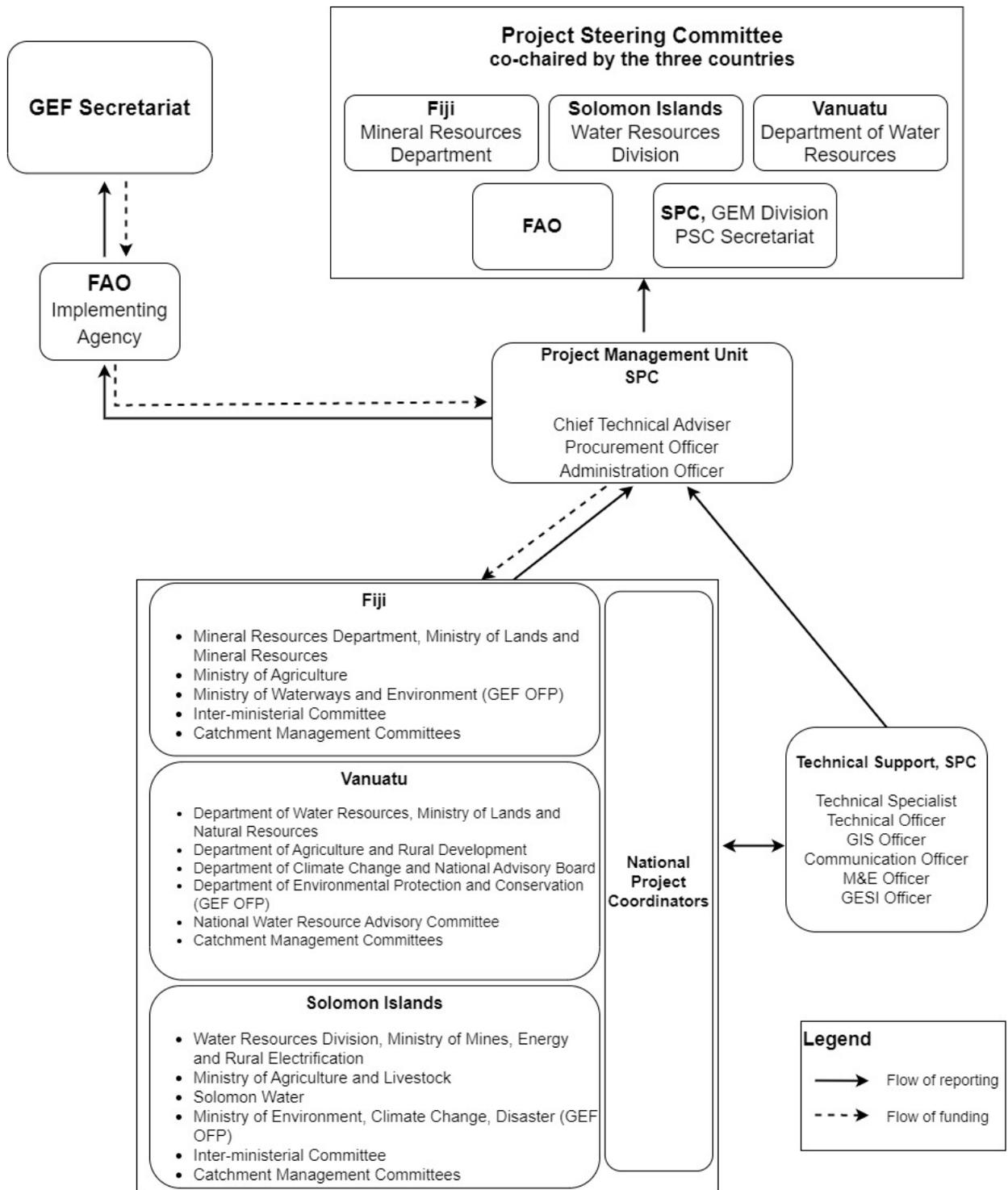
1. Oversight and assurance of technical quality of outputs;
2. Close linkages between the project and other ongoing projects and programmes relevant to the project;
3. Timely availability and effectiveness of co-financing support;
4. Sustainability of key project outcomes, including up-scaling and replication;
5. Effective coordination of governmental partners work under this project;
6. Approval of the annual Project Progress and Financial Reports, the Annual Work Plan and Budget;
7. Making by consensus, management decisions when guidance is required by the PMU.

The PSC members will: (i) technically oversee activities in their sector; (ii) ensure a fluid two-way exchange of information and knowledge between their agency and the project; (iii) facilitate coordination and links between the project activities and the work plan of their agency; and (iv) facilitate the provision of co-financing to the project.

Each country government participating in the project will designate a National Beneficiary Representative. The National Beneficiary Representative will be responsible for coordinating the activities with all the national bodies related to the different project components, as well as with the project partners. They will also be responsible for supervising and guiding the Chief Technical Adviser on the government policies and priorities.

The National Beneficiary Representative (or designated person from lead national institution) will chair the Project Steering Committee (PSC) which will be the main governing body of the project. The Chair of the PSC will rotate between the National Beneficiary Representative on an annual basis. The PSC will approve Annual Work Plans and Budgets on a yearly basis and will provide strategic guidance to the Project Management Team and to all executing partners.

The overall project organizational structure and reporting lines between the various stakeholders are outlined in Fig. 22 hereunder.



**Figure 22.** Project organization structure

A Project Management Unit (PMU) will be established within the GEM Division of SPC in Suva, Fiji and will be funded by the GEF grant. The main functions of the PMU, following the guidance of the Project Steering Committee, will be to ensure overall efficient management, coordination, implementation and monitoring of the project through the effective implementation of the annual work plans and budgets. The PMU will be composed of a Chief Technical Adviser (CTA) who will work part-time (68%) for the project lifetime. In addition, the PMU will include a Regional Administration Officer with the position being fully funded by the PMC.

The PMU will oversee daily implementation, management, administration and technical supervision of the project, on behalf of the Operational Partner and within the framework delineated by the PSC. The PMU will be responsible, among others, for:

1. Overall technical and operational lead for the implementation of all project outputs and activities and ensure technical soundness of project implementation;
2. Coordination and close monitoring of the implementation of project activities;
3. Coordination with relevant initiatives and activities by other projects including other GEF-financed projects;
4. Ensuring a high level of collaboration among participating institutions and organizations at the national and local levels;
5. Ensuring compliance with all Operational Partners Agreement (OPA) provisions respectively during the implementation, including on timely reporting and financial management;
6. Leading and supervising the preparation of various technical outputs, e.g., knowledge products, reports and case studies.
7. Ensuring meaningful engagement of stakeholders as per the Stakeholder Engagement Plan.
8. Ensuring that all project resources are used solely to achieve project objectives consistent with the approved work plan and budget and government financial policies and FAO/GEF requirements.
9. Tracking the project's progress and ensuring timely delivery of inputs and outputs including targets for the project's indicators in line with the results framework;
10. Providing technical support and assessing the outputs of the project national consultants hired with GEF funds, as well as the products generated in the implementation of the project, including knowledge management and communication outputs;
11. Approving and managing requests for provision of financial resources using provided format in OPA annexes;
12. Monitoring financial resources and accounting to ensure accuracy and reliability of financial reports;
13. Ensuring timely preparation and submission of requests for funds, financial and progress reports to FAO as per OPA reporting requirements;
14. Maintaining documentation and evidence that describes the proper and prudent use of project resources as per OPA provisions, including making available this supporting documentation to FAO and designated auditors when requested;
15. Implementing and managing the project's monitoring and communications plans;
16. CTA to manage and monitor the project risks initially identified including social and environmental risks. and update the status of these risks by maintaining the project risks log.

17. Organizing project workshops and meetings to monitor progress and preparing the Annual Budget and Work Plan;
18. Submitting the six-monthly Project Progress Reports (PPRs) with the AWP/B to the PSC and FAO;
19. Preparing the first draft of the Project Implementation Review (PIR);
20. Supporting the organization of the mid-term review in close coordination with the FAO Budget Holder and the GEF Coordination Unit.
21. Supporting the organization of the terminal evaluation in close coordination with the FAO Budget Holder and the FAO Independent Office of Evaluation (OED).
22. Submitting the OP required technical and financial reports to FAO and facilitate the information exchange between the OP and FAO, if needed;
23. Informing the PSC and FAO of any delays and difficulties as they arise during the implementation to ensure timely corrective measure and support.
24. Providing draft terminal report for BH two months before the ending date of the OPA or the project;

**The PMU** will be supported on a needs basis for the delivery of the project's activities by a project support team consisting of appropriately qualified existing SPC staff, with the project funding a proportion of their salary (cost recovery) as indicated between brackets. This project support team will consist of a technical specialist (98%), a technical support officer (35%), a GIS officer (20%), a communication officer (10%), a Procurement Officer (10%), and a GESI officer (6%). SPC being the principal scientific and technical organisation in the Pacific region has the capacity and mandate from its member countries to deliver on the technical and other scientific aspects of projects in the region. As such, it is proposed that also under this project SPC utilizes its existing technical, scientific, and social development expertise in delivering, in collaboration with a number of contractors and national consultants, the proposed project Outputs. The tasks associated with project delivery and expected under each project Component for the proposed positions are described in the detailed TORs provided in Annex M.

**The Chief Technical Adviser (CTA)** will be recruited following SPC's procedure, or utilise appropriately qualified existing SPC staff, with input to the selection process from the Project partners. The position will be appointed by the project executing agency with the project supporting 68% of the cost for the CTA position responsibilities. The CTA will be responsible for the overall management of the Project, including the mobilisation of all project inputs, supervision over project staff, consultants and sub-contractors. The CTA will report to the Regional Steering Committee for all of the Project's substantive and administrative issues. From the strategic point of view of the Project, the CTA will report on a periodic basis to the Regional Steering Committee, based on the Regional Steering Committee's instruction. The CTA will be responsible for regular monitoring of project results and risks, including social and environmental risks. The CTA will perform a liaison role with the government, FAO and other UN agencies, CSOs and project partners, and maintain close collaboration with other donor agencies providing co-financing. The CTA will work closely with the Project Implementing Agency coordinators. A detailed description of tasks is given in Annex M.

### **Country engagement**

Engagement with the project countries will be achieved primarily through the key national stakeholders identified for each country during the national design phase. These by default include the national lead agencies (Mineral Resources and Water Resources Departments) and the Ministries of Agriculture due to the nature of the project. Additionally, for each project country, other specific key stakeholders have been identified expecting to have an important role during the delivery of project activities. In facilitating the execution of the proposed activities at the national and local level, existing national water committees and catchment management committees will be engaged. These committees and the stakeholders they consist of were identified during the project design phase and their participation during national design workshops ensured their commitment during project implementation.

In Vanuatu, the National Water Committee established in 1994 and the more recent National Water Resource Advisory Committee will be revived to oversee the implementation of proposed activities at the national level. Additionally, the Sarakata Catchment Management Committee established during the GEF IWRM Project will be engaged to oversee activities at the local level in the Sarakata Catchment and the more recent Tagabe Catchment Management Committee, established during the GEF R2R, will be consulted to ensure lessons learned during R2R are taken into consideration.

In Fiji, an Inter-ministerial Committee will be established to oversee legislation/policy development and aquifer management planning under project Component 2 and to provide coordination at the national level for interventions proposed under Component 3. The first steps in bringing together Government Departments from different Ministries to better coordinate licensing and operation of the water bottling industry were made during the project design phase. These initiatives will be formalized early during project implementation through the signing of MOUs between relevant Departments and Ministries. Moreover, existing Catchment Management Committees (e.g. Nadi Basin Catchment Committee) will be engaged to ensure their input and involvement in aquifer management planning and consideration of lessons learnt.

In the Solomon Islands, several stakeholders were engaged during project design (Government, NGOs and civil society) which form part of the National Inter-sectoral Water Coordinating Committee established in 2009 to coordinate the GEF IWRM planning process and the Joint Inter-ministerial Committee established in 2017 to oversee the GEF R2R project activities. These committees as well as other specific groups (e.g. the Kovi/Kongulai Catchment Group) will be engaged to oversee project activities and ensure their long term sustainability. Solomon Water has been identified as a key stakeholder with whom collaboration should be maintained due to the complementarity that exists between the work proposed under this project and the work Solomon Water is delivering (and planning) in Honiara.

Regional oversight and technical support will be provided by SPC throughout the entire project duration, replicating previous successful models of project implementation.

Engagement will also be maintained with the GEF operational focal points and their respective agencies mainly during the annual PSC meetings to assess project progress and workplans. Engagement with national lead agencies will be maintained at Director level (or their designated representatives) to coordinate nationally implemented activities and annually during PSC meetings.

**National project coordinators** engaged for the duration of the project in each country, will play an essential role in facilitating communication and engagement with relevant stakeholders at national, island and community level. The national project coordinator will be supported by the operational partner to ensure relevant and appropriate information on the project is effectively communicated to the stakeholders in accessible formats. The coordinators will play a key role in maintaining country engagement and driving national project activities. Project funds to cover for the position and associated operational budget will be transferred to the national lead agencies through a grant agreement with the Operational Partner (SPC). The National Project Coordinator shall consult and coordinate with PMU and other representatives of SPC and report directly to the CTA. The position will be recruited by and sitting within the national lead agencies, reinforcing the national ownership aspect of the project.

In addition to the National Project Coordinators, local consultants based in the three project countries will be additionally contracted on a needs basis to support the national project coordinators implementing some of the more technical activities at the national level.

The financing of certain nationally implemented activities will be managed directly by SPC utilizing SPC's accredited procurement and project management policies and capacity. Where appropriate (approved micro assessments and assurance activity plans in place), funds will be transferred to the national lead agencies using grant agreements. In-country procurements, depending on their nature could be managed by either SPC or the national lead agency utilizing the operational budget transferred through grant agreements. For example, costs related to bringing together the members of inter-sectoral and inter-ministerial committees would be best managed by the national lead agencies.

**The Food and Agriculture Organization (FAO)** is the implementing agency (IA) and has the overall responsibility to GEF for delivering all milestones according to work plan. The GEF will make its payments based on these milestones. It should be noted that the identified Operational Partner(s) or OP results to be implemented by the OP and budgets to be transferred to the OP are non-binding and may change due to FAO internal partnership and agreement procedures which have not yet been concluded at the time of submission of this funding proposal. In the IA role, FAO will utilize the GEF fees to deploy three different actors within the organization to support the project:

- The Budget Holder, the FAO Sub-Regional Coordinator for the Pacific (FAO-SAP), will provide oversight of day to day project execution;
- The Lead Technical Officer(s), from FAO's Regional Office for Asia and the Pacific, will provide oversight/support to the projects technical work in coordination with government representatives participating in the Project Steering Committee;
- The Funding Liaison Officer(s) within FAO will monitor and support the project cycle to ensure that the project is being carried out and reporting done in accordance with agreed standards and requirements.
- The HQ Technical Officer is accountable for advising and supporting the LTO in ensuring project formulation, appraisal and implementation adhere to FAO corporate technical standards and policies.

FAO responsibilities, as GEF agency, will include:

- Administrate funds from GEF in accordance with the rules and procedures of FAO;
- Oversee project implementation in accordance with the project document, work plans, budgets, agreements with co-financiers, Operational Partners Agreement(s)and other rules and procedures of FAO;
- Provide technical guidance to ensure that appropriate technical quality is applied to all activities concerned;
- Conduct at least one supervision mission per year; and
- Report to the GEF Secretariat and Evaluation Office, through the annual Project Implementation Review, the Mid Term Review, the Terminal Evaluation and the Project Closure Report on project progress;
- Financial reporting to the GEF Trustee.

GESI awareness and capacity will be built within the PMU and Steering Committee to ensure whole-of-project commitment to achieving GESI outcomes and sustaining GESI-responsive management practices beyond the life of the Project. GESI sensitization and awareness training will be conducted by the Gender Specialist and local GESI organizations. Pre and post learning surveys will be conducted to track changes in knowledge and attitudes about GESI and its relevance to achieving sustainable water security.

#### **6.b Coordination with other relevant GEF-financed projects and other initiatives.**

Several relevant initiatives, financed by the GEF and other donors are currently taking place in the three project countries. Preliminary consultations have taken place with stakeholders involved in some of these initiatives and relevant activities supporting (and potentially co-financing) the current project have been identified and presented in the Table below. Coordination with these relevant projects will be ensured through the active participation of project staff during national workshops and inception meetings and through effective communication maintained throughout the entire project duration.

In the Solomon Islands, substantial complementarity is foreseen with the ADB/EU/GEF financed activities aiming at improving the efficiency of urban water supply and sanitation services in Honiara. The proposed project, through the enhanced understanding of the Honiara aquifer, the identification of new groundwater sources, and the development of a groundwater management plan will contribute to the objective of the ADB/EU/GEF projects. Similarly, it is expected that the comprehensive mapping and modelling of watersheds (including the Kongulai catchment) proposed under the GEF component will serve as important baseline information for the development of the Honiara aquifer management plan and for the broader understanding of aquifer processes.

In Vanuatu, complementarity exists with the upcoming ADB-funded Luganville Urban Water Supply and Sanitation project which is currently under its Project Readiness Financing stage. The Luganville water supply is currently sourced from an old bore and plans exist under the ADB project to expand the groundwater supply through additional bores. The resource management activities around the Sarakata

Catchment proposed under this GEF project will have to consider the current and future groundwater abstraction through the expanded Luganville water supply network.

**Table 20.** Relevant projects and identified co-financing (for non-GEF projects).

Project	Project objective	Relevant expected results	Co-financing in USD
<b>Solomon Islands</b>			
<p>Solomon Islands: Urban Water Supply and Sanitation Sector Project (ADB/EU)</p>	<p>To improve efficiency, climate change and disaster resiliency, and sustainability of safe water and sanitation in Honiara and five other urban areas.</p>	<p>Outcome 1: Continuous, safe, and climate resilient urban water supply ensured.</p> <p>Outcome 2: Effective, efficient, safe and climate resilient urban sanitation services provided.</p> <p>Outcome 3: Awareness and behaviors of hygiene and water conservation in Honiara enhanced and sustained.</p> <p>Outcome 4: Solomon Islands Water Authority (Solomon Water) is financially and technically sustainable.</p>	<p>Total project budget: 9 million (ADB) 20.35 million (EU)  (\$6,806,746 considered as co-financing)</p>
<p>Strengthening Resilience of Water Supply in Honiara (GEF-7)</p>	<p>To improve efficiency, accessibility, climate change and disaster resiliency, and sustainability of safe water and sanitation in Honiara.</p>	<p>Component 1: Development of watershed maps and hydrological models.</p> <p>Component 2: Support community livelihood and forest carbon PES activities.</p> <p>Component 3: Improve watershed governance</p>	

<p>Community Resilience to Climate and Disaster Risk in Solomon Islands Project (GEF-5)</p>	<p>Increase the capacity of selected rural communities to manage natural hazards and climate change risks.</p>	<p>Capacity of Government agencies and partners to generate and use data, information and modelling tools to support planning, implementation and monitoring of CCA and DRR strategies and actions is enhanced.</p> <p>Vulnerability of selected communities against extreme events and climate change impact is reduced.</p>	
<p>Solomon Islands Water Sector Adaptation Project (SIWSAP) (GEF-5)</p>	<p>To improve the resilience of water resources to the impacts of climate change in order to improve health, sanitation and quality of life, and sustain livelihoods in targeted vulnerable areas of the Solomon Islands.</p>	<p>Water Sector ? Climate Change Adaptation Response Plans formulated, integrated and mainstreamed in water sector-related and in broader policy and development frameworks.</p> <p>Increased reliability and improved quality of water supply in targeted areas.</p> <p>Investments in cost-effective and adaptive water management interventions and technology transfer.</p> <p>Improved governance and knowledge management for CCA in the water sector at the local and national levels.</p>	

<p>Enhancing urban resilience to climate change impacts and natural disasters: Honiara (Adaptation Fund)</p>	<p>To enhance the resilience of Honiara and its inhabitants to current and future climate impacts and natural disasters, with a particular focus on pro-poor adaptation actions that involve and benefit the most vulnerable communities.</p>	<p>Reduced vulnerability of hotspot communities to climate-related hazards and threats.</p> <p>Strengthened awareness and ownership of adaptation and climate risk reduction processes and capacity to implement at local level.</p> <p>Increased ward-level climate, disaster and ecosystem resilience in response to climate change and variability induced stress.</p> <p>Strengthened institutional capacity to reduce risks associated with climate induced socioeconomic and environmental losses.</p>	
<p>Enhancing resilience of communities in Solomon Islands to the adverse effects of climate change in agriculture and food security (Adaptation Fund)</p>	<p>To strengthen ability of communities in the Solomon Islands to make informed decisions and manage likely climate change driven pressures on food production and management systems.</p>	<p>Promote and pilot community adaptation activities enhancing food security and livelihood resilience in communities in the low lying, coastal and highland areas of the country.</p> <p>Strengthening of institutions and enabling environment for effective implementation of policy instruments and actions to integrate climate risks into agriculture and food security.</p> <p>Generation and diffusion of knowledge on adapting to climate change in a systemic manner at the community, national and regional level.</p>	
<p><b>Vanuatu</b></p>			

<p>Adaptation to Climate Change in the Coastal Zone in Vanuatu ? Phase II (VCAP II) (GEF-7)</p>	<p>To improve the resilience of the vulnerable areas and communities therein to the impacts of climate change through integrated approaches in order to sustain livelihoods, food production and preserve and improve the quality of life by building on the lessons learned from the first phase project.</p>	<p>Improved Climate resilience of coastal and upland areas through integrated approaches.</p> <p>Reduced exposure to flood-related risks and hazards in the target coastal and inland communities.</p> <p>Climate change Adaptation enabling policies and supportive institutions in place.</p> <p>Human resources in place at the national, provincial and community levels.</p> <p>Increased awareness and ownership of climate risk reduction processes at the national and local levels.</p>	
<p>Luganville Urban Water Supply and Sanitation (Project Readiness Financing) 2020-2023 (ADB)</p>	<p>To improve access to integrated and resilient urban water supply and sanitation services in greater Luganville, Vanuatu.</p>	<p>The project and associated project readiness financing facility will assist the government to implement selected high priority improvements, and will include three outputs: (i) urban water access, quality, and resilience is improved; (ii) urban sanitation and hygiene awareness are improved; and, (i) capacity and resilience in urban service delivery is improved. The project will also investigate potential support for future private sector participation water supply system operation.</p>	<p>Total project budget: 3 million (not considered as co-financing for this project)</p>

<p>Climate Information Services for Resilient Development in Vanuatu 2015-2022 (GCF)</p>	<p>To address key climate change vulnerabilities and support climate resilient development</p>	<p>Activity 1.1: Review existing Vanuatu Government policy, planning and associated institutional/governance arrangements as related to climate adaptation and disaster risk management, and use of climate information services (incl. water sector).</p>	<p>0.164 million</p>
	<p>through the delivery of tailored Climate Information Services, with a focus on 5 priority development sectors.</p>	<p>Activity 1.2: Delivery of targeted training and on-the-job support for application of CIS.</p>	<p>1.36</p>
		<p>Activity 1.3: Application of CIS through selected case studies within the priority sectors (incl. water sector).</p>	<p>0.164</p>
		<p>Activity 3.1: Delivery of all on-line CIS outputs including more customized access for Decision Support System tools and processes (Activity 3.1).</p>	<p>0.435</p>
		<p>Activity 3.2: Development of a Vanuatu Climate Futures portal for accessing, analyzing and visualizing multi-decadal GCM and down-scaled projections and sector specific (incl. water sector) application-ready datasets for key climate variables.</p>	<p>0.355</p>
		<p>Activity 4.1: Digitised high quality daily/sub-daily data from archived paper records for key climate parameters (including rainfall) from relevant observations stations for purposes of uploading to CliDE and associated VMGD data portals.</p>	
		<p>Activity 4.3: Development (incl. back-up systems) and maintenance (incl. servicing and spare parts) of existing</p>	<p>0.21</p>

		<p>VMGD weather and climate infrastructure.</p> <p>Activity 4.4: Installation of new automated weather stations where required for collecting core agro-meteorological data.</p> <p>Activity 5.4: Develop and provide downscaled (&lt; 20Km grid size) multi-decadal projections for temperature, rainfall, drought, tropical cyclones.</p> <p>Activity 5.5: Develop tailored, application-ready climate projection data sets for use in climate vulnerability/impact assessments for relevant sectors (incl. water sector).</p> <p>Activity 5.8: Develop and apply agro-met services utilizing climate information for climate smart decision-making in agricultural sector.</p>	<p>0.955</p> <p>0.655</p> <p>0.61</p> <p>0.61</p> <p>0.39</p>
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<p>Enhancing Adaptation and Community Resilience by Improving Water Security in Vanuatu (GCF ? under preparation)</p>	<p>To support communities creating Drinking Water Safety &amp; Security Plans and to adapt water supplies to make them more resilient, through source water protection zones and physical water system improvements.</p>		<p>14.765 million (not considered as project is currently being designed)</p>
<p>R2R: Integrated Sustainable Land and Coastal Management (GEF-5)</p>	<p>To test and implement sustainable and integrated management of forest, land and marine resources to achieve effective ridge-to-reef (R2R) conservation in selected priority watersheds in Vanuatu.</p>	<p>Farmers, ranchers and fishers are managing resources sustainably in target localities, resulting in improved flows of ecosystem goods and services, as a result of increased capacities and awareness.</p> <p>Capacities for generation of ecosystem goods and services are permanently restored in priority areas affected by land degradation</p>	
<p><b>Fiji</b></p>			
<p>Strengthening Hydro-Meteorological and Early Warning Systems in the Pacific (CREWS) (WMO/ UNDRR/ WB)</p>	<p>To enhance the effectiveness and inclusiveness of Pacific Island and Regional Early Warning systems for local and vulnerable populations</p>	<p>Output 3.4: Capacities to detect, monitor and forecast severe high impact meteorological, hydrological, and other related environmental hazards? events improved.</p> <p>Output 3.7: Socio-economic benefits of Regional Specialized Meteorological Centre Nadi and Fiji Meteorological Service demonstrated.</p>	

<p>Fiji urban water supply and wastewater management project (GCF)</p>	<p>To improve access to safe water and sewerage services by building infrastructure to increase water production by 20% and wastewater treatment by 200% in the greater Suva area, and supporting government to develop and implement policy and regulatory reforms in water and sewerage.</p>	<p>Strengthened institutional and regulatory systems for climate-responsive planning and development.</p> <p>Strengthened adaptive capacity and reduced exposure to climate risks.</p>	
<p>Community-based Integrated Natural Resource Management Project (GEF-6)</p>	<p>To promote community-based integrated natural resource management at landscape level to reduce land degradation, enhance carbon stocks and strengthen local livelihoods in Ra and Tailevu provinces</p>	<p>Local level capacities strengthened for integrated natural resource management.</p>	
<p>Implementing a "Ridge to Reef" Approach to Preserve Ecosystem Services, Sequester Carbon, Improve Climate Resilience and Sustain Livelihoods in Fiji (Fiji R2R) (GEF-5)</p>	<p>To preserve biodiversity, ecosystem services, sequester carbon, improve climate resilience and sustain livelihoods through a ridge-to-reef management of priority watersheds in the two main islands of Fiji.</p>	<p>Integrated catchment management plans integrating conservation of biodiversity, forests, land and water formulated and implemented in priority sites.</p> <p>Strengthened governance for integrated natural resources (land, water, biodiversity, forests) management.</p>	

<p>Increasing the resilience of informal urban settlements in Fiji that are highly vulnerable to climate change and disaster risks (Adaptation Fund)</p>	<p>To increase the resilience of informal urban settlements in Fiji that are highly vulnerable to climate change and disaster risks.</p>	<p>Strengthened awareness and ownership of adaptation and climate risk reduction processes and capacity at the community level with particular emphasis on women, youth, older people and other people in vulnerable situations.</p> <p>Increased adaptive capacity with relevant development and natural resource sectors and increased ecosystem resilience in response to climate change and variability induced stress.</p>	
<b>Regional</b>			
<p>ISLANDS - Pacific Child Project (GEF-7)</p>	<p>To prevent the build-up of POPs and mercury materials and to manage and dispose of existing harmful chemicals and wastes across Pacific SIDS.</p>	<p>Harmful chemicals and materials present and/or generated in SIDS are being disposed of in an environmentally sound manner.</p>	

## 7. Consistency with National Priorities

Describe the consistency of the project with national strategies and plans or reports and assessments under relevant conventions from below:

NAPAs, NAPs, ASGM NAPs, MIAs, NBSAPs, NCs, TNAs, NCSAs, NIPs, PRSPs, NPFE, BURs, INDCs, etc.

The project is consistent with the national priorities in the project countries. Analysis of compliance per country follows.

### Fiji

The importance placed on water and sanitation by the Fijian Government is clearly stipulated in Section 35 and 36 of the Constitution of the Republic of Fiji where it provides the following:

- Section 35 ?The State must take reasonable measures within its available resources to achieve the progressive realisation of the right of every person to accessible and adequate housing and sanitation?.

- Section 36 ?The State must take reasonable measures within its available resources to achieve the progressive realisation of the right of every person to be free from hunger, to have adequate food of acceptable quality and to clean and safe water in adequate quantities.?
- The Green Growth Framework for Fiji was developed in 2014 as a tool to accelerate integrated and inclusive sustainable development, strengthen environmental resilience, drive social improvement and reduce poverty, enhance economic growth and also build capacity to withstand and manage the anticipated adverse effects of climate change. Thematic Area 6 of the GGF describes the importance of freshwater resources and sanitation management and empowerment of water catchment management to ensure protection of Fiji?s sustainable freshwater resources from risk of pollution and other contaminants and other catchment security. It also stresses on the need to implement adaptation measures to protect freshwater aquifers from saltwater intrusion and develop water infrastructure that minimize ecosystem impacts.

Fiji?s 5 Year and 20 Year National Development Plan 2017-2036 stresses the need to have 100% of urban population accessing clean and safe water and proper sanitation by 2021 and for the rural and maritime areas by 2030. Linked to this water and sanitation vision and of relevance to this project are the following NDP objectives:

1. Allocation of resources for sustained maintenance and construction of rural water schemes, development of groundwater sources and aquifer management.
2. Considerations to build climate resilient water infrastructure for all new projects.

In response to international commitments and national needs, under the leadership of the Ministry of Economy, the Fijian Government prepared a high-level strategic National Adaptation Plan (NAP) to spearhead ongoing efforts to comprehensively address climate change. Among other things, the NAP is particularly expected to have benefits for ensuring sustainable withdrawal and supply of fresh water to address water scarcity and to substantially reduce the number of people suffering from water scarcity. The NAP calls for integrated water resource management and for the protection and restoration of water-dependent ecosystems. The NAP also viewed water infrastructure vulnerability to environmental and climate hazards as a critical concern, as water is an input into agriculture, industry, electricity generation, sanitation, and human consumption.

The Rural Water and Sanitation Policy 2021, developed by the Department of Water and Sewerage under the Ministry of Infrastructure and Meteorological Services, identifies the lack of understanding on the broader impacts of groundwater extraction to aquifers. The proposed work under this project is well aligned with:

- Policy Objective 1: All sources of water are investigated and jointly developed and managed to provide the optimum long-term supply for the local community and as far as possible eliminate the risk of water borne diseases from the drinking water.
- Policy Objective 2: The impacts of increased water use and wastewater disposal are properly estimated and measures taken to manage them to ensure they are not polluting the water sources.
- Policy Objective 5: Water sources are not damaged by over-exploitation and they are sustainably used and that their quality is maintained and natural benefits protected.

To achieve the recommendations and targets set out in the GGF, NDP and NAP, the National Water Resources Management and Sanitation Policy was drafted in 2021 aiming to provide strategies and targets to guide implementation at national, divisional and operational level among water and sanitation stakeholders. The proposed GEF investment is well aligned with the following Policy Targets:

- Ensure water resources are sustainably, equitably and productively managed for all sectors of Fiji society.
- A well coordinated water resources allocation and water rights provision for Fiji's water sector.
- A well coordinated data sharing mechanism on aquifers, rivers, streams, rainfall for water sectors stakeholders.
- A sustainable ground water management.
- Efficient, equitable and sustainable water resources for all water users and uses.

The associated Strategies proposed in this Policy which the project could support include:

- The development of a Water Resources Act to ensure ownership of water is to be vested in the State.
- The establishment of a National Water Resources Statistics database and mechanism for detailed water resources monitoring and management in collaboration with other relevant agencies.
- The establishment of a monitoring and enforcement regime to make water allocation plans for areas of specific concern.
- Ensuring data collection and analysis to spot intervention areas and needs.
- Enhancing capacity to analyze water availability through strengthening hydrological analysis.
- Improving water information and data through investment.

In terms of groundwater management specifically, the Policy proposes the following strategies:

- Investigating, assessing and monitoring the availability and use of groundwater in water stressed areas and in deep aquifers.
- Collaboration between stakeholders to prevent deterioration of the status of groundwater bodies; protect, enhance and restore all bodies of groundwater and reverse significant and sustained upward trend in the concentration of pollutants in groundwater.
- Ensuring sustainable groundwater management concepts such as local supply side measures (rainwater harvesting, aquifer recharge enhancement) and demand side interventions to be applied for irrigated agriculture and urban centres.
- Consideration of social, cultural, economic and environmental impacts on groundwater management and allocation decisions.

## **Solomon Islands**

The National Development Strategy 2016-2035 maps out a strategic direction for the future development of Solomon Islands. It presents a visionary strategy for the next twenty years, setting out a long-term vision, mission and objectives that reflect the aspirations of all Solomon Islanders.

The proposed project components are aligned with Objective 1 'Sustained and inclusive economic growth' - Medium Term Strategy 3 on 'expanding and upgrading weather resilient infrastructure and utilities focused on access to productive resources and markets and to essential services', which specifically aims to

1. facilitate infrastructure development for efficient, effective and quality service delivery to rural communities in water supply and sanitation,
2. foster and enhance continuous reform at Solomon Islands Water Authority (SIWA),
3. ensure the water provided to all customers is sufficient and chemically safe to appropriate WHO standards,
4. preserve and properly manage water catchment forest areas,
5. enforce conservation, land use controls and proper water legislation and laws,
6. work with Government to secure perpetual access to critical water sources,
7. examine the need to upgrade and extend coverage of water supply and sanitation systems in urban, peri-urban and rural areas,
8. improve ongoing strategies and practices to deal with the significant non-revenue water lost through theft and leakage as well as significant debt incurred by many customers.

Consistency also exists with Objective 1 - Medium Term Strategy 4 on 'strengthening land reform and other programmes to encourage economic development in urban, rural and customary lands', which specifically aims to

1. facilitate infrastructure development for an efficient, effective and quality service delivery to rural communities in water supply and sanitation and
2. protect natural resources, environment and conservation.

The project is fully aligned with Objective 2 'Poverty alleviated across the whole of the Solomon Islands, basic needs addressed and food security improved; benefits of development more equitably distributed' and particularly with Medium Term Strategy 5 on 'alleviating poverty, improving provision of basic needs and increasing food security' which aims to ensure availability of water and sanitation for all and implemented based on accessibility by gender and vulnerable groups (links to MTS 7).

The Solomon Islands National Water Resources and Sanitation Policy drafted in 2017 was approved by Cabinet in 2019. The Policy builds on the aim of the National Development Strategy to 'improve water supplies and sanitation in urban and rural areas in terms of quality, reliability, and coverage' and responds, through the Ministry of Mines, Energy and Rural Electrification, to the call for the development of sector plans and policies as a linkage between the broad goals of NDS and the specific activities identified by the Ministry Corporate and Provincial Plans and Programmes. The Policy also builds on the draft National Water Policy 2007, the draft Rural Water Supply and Sanitation Policy 2013. Issues of relevance to this project, such as the lack of protection of groundwater resources from mining, forestry, farming, and urbanization, and the unregulated groundwater extraction have been identified in the Implementation Plan which accompanied the National Water Resources and Sanitation Policy.

This project will support Policy Objectives 1.1 and 1.2 on updating and enforcing water resource policies and the legal and regulatory base for developing and managing water resources, Objective 1.5 on

establishing a WATSAN monitoring and reporting program and database, Objectives 4.1, 4.2, and 4.3 on setting in place laws, regulations, practices, and incentives to protect public water sources and water source areas, and Objectives 5.2 and 5.4 on strengthening access and local management of rural and urban communities to safe and sustainable water supplies.

More specifically, the proposed activities under this project are well aligned and can support the following activities identified in the Implementation Plan towards achieving the relevant Policy Objectives:

Policy Objective 1.5 National WATSAN monitoring, and reporting program and data base established and operational

- Activity 1.5.1 Rainfall, stream flow, and water quality monitoring system established for key public water supply catchments.
- Activity 1.5.2 Monitoring system for groundwater levels, use and quality established.

Policy Objective 2.1 Skills training programs for water and sanitation managers, technical staff and community operators established and successful

- Activity 2.1.1 Skills training programs for water resources management, monitoring & data analysis for national and provincial levels.

Policy Objective 4.1 Laws, regulations, ordinances and practices in place to protect public water sources and water source areas from pollution, misuse or over-use

- Activity 4.1.5 All water extractions limited to less than or equal to the sustainable safe yield of catchment or groundwater systems.
- Activity 4.1.6 All groundwater bores and drillers licensed.

Policy Objective 5.2 All rural and urban communities have access to approved, safe, adequate, reliable, affordable and sustainable water supplies

- Activity 5.2.1 Analysis of the water supply needs of rural villages communities.
- Activity 5.4.1 Pilot project on local planning, ownership, management and maintenance of rural community water supply-schemes.
- Activity 5.4.2 Guidelines for community participation in the planning of village water supply established.
- Activity 7.4.2 Pilot projects of trials of adaptation strategies in water supply undertaken in priority areas in SI.

Even though the Policy and Implementation Plan were approved by Cabinet in 2019, most activities have not yet been implemented due to the need for a new water resources legislation to be developed to replace the outdated Rivers Water Act which also does not address groundwater. A draft legislation exists since

2006 and provincial consultations are currently taking place aiming for endorsement of the legislation by mid-2022.

## Vanuatu

Vanuatu's 2016-2030 National Sustainable Development Plan serves as the country's highest level policy framework and followed the Priorities and Action Agenda 2006-2015 which sought to deliver a just, educated, healthy, and wealthy Vanuatu. It seeks to further extend the linkages between resources, policy and planning to the people and place they exist to serve. The current project is well aligned with all three pillars of Society, Environment, and Economy, and will address some of the specific objectives identified in the NDSP. These include:

- Society Goal 4 ?An inclusive society which upholds human dignity and where the rights of all Ni-Vanuatu including women, youth, the elderly and vulnerable groups are supported, protected and promoted in our legislation and institutions?. Links exist with the proposed development and implementation of the project's GESI action plan and increased engagement of women in water resource management.
- Society Goal 6 ?A dynamic public sector with good governance principles and strong institutions delivering the support and services expected by all citizens of Vanuatu?. Links exist with the proposed development of operational drilling practices and the governance/policy support proposed under Project Component 2, as well as the proposed support for institutional capacity under Project Component 4.
- Environment Goal 1 ?A nation that ensures our food and nutrition security needs are adequately met for all people through increasing sustainable food production systems and improving household production?. Links exist with Project Component 3 and the proposed development of groundwater resources for agriculture, and improved land management practices.
- Environment Goal 3 ?A strong and resilient nation in the face of climate change and disaster risks posed by natural and man-made hazards?. Links exist with Project Component 3 and the potential development of groundwater for community water supply.
- Environment Goal 4 ?A nation which utilises and sustainably manages our land, water and natural resources?. Links exist with the groundwater governance activities proposed under Project Component 2, and with the development of land management practices proposed under Project Component 3.
- Economy Goal 2 ? Policy Objective 2.2 ?Ensure all people have reliable access to safe drinking water and sanitation infrastructure?. Links exist with the drilling operations and development of groundwater development infrastructure proposed under Project Component 3.

The Vanuatu National Water Policy (2017-2030) has identified seven priority areas for the Government to strengthen water safety and security for all. The proposed project has clear links exist with Priority Area 7 ?Secure Water Future? which recommends a number of actions including:

- The strengthening of risk management through the mapping of groundwater resources to enable investments, giving priority to groundwater for drinking water purposes,

- The improvement of disaster preparedness, response, and recovery through the improved protection of water supplies, improved data management, and lesson learning and knowledge management.

The Vanuatu National Water Strategy (2018-2030) has been developed within the policy priorities established in the Vanuatu National Water Policy (2017-2030). Additional links are identified with actions proposed under the Strategy document including:

Priority area 1: Water safety and security

- The development of a national groundwater resource inventory to identify priority areas for investment (links with project Component 1),
- The identification of water protection zones to ensure the safety and security of water catchment areas (links with project Component 2).

Priority area 2: Water supply markets

- Strengthening access to high quality water market services in the form of personnel by extending support to vocational and professional training in water disciplines (drillers, hydrogeologists) and techniques by facilitating the entry of private sector innovations (links to project component 4).

Additional links with project Components 3 and 4 are also identified with Priority area 8 'Capacity to reform', identified in the National Water Strategy which proposes:

- The training of provincial staff to monitor water systems and manage the necessary government information systems,
- The training of staff in modern water drilling strategies,
- The establishment of modern data collection and management systems to optimize the operation of drilling teams,
- The introduction of asset management information systems to optimize the maintenance of drilling rigs.

The project's objective is to enhance water and food security and, in this context, links exist with Thematic Area 10 of the Vanuatu Agriculture Sector Policy 2015-2030 and more specifically with Policy Directive 10.4 (Enhance the sustainability of food supply at national level) which recommends, among others, to practice water irrigation to improve the productivity of farming systems. In the context of climate change adaptation and disaster risk reduction, links also exist with Thematic Area 12 which recommends, among others, prioritizing land use planning to reduce land and water degradation to reduce climate-related losses and vulnerability and maximize local production.

Some of the proposed work under Project Component 3 is closely linked to priorities defined under Thematic Area 3 'Livestock Feed, Water and Nutrition' the National Livestock Policy 2015-2030 and

relevant Action Framework. Under the Directive that "all livestock must have access to sufficient, adequate and clean drinking water, proposed actions include:

- Promoting appropriate technologies to access and distribute water to farms,
- Promoting the use of appropriate technologies to provide water in areas of Vanuatu that do not have adequate water resources,
- Collaborating with the Department in charge of rural water supply to roll out initiatives of National Water Strategy including in remote and hilly pastures.

Activities proposed under project Component 2 are well reflected in the National Environment Policy and Implementation Plan and specifically under Policy Objective 2.3 "Protect vulnerable forests, watersheds, catchments and freshwater resources, including community water sources" which proposes:

- The collection of relevant data and information about catchments,
- The identification of vulnerabilities for selected catchments,
- The development of appropriate management plans,
- The completion of water resources inventory to assist achieving the target of "100% of households with all year access to drinking water" as per agreed standards by 2030.

Additional links exist with Policy Objective 2.5 "Increase agricultural food production using sustainable practices" which proposes the identification of potable water sources and appropriate technologies to access water (e.g. drill wells) to achieve the target of "60-70% of livestock having access to safe water by 2025".

Finally, the Vanuatu Climate Change and Disaster Risk Reduction Policy 2016-2030 which sets the framework for mainstreaming climate change and disaster risk reduction into sustainable development processes for Vanuatu, identifies a number of climate change impacts for Vanuatu including:

- Reduced availability of freshwater
- Saltwater intrusion of groundwater
- Compromised food security

Activities proposed under this project are well aligned with the strategic priorities for addressing these impacts, as outlined in this Policy.

## **8. Knowledge Management**

**Elaborate the "Knowledge Management Approach" for the project, including a budget, key deliverables and a timeline, and explain how it will contribute to the project's overall impact.**

In line with FAO's Knowledge Strategy and GEF's Knowledge Management Approach (2015), the project will produce (i): needed information and knowledge in relation to groundwater resources, management &

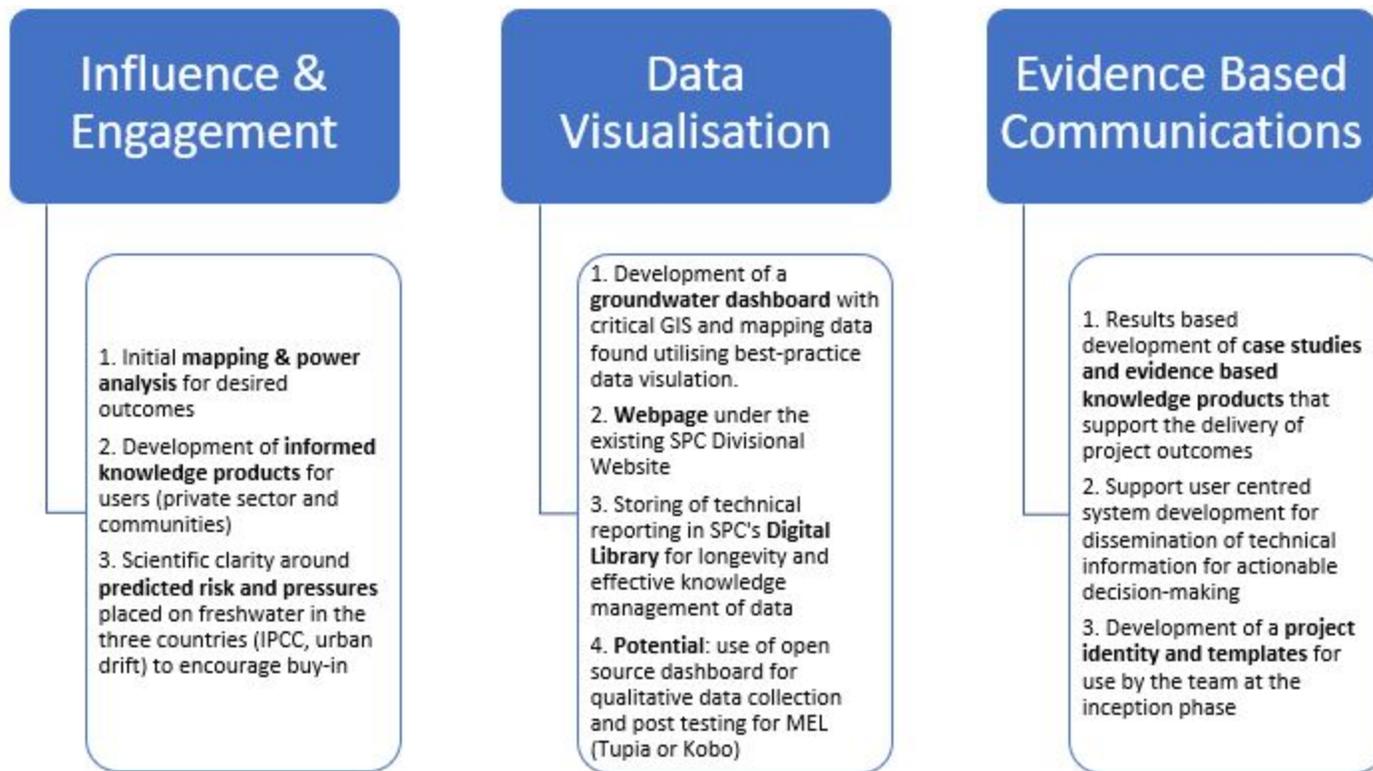
sustainability, and (ii) more informed access to needed information to support informed decision-making. As this project is the first systematic attempt in Pacific SIDS to assess freshwater potential of volcanic aquifers, the incorporation of the knowledge produced by the project in the Pacific Community's extensive knowledge systems will create a longer-term learning & data visualisation opportunity as the demand of information on this theme is expected to increase in the coming years.

### Key Deliverables

Underpinned by the fact that this is the first systematic approach towards mapping volcanic freshwater sources across the three countries, the project will field test best practice approaches iteratively and inform the development of critical knowledge products, engagement strategies and broad communications actions.

The key knowledge management deliverables of the project will span over three areas:

- Engagement & Stakeholder mapping to ensure collective ownership and understanding of the project., including the development of targeted knowledge products based on the needs of the users and clear, easy-to-understand knowledge products. Such products may include information sessions, informative brochures, and short videos aiming to raise community and private sector awareness on the project objectives, to allow for a more effective engagement and collaboration with these users throughout the project.
- Development of data visualisation tools to support future growth and understanding of volcanic aquifers analysis: through the development of a visual dashboard the data captured will be developed to drive increased understanding, knowledge management and dissemination. This will form the basis of a volcanic groundwater dashboard that will be built upon as more data from other projects is made available to develop a comprehensive digital tool to support informed decision-making. Government Departments and other national stakeholders involved in the development and management of these groundwater resources (e.g. National Lead Agencies, National Water Committees, Catchment Management Committees) will utilize this dashboard to present for example relevant water resources information to prospective public and private investors. This will be housed on the Pacific Data Hub (<https://pacificdata.org>).
- Development of evidence-based case studies and communications actions supported by the internal GEM Division Knowledge Management, Communications & Learning Team throughout the life of the project, to contribute also to GEF IW:LEARN and Kaleo platforms and exchanges. 1% of the GEF IW grant was allocated to support IW:LEARN activities including the attendance to two IW Conferences and relevant regional thematic trainings, the development of two experience notes per project country, and the development of a project website with RSS feed to the IW:LEARN website.



**Figure 23. Knowledge management strategy**

Figure 23. Knowledge management strategy

This approach will support impact based approaches through more informed understanding of the gaps and barriers to achieve the success of the desired outcomes of the project, drive the development of long-term knowledge development for use by decision-makers utilising best practice data visualisation and finally promote the understanding of the critical risk and issue posed by a changing climate on freshwater, the benefits of groundwater use in volcanic islands in Pacific SIDS and the longer term engagement with the importance of sustainable planning and use of freshwater systems in our region more broadly.

A particular focus will be placed on ensuring that all information, education and communication material produced by the Project is GESI-sensitive, user-friendly, and accessible to people with limited literacy, technical knowledge, and internet access. This means that all materials go beyond technical issues and include messaging on the need for whole of community participation in water planning and management, impacts of water problems on different groups of people, and the need for equitable access.

## 9. Monitoring and Evaluation

### Describe the budgeted M and E plan

The project results, as outlined in the project results framework (Annex A1), will be monitored regularly, reported annually and assessed during project implementation to ensure the project effectively achieves these results. Monitoring and evaluation activities will follow FAO and GEF's policies and guidelines for monitoring and evaluation. The M&E system will also facilitate learning, replication of the project's results and lessons which will feed the project's knowledge management strategy.

### Monitoring Arrangements

Project oversight and supervision will be carried out by the Budget Holder (BH) with the support of the Project Task Force (PTF), Lead Technical Officer (LTO) and Funding Liaison Officer (FLO) and relevant technical units in FAO headquarters. Oversight will ensure that: (i) project outputs are produced in accordance with the project results framework and leading to the achievement of project outcomes; (ii) project outcomes are leading to the achievement of the project objective; (iii) risks are continuously identified and monitored and appropriate mitigation strategies are applied; and (iv) agreed project global environmental benefits are being delivered.

The FAO-GEF Coordination Unit and HQ Technical units will provide oversight of GEF financed activities, outputs and outcomes largely through the annual Project Implementation Reports (PIRs), periodic backstopping and supervision missions.

Day-to-day project monitoring will be carried out by the Project Management Unit. Project performance will be monitored using the project results matrix, including indicators (baseline and targets) and annual work plans and budgets. At inception phase, the results matrix will be reviewed to finalize the identification of i) outputs ii) indicators iii) targets and iv) any missing baseline information.

A detailed M&E plan, which builds on the results matrix and defines specific requirements for each indicator (data collection methods, frequency, responsibilities for data collection and analysis, etc) will also be developed during project inception by the PMU M&E.

**Table 21. Monitoring and Evaluation Budgeted Plan**

<b>M&amp;E requirements</b>	<b>Primary responsibility</b>	<b>Time frame</b>	<b>Budget (USD)</b>
<b>Inception Workshop</b>	? CTA ? National Implementation Partners ? FAO	Within two months of project document signature	Budgeted under activities
<b>Inception Report</b>	Project Team	Within one month of inception workshop	Budgeted under activities
<b>Standard FAO monitoring and reporting requirements</b>	FAO	Quarterly	Budgeted under activities

<b>Risk management</b>	? CTA ? FAO	Quarterly	Budgeted under activities
<b>Project Progress Report (PPR)</b>	Oversight by CTA, Project team	Biannually	Budgeted under activities
<b>Monitoring of indicators in project results framework</b>	Oversight by CTA, Project team	Annually before PIR	Budgeted under activities
<b>GEF Project Implementation Report (PIR)</b>	? CTA ? FAO	Annually	Budgeted under activities
<b>Lessons learned and knowledge generation</b>	Project team	Annually	Budgeted under activities
<b>Regional Steering Committee meetings</b>	? PSC ? FAO ? CTA	Annually	Budgeted under activities
<b>Mid-term GEF Core Indicators update</b>	Oversight by CTA, Project team	Before mid-term review mission takes place.	Budgeted under activities
<b>Independent Mid-term Review (MTR) and management response</b>	? FAO/BH ? CTA ? Project team	Before 3rd PIR.	65,000
<b>Terminal GEF Core Indicators update</b>	Oversight by CTA, Project team	Before terminal evaluation mission takes place	Budgeted under activities
<b>Independent Terminal Evaluation (TE) included in FAO evaluation plan, and management response</b>	? FAO/OED ? CTA ? Project team	Six months before operational closure	65,000
<b>Terminal Report</b>	? FAO Supporting Services		6,550

<b>Monitoring of environmental and social risks, and corresponding management plans as relevant</b>	? CTA	On-going	Budgeted under activities
	? FAO		
<b>Stakeholder Engagement Plan</b>	? CTA	On-going	Budgeted under activities
	? FAO		
<b>Gender Action Plan</b>	? CTA	On-going	Budgeted under activities
	? FAO		
<b>Addressing environmental and social grievances</b>	? CTA	On-going	Budgeted under activities
	? FAO		
<b>Monitoring and Evaluation Expert</b>	? SPC		33,450
<b>Travel</b>	? SPC		10,000
<b>Total</b>			<b>180,000</b>

### Monitoring and Reporting

In compliance with FAO and GEF M&E policies and requirements, the PMU, in consultation with the PSC and PTF will prepare the following i) Project inception report; (ii) Annual Work Plan and Budget (AWP/B); (iii) Project Progress Reports (PPRs); (iv) annual Project Implementation Review (PIR); (v) Technical Reports; (vi) co-financing reports; and (vii) Terminal Report. In addition, the Core Indicators included in indicate annex will be used to monitor Global Environmental benefits / adaptation benefits (specify as appropriate) and updated regularly by the PMU.

Project Inception Report. A project inception workshop will be held within two months of project start date and signature of relevant agreements with partners. During this workshop the following will be reviewed and agreed:

- the proposed implementation arrangement, the roles and responsibilities of each stakeholder and project partners;
- an update of any changed external conditions that may affect project implementation;
- the results framework, the SMART indicators and targets, the means of verification, and monitoring plan;

- the responsibilities for monitoring the various project plans and strategies, including the risk matrix, the Environmental and Social safeguards and Management Plan, the gender strategy, the knowledge management strategy, and other relevant strategies;
- finalize the preparation of the first year AWP/B, the financial reporting and audit procedures;
- schedule the PSC meetings;
- prepare a detailed first year AWP/B,

The PMU will draft the inception report based on the agreement reached during the workshop and circulate among PSC members, BH, LTO and FLO for review within one month. The final report will be cleared by the FAO BH, LTO and the FAO GEF Coordination Unit and uploaded in FAO's Field Program Management Information System (FPMIS) by the BH.

Results-based Annual Work Plan and Budget (AWP/B)[1]. The draft of the first AWP/B will be prepared by the PMU in consultation with the FAO Project Task Force and reviewed at the project Inception Workshop. The Inception Workshop inputs will be incorporated and subsequently, the PMU will submit a final draft AWP/B to the BH within two weeks after the workshop. For subsequent AWP/B, the PMU will organize a project progress review and planning meeting for its progress review and adaptive management. Once PSC comments have been incorporated, the PMU will submit the AWP/B to the BH for non-objection, LTO and the FAO GEF Coordination Unit for comments and for clearance by BH and LTO prior to uploading in FPMIS by the BH. The AWP/B must be linked to the project's Results Framework indicators to ensure that the project's work and activities are contributing to the achievement of the indicators. The AWP/B should include detailed activities to be implemented to achieve the project outputs and output targets and divided into monthly timeframes and targets and milestone dates for output indicators to be achieved during the year. A detailed project budget for the activities to be implemented during the year should also be included together with all monitoring and supervision activities required during the year. The AWP/B should be approved by the Project Steering Committee, LTO, BH and the FAO GEF Coordination Unit, and uploaded on the FPMIS by the BH.

Project Progress Reports (PPR): The PPRs are used to identify constraints, problems or bottlenecks that impede timely implementation and to take appropriate remedial action. PPRs will be prepared based on the systematic monitoring of output and outcome indicators identified in the Project Results Framework Annex A1, AWP/B and M&E Plan. Each semester the CTA will prepare a draft PPR, will collect and consolidate any comments from the FAO PTF. The CTA will submit the final PPRs to the FAO Subregional Office in the Pacific Islands every six months, prior to 31 July (covering the period between January and June) and before 31 January (covering the period between July and December). The July-December report should be accompanied by the updated AWP/B for the following Project Year (PY) for review and no-objection by the FAO PTF. The Budget Holder has the responsibility to coordinate the preparation and finalization of the PPR, in consultation with the PMU, LTO and the FLO. After LTO, BH and FLO clearance, the FLO will ensure that project progress reports are uploaded in FPMIS in a timely manner.

Annual Project Implementation Report (PIR): The PIR is a key self-assessment tool used by GEF Agencies for reporting every year on project implementation status. It helps to assess progress toward achieving the project objective and implementation progress and challenges, risks and actions that need to be taken. Under the lead of the BH, the Project Coordinator / Project Manager will prepare a consolidated annual PIR report covering the period July (the previous year) through June (current year) for each year of implementation, in collaboration with national project partners (including the GEF OFP), the Lead Technical Officer, and the FLO. The PC/PM will ensure that the indicators included in the project results framework are monitored annually in advance of the PIR submission and report these results in the draft PIR.

BH will be responsible for consolidating and submitting the PIR report to the FAO-GEF Coordination Unit for review by the date specified each year after each co-implementing agency's review for each respective output under their responsibilities (to be included for joint implementation only). FAO - GEF Funding Liaison Officer review PIRs and discuss the progress reported with BHs and LTOs as required. The BH will submit the final version of the PIR to the FAO-GEF Coordination Unit for final approval. The FAO-GEF Coordination Unit will then submit the PIR(s) to the GEF Secretariat as part of the Annual Monitoring Review of the FAO-GEF portfolio.

Technical Reports: Technical reports will be prepared as part of project outputs and to document and share project outcomes and lessons learned. The LTO will be responsible for ensuring appropriate technical review and clearance of technical reports. Copies of the technical reports will be distributed to project partners and the Project Steering Committee as appropriate.

Co-financing Reports: The PMU will be responsible for tracking co-financing materialized against the confirmed amounts at project approval and reporting. The co-financing report, which covers the GEF fiscal year 1 July through 30 June, is to be submitted on or before 31 July and will be incorporated into the annual PIR. The co-financing report needs to include the activities that were financed by the contribution of the partners.

Tracking and reporting on results across the GEF 7 core indicators and sub-indicators: As of July 1, 2018, the GEF Secretariat requires FAO as a GEF Agency, in collaboration with recipient country governments, executing partners and other stakeholders to provide indicative, expected results across applicable core indicators and sub-indicators for all new GEF projects submitted for Approval. During the approval process of the (insert short project title) expected results against the relevant indicators and sub-indicators have been provided to the GEF Secretariat. Throughout the implementation period of the project, the PMU, is required to track the project's progress in achieving these results across applicable core indicators and sub-indicators. At project mid-term and project completion stage, the project team in consultation with the PTF and the FAO-GEF CU are required to report achieved results against the core indicators and sub-indicators used at CEO Endorsement/ Approval.

Terminal Report: Within two months prior to the project's completion date, the CTA will submit to the PSC and FAO Representation a draft Terminal Report. The main purpose of the terminal report is to give

guidance to authorities (ministerial or senior government level) on the policy decisions required for the follow-up of the project, and to provide the donor with information on how the funds were utilized. Therefore, the terminal report is a concise account of the main products, results, conclusions and recommendations of the Project, without unnecessary background, narrative or technical details. The target readership consists of persons who are not necessarily technical specialists but who need to understand the policy implications of technical findings and needs for ensuring sustainability of project results. Work is assessed, lessons learned are summarized, and recommendations are expressed in terms of their application to the integrated landscape management in the three pilot sites, as well as in practical execution terms. This report will specifically include the findings of the final evaluation. A project evaluation meeting will be held to discuss the draft final report with the PSC before completion by the Project Coordinator and approval by the BH, LTO, and FAO-GEF Coordination Unit.

### **Mid Term Review and Terminal Evaluation provisions**

#### **Mid-Term Review**

An independent mid-term review (MTR) will be carried out at project mid-life in terms of expenditure and/or overall project duration, tentatively in the fourth quarter of project year 2. The BH will arrange an independent MTR in consultation with the Project Steering Committee (PSC), the Project Management Unit (PMU), the lead technical officer (LTO) and the FAO-GEF Coordination Unit in FAO headquarters. The MTR will be conducted to review progress and effectiveness of implementation in terms of achieving project objective, outcomes and outputs. The MTR will allow mid-course corrective actions, if needed. The MTR will provide a systematic analysis of the information on project progress in the achievement of expected results against budget expenditures. It will refer to the project budget (see Annex A2) and the approved AWP/Bs (sentence only valid for the GEF). It will highlight replicable good practices and key issues faced during project implementation and will suggest mitigation actions to be discussed by the PSC, the LTO and FAO-GEF Coordination Unit.

After the completion of the Mid-Term Review, the BH will be responsible for the distribution of the MTR report at country level (including to the GEF OFP) and for the preparation of the Management Response within 4 weeks and share it with national partners, GEF OFP and the FAO-GEF CU.

#### **Terminal Evaluation**

The GEF evaluation policy foresees that all Medium and Full sized projects require a separate terminal evaluation. Such evaluation provides: i) accountability on results, processes, and performance ii) recommendations to improve the sustainability of the results achieved and iii) lessons learned as an evidence-base for decision-making to be shared with all stakeholders (government, execution agency, other national partners, the GEF and FAO) to improve the performance of future projects.

As per the FAO policy on evaluation, the FAO Office of Evaluation (OED) will conduct a final evaluation of the project, to be launched within six months prior to the actual completion date (NTE date). It will aim at identifying project outcomes, their sustainability and actual or potential impacts. It will also have the purpose of indicating future actions needed to assure continuity of the process developed through the project. OED will conduct the evaluation in consultation with project stakeholders and the donor, and share with them the evaluation report, which is a public document.

After the completion of the terminal evaluation, the BH will be responsible to prepare the management response to the evaluation within 4 weeks and share it with national partners, GEF OFP, OED and the FAO-GEF CU. The BH will also send the updated core indicators used during the TE to the FAO-GEF CU for their submission to the GEF Secretariat.

**Table 22:** Monitoring and evaluation budget

Description	Line	Agency	USD
Independent Mid-term Review (MTR)	Contracts	FAO Supporting Services	65,000
Independent Final evaluation (TE)	Contracts	FAO Supporting Services	65,000
Terminal Report	Contracts	FAO Supporting Services	6,550
Monitoring and evaluation expert	Contracts	SPC	33,450
Travel	Travel	SPC	10,000
<b>Total</b>			<b>180,000</b>

The evaluations will also assess how the OPA implementation and partnership agreement influenced the achievement and sustainability of results while contributing to enhance capacities of the OP/s. In doing so, the evaluation will consider the brief guidance note and evaluation questions OED has developed in consultation with the OPIM unit.

### Disclosure

The project will ensure transparency in the preparation, conduct, reporting and evaluation of its activities. This includes full disclosure of all non-confidential information, and consultation with major groups and representatives of local communities. The disclosure of information shall be ensured through posting on websites and dissemination of findings through knowledge products and events. Project reports will be broadly and freely shared, and findings and lessons learned made available.

### 10. Benefits

**Describe the socioeconomic benefits to be delivered by the project at the national and local levels, as appropriate. How do these benefits translate in supporting the achievement of global environment benefits (GEF Trust Fund) or adaptation benefits (LDCF/SCCF)?**

Groundwater ecosystems have the potential to provide important services with high socioeconomic value. These include the purification of water and its long-term storage in good quality, the provision of water supply for drinking, industrial, and agricultural water supply, the mitigation of floods and droughts, the provision of environmental flow requirements. Due to climate change and aquifer over-exploitation, many

of the groundwater ecosystem services, especially those provided by coastal aquifer systems, are at serious risk. Important socio-economic benefits will be delivered at both local and national scales through the identification of new groundwater resources stored in unexplored volcanic aquifers, offering higher resilience against climate variability and contamination. Increased knowledge and understanding of the potential of groundwater stored in volcanic aquifers, on behalf of local communities and stakeholders as well as of provincial and national governments will allow for informed decision making related to the exploitation of these resources. Strengthened governance frameworks and policies will ensure the exploitation of existing and newly discovered aquifers will be realized in a sustainable and inclusive way. On the ground demonstrations of groundwater integration into IWRM practices will allow for their replication in similar contexts within the project countries and beyond. Socioeconomic benefits delivered by the project will include:

- Improved water and food security
- Improved livelihoods
- Increased resilience against climate variability and natural disasters
- Improved access to water and infrastructure for small scale farmers and livestock owners
- Gender equality and social inclusion

These benefits will further support the achievement of global environment benefits including:

- Reduced pollution load in highly exploited aquifers from land-based activities
- Sustained freshwater ecosystems goods and services
- Reduced vulnerability to climate variability and climate-related risks, and increased ecosystem resilience

### 11. Environmental and Social Safeguard (ESS) Risks

Provide information on the identified environmental and social risks and potential impacts associated with the project/program based on your organization's ESS systems and procedures

#### Overall Project/Program Risk Classification \*

PIF	CEO Endorsement/Approva I	MTR	TE
Low	Low		

Measures to address identified risks and impacts

Elaborate on the types and risk classifications/ratings of any identified environmental and social risks and impacts (considering the GEF ESS Minimum Standards) and any measures undertaken as well as planned management measures to address these risks during implementation.

Initial screening against FAO Environmental and Social Standards (ESS) of the project concept was completed as part of the Project Identification Form and a risk classification of 'low' risk was determined.

Subsequent to this, the FAO screening checklist was updated to ensure completeness against GEF Minimum Standards. The screening process was repeated using the updated checklist in August 2021 by the SPC Environmental and Social Safeguards Advisor and a 'low' risk was confirmed, meaning the project has:

1. The project has no or minimal potential negative environmental and/or social impacts, either upstream or downstream.
2. The project will not be controversial in terms of the interests of key stakeholders.
3. In the case of minimal impacts, the risk remains low because they are widely known and readily available good practices that will be used to address those impacts, and a track record of the implementer of the project know how to apply and do engage in these good practices

The full results of are presented in Annex II. The following table gives an overview of the screening assessment of and where standards are triggered it provides high level measures that are to be implemented for any identified minimal impacts.

<b>FAO ESS</b>	<b>Y/N</b>	<b>Justification</b>	<b>Recommended Measures</b>
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ESS 1: Natural Resource Management	Y	<p>ESS 1C is triggered as the project will potentially manage access to land the associated natural resources (tenure) in order to better manage aquifers. Changes to tenure affects how farmers or other users decide to use the natural resource, who will benefit from improvements or who may lose from changes to land use or access.</p> <p>This project involves the development of Aquifer Management Plan and water quality management activities which have the potential to impact on tenure through change access to and uses of some areas of land.</p>	<p>Development of Aquifer Management Plans and activities restricting or changing land use will be in compliance with FAO Voluntary Guidance on Tenure.</p> <p>Annex I1 provides procedure to be followed in development of the Aquifer Management Plans.</p>
ESS 2: Biodiversity, ecosystems and natural habitat	N	The project is not proposing activities that would have adverse impacts on natural or critical natural habitats, ecosystem functionality, decrease biodiversity, contravene applicable international environmental treaties or agreements or introduce or use potentially invasive, nonindigenous species.	
ESS 3: Plant genetic resources for food and agriculture	N	This project is not introducing any crops and will only use native plant species for any restoration activities.	
ESS 4: Animal ? livestock and aquatic genetic resources for Food and Agriculture	N	This project is not undertaking any activities which introduce or negatively impact any livestock species.	
ESS 5: Pest and pesticide management	N	Project activities do not involve the use of pesticides	
ESS 6: Involuntary displacement and resettlement	N	The project will not engage in the resettlement of people or restrict their livelihood abilities.	

ESS 7: Decent work	N	The project will not impact the current or future employment of the rural poor and the FAO have procedures in place to prevent workplace discrimination.	
ESS 8: Gender equality	N	The project has a Gender Equity and Social Inclusion Action Plan which ensures that any existing gender inequalities in participation are not overlooked and that women benefit equally from project outcomes.	
ESS 9: Indigenous Peoples and Cultural Heritage	N	The project countries are recognised as not having Indigenous Peoples per the FAO policy on Indigenous Peoples and will not be located in an area where cultural heritage exists	
Community Health and Safety (GEF MS 9)	N	The project does not expose the community to health, safety or security risks	
Resource Efficiency and Pollution Prevention (GEF MS 7)	N	There are no proposed activities related to the use of banned, restricted or prohibited substances chemicals or hazardous materials.	

#### Supporting Documents

Upload available ESS supporting documents.

Title	Module	Submitted
<b>Pacific Islands PIF Review Yellow-Marked</b>	<b>Project PIF ESS</b>	
<b>Pacific Islands - Climate Risk Screening Summary</b>	<b>Project PIF ESS</b>	
<b>ToC PICs1-LPG</b>	<b>Project PIF ESS</b>	
<b>FAO ESS Screening Checklist- Pacific</b>	<b>Project PIF ESS</b>	
<b>Risk Certification</b>	<b>Project PIF ESS</b>	

**ANNEX A: PROJECT RESULTS FRAMEWORK (either copy and paste here the framework from the Agency document, or provide reference to the page in the project document where the framework could be found).**

Results chain	Indicators	Baseline	Mid-term target	Final target	Means of verification	Assumptions
<b>Objective:</b> The project aims to enhance water and food security and climate resilience, sustain ecosystem services, and relieve pressure on over-exploited coastal aquifers by expanding and assessing the role of volcanic aquifers and by introducing sound groundwater governance frameworks in selected volcanic island states of the Pacific						
Core Indicator 4.1	Area of landscapes under improved management to benefit biodiversity	0	0	35,358hectares	Executing partner reporting	Governments and national stakeholders are committed to introduce governance reforms, to adopt management plans, and to cooperate towards the successful implementation of project activities
Core Indicator 11	Direct beneficiaries	0	0	150,588 (Female: 72,000 ? Male: 78,588)	Executing partner reporting	
<b>Component 1: Expanding and assessing the role of groundwater resources.</b>						

Results chain	Indicators	Baseline	Mid-term target	Final target	Means of verification	Assumptions
<p><u>Outcome 1.1:</u> The knowledge of the exploitable groundwater resources is improved in the three project island states.</p>	<p>Number of comprehensive groundwater assessments of selected volcanic islands in the three project island states</p>	<p>While general geo-hydrological knowledge exists for most of the major islands in the three beneficiary island states archipelagos, knowledge of their groundwater potential is limited to shallow sedimentary coastal aquifers, with little or no attention given to the groundwater resources of the upstream fractured basal volcanic aquifers.</p>	<p>Three in depth comprehensive modern assessments of the exploitable groundwater resources of one major volcanic island for each project country are in progress.</p>	<p>Three groundwater assessments and technical economic exploitation feasibility in selected volcanic islands completed.</p>	<p>Maps; technical reports; Project Implementation Reviews; Project Progress Reports.</p>	<p>Project able to catalyse cutting edge scientific expertise in volcanic environments, and adopt advanced groundwater exploration technologies</p>

Results chain	Indicators	Baseline	Mid-term target	Final target	Means of verification	Assumptions
<u>Output.1.1.1</u> : An assessment of the potential and current state of the groundwater resources in the three project islands is produced.	Number of macro-scale (island-level) groundwater assessment reports produced.	Hydrogeological maps (1986, 1:250,000) exist for one project country (Fiji).  Geological maps (1968, 1:150,000) exist for the other 2 project countries (Vanuatu, Solomon Islands).  Targeted field assessments have been performed in specific areas in all 3 countries.	Assessments of groundwater resources in three major volcanic islands in progress.	Groundwater resources assessment for 1 major volcanic island per project country completed	Aquifer assessment reports approved by Steering Committee.	All existing baseline information is made available by the countries.
<u>Output.1.1.2</u> : Technical-economic feasibility studies of the exploitation of volcanic aquifers and of their strategic uses are produced.	Number of feasibility study reports produced.	Investigations have been done by water bottling companies in one project country (Fiji) for the aquifers they operate in (not publicly available).	Three feasibility assessments of the exploitation of more prospective aquifers in progress.	Three feasibility reports produced with recommendations on strategic use for at least 1 aquifer per project country	Feasibility study reports approved by Steering Committee.	The assessment conducted under Output 1.1.1 identifies at least one high prospect aquifer system per country.

Results chain	Indicators	Baseline	Mid-term target	Final target	Means of verification	Assumptions
<u>Output.1.1.3</u> : The dialogue with potential public and private investors is facilitated by presenting outputs 1.1.1 and 1.1.2 to Governments.	Number of national dialogues conducted with government agencies, private investors, IFIs, and donors.	Countries lack the capacity to present packaged information to prospective public and private investors.	Design, timing and organization of national dialogues conducted.	At least 3 national dialogues (participation of at least 40% women) conducted presenting groundwater assessment and feasibility studies to public and private investors.	Dialogues final reports.  Gender disaggregated data on participation will be collected.	The assessments and feasibility studies conducted under Outputs 1.1.1 and 1.1.2 identify the presence of high prospect exploitable aquifer systems.  Countries willing to engage in dialogue.
<u>COMPONENT 2: Introducing sound groundwater governance frameworks</u>						
<u>Outcome 2.1</u> : Sound groundwater governance frameworks and policies are adopted.	Number of countries implementing aquifer management plans.	No countries implement aquifer-specific management plans for improved groundwater governance.	Development of aquifer management plans in progress in all three countries.	Aquifer management plans developed in all three countries, approved by the Steering Committee and submitted for adoption by governments.	Steering Committee Meeting minutes.	Countries? authorities committed to introducing policy and legislative reforms to improve groundwater governance.

Results chain	Indicators	Baseline	Mid-term target	Final target	Means of verification	Assumptions
<p><u>Output 2.1.1:</u> Ongoing national efforts in reviewing existing legislations and developing new groundwater policies are supported.</p>	<p>Number of policy/legislation documents drafted and submitted for adoption.</p>	<p>Countries have limited capacity in developing legislation/policy documents. Processes are slow and often incomplete.</p>	<p>One policy/legislation document drafted.</p>	<p>Two policy/legislation documents drafted and submitted to Government for adoption.</p>	<p>Developed/updated policy and legislation documents.</p> <p>Letters verifying submission of documents to Governments for adoption.</p>	<p>Countries are committed to introducing policy and legislative reforms to improve groundwater governance.</p>
<p><u>Output 2.1.2:</u> Aquifer conceptual models and diagnostic analyses of the current state of one selected primary aquifer in each of the project countries are developed.</p>	<p>Number of aquifer conceptual models and diagnostic analysis reports developed including consideration for gender issues, and focusing on quantity-quality issues, climate variability and change, groundwater uses and users, water nexus conflicts.</p>	<p>Limited experience in countries in developing aquifer conceptual models.</p> <p>IWRM diagnostic reports prepared as part of the GEF Pacific IWRM project development (2004-2008) identifying the status of IWRM in the 3 project countries.</p>	<p>Countries agree on selection of primary aquifers, also based on results of Component 1.</p> <p>Diagnostic work in progress in all three primary aquifers.</p>	<p>Conceptual models and diagnostic analysis reports completed for 3 primary aquifers (1 per country).</p>	<p>Conceptual models and diagnostic analysis reports approved by Steering Committee.</p>	<p>Data collected allows the reconstruction of aquifer hydrogeology.</p> <p>Broad stakeholder participation in the development of diagnostic studies.</p>

Results chain	Indicators	Baseline	Mid-term target	Final target	Means of verification	Assumptions
<p><u>Output 2.1.3:</u> Aquifer management plans are drafted to complement existing catchment plans where available, and address groundwater issues where they exist.</p>	<p>Number of aquifer management plans drafted including consideration for gender issues.</p>	<p>Management plans for catchments have been developed in the three countries during the course of previous GEF investments (IWRM, R2R). However, no aquifer specific management plans are in place.</p>	<p>Preparation of aquifer management plans in progress.</p>	<p>Aquifer management plans for 3 primary aquifers (1 per country) published and submitted for adoption by local/national governance entities.</p>	<p>Documentation of submission for governments ? adoption.</p>	<p>National and local administrators committed to the adoption and implementation of the plans, including required policy and legislative reforms.</p>
Component 3: Tackling hot-spots						
<p><u>Outcome 3.1:</u> Groundwater is integrated into IWRM policies and practices.</p>	<p>Number of groundwater management tools (groundwater monitoring, land use management, small scale groundwater developments, drilling plans/standards) provided to countries aimed at facilitating integration of groundwater into IWRM plans.</p>	<p>Groundwater only marginally addressed in IWRM planning.</p>	<p>Two groundwater management tools developed.</p>	<p>All four groundwater management tools developed and approved by the Steering committee.</p>	<p>Technical reports, Steering Committee Meeting minutes.</p>	<p>All stakeholders, including the private sector, remain committed and cooperate towards the successful execution of activities.</p>

Results chain	Indicators	Baseline	Mid-term target	Final target	Means of verification	Assumptions
<p><u>Output 3.1.1:</u> Groundwater and water resource monitoring systems to assess the impacts from competing groundwater uses and to improve water resource management are installed in selected developed aquifers.</p>	<p>Number of monitoring systems (monitoring bores, rainfall and stream gauges) installed and field tested to support selected developed aquifers.</p>	<p>Partial monitoring systems present in some aquifers, inadequate for multi-purpose monitoring needs.</p> <p>Level of aquifer monitoring varies between project countries.</p>	<p>At least 1 monitoring system installed in one primary aquifer.</p>	<p>Improved monitoring systems designed and field tested in 6 project sites (including the 3 primary aquifers).</p>	<p>Multi-parameter monitoring data reports; Field implementation reports; TORs.</p>	<p>Land ownership and accessibility issues are solved.</p> <p>Country commitment to system maintenance .</p>
<p><u>Output 3.1.2:</u> Land use management measures to demonstrate improved environmental and water resources benefits and management in selected hot-spots are integrated into existing practice.</p>	<p>Number of land use management measures implemented for improved water resources quality and management.</p>	<p>Land use management measures have been pilot tested during previous GEF investments (IWRM, R2R) in the 3 project countries.</p>	<p>Implementation of measures in progress.</p>	<p>Land use management measures for improved water resources quality and management implemented in at least 2 project countries.</p>	<p>Field implementation reports; TORs.</p>	<p>Land ownership and accessibility issues are solved.</p> <p>Country commitment to system maintenance .</p>

Results chain	Indicators	Baseline	Mid-term target	Final target	Means of verification	Assumptions
<p><u>Output 3.1.3:</u> Small-scale demonstrations in groundwater utilization to address water and food security are trialled in selected hot-spots.</p>	Number of small-scale groundwater exploitation systems developed.	In the selected hot spot areas groundwater, albeit critical for water and food security, has not been considered.	Implementation of small-scale demonstration groundwater exploitation systems, in progress.	Small scale demonstration groundwater exploitation systems installed and field tested in all 3 project countries.	Field implementation reports; TORs.	<p>Land ownership and accessibility issues are solved.</p> <p>Country commitment to system maintenance.</p> <p>Aquifers in selected hot spot areas yield adequate volumes of groundwater to address water/food security issues.</p>
<p><u>Output 3.1.4:</u> Operational and management plans to help coordinate water drilling activities.</p>	National operational and management plans for drilling units drafted for two project countries (Vanuatu, Solomon Islands)	No operational and management plans for national drilling units currently exist in Vanuatu or Solomon Islands.	Operational and management plans for national drilling units drafted for 1 project country (Vanuatu).	Operational and management plans for national drilling units endorsed in 2 project countries (Vanuatu, Solomon Islands).	Operational and management plans.	<p>Full participation of the national and private drilling industry.</p> <p>Agreement reached between private</p>

Results chain	Indicators	Baseline	Mid-term target	Final target	Means of verification	Assumptions
	Development and adoption of drilling standards.	National drilling standards have not been adopted in any of the project countries.	National drilling standards have been drafted for 1 project country.	National drilling standards published and submitted for adoption in 2 project countries (Fiji, Vanuatu).	National drilling standard reports published.	industry and national authority enforcing the policy and standards.
<u>Component 4: Reinforcing Institutional capacity</u>						
<u>Outcome 4.1:</u> Enhanced national capacities in groundwater assessment, monitoring and management .	Number of public civil servants - gender balanced - participating in training and other capacity reinforcement events.	Knowledge and experience in groundwater science, exploitation, monitoring and management is scarce in project countries.	At least 30 public civil servants participating in training modules and events.	An overall number of 60 civil servants (20 for each country) trained (participation of at least 40% women).	Reports of training activities and capacity building events including gender participation.	Staff of relevant governmental bodies willing to participate.
<u>Output 4.1.1:</u> Capacities of water and land administrators are strengthened through training in	Number of government public employees with improved knowledge in groundwater science,	No formal trainings on groundwater science have taken place, and only one regional drilling training event has been held	At least 30 trainees (participation of at least 40% women) reporting fully satisfactory participation	A total of at least 60 trainees (participation of at least 40% women) reporting fully satisfactory participation.	Reports of training modules and study tours including evaluation by participants.	The public civil servants attending trainings and events represent key technical and

Results chain	Indicators	Baseline	Mid-term target	Final target	Means of verification	Assumptions
groundwater management, and technical aspects, and knowledge exchanges with similar contexts in small volcanic islands of the Mediterranean, the Atlantic, and the Caribbean.	assessment, management, monitoring and advanced drilling techniques (gender balanced).	so far (during the EU-funded BSRP project).			Gender disaggregated data on participation will be collected.	management roles in countries.
<u>Output 4.1.2:</u> Project website and knowledge management platform created.	Project website in place.  Communication strategy drafted and endorsed by the Steering Committee.	No website in place.  No communication strategy in place.	Website launched and populated with project information and deliverables.  Communication strategy drafted and endorsed by the SC.	Website maintained and fully populated with project deliverables.  Communication strategy fully implemented.	Project website.  Communication strategy document endorsed by SC.	PMU able to devote expert staff to facilitate countries? interactions and ensure quality and timeliness of uploads and online events.
<u>Output 4.1.3:</u> Contribution to IWLEARN activities, including sharing of results globally focusing on SIDS.	Level of engagement in IW:LEARN through participation and delivery of key products.	Project countries have been participating in IW:LEARN activities with relevant contributions during previous GEF projects (IWRM and R2R)	Project engaged with IW:LEARN activities through participation in at least 1 IW international conference, and 1 training/twinning event.	At least 2 experience notes produced by each country.	IW:LEARN experience notes.	Project staff and country focal points able to travel.

**ANNEX B: RESPONSES TO PROJECT REVIEWS (from GEF Secretariat and GEF Agencies, and Responses to Comments from Council at work program inclusion and the Convention Secretariat and STAP at PIF).**

STAP Review Comments	Responses
<p>STAP welcomes this project from FAO to enhance water-food security and climate resilience in the volcanic island countries of the Pacific. The project offers good prospects for national benefits with implications for regional, global scaling of lessons. Inclusion within the International Waters mandate relies on consideration of groundwater resources as ?shared? among Pacific Islands, as defined by the 1997 SAP.</p> <p>Opportunities for improvements beyond the baseline within particular island states are favorable. Anticipated benefits for the Northeast Australian Shelf-Great Barrier Reef as a shared water ecosystem are indirect and difficult to quantify. The project offers a good identification of opportunities to integrate lessons on groundwater within IWRM and water-food nexus policies and practices.</p>	<p>Much appreciated.</p>
<p>The project includes some innovative aspects including the integration of the land degradation neutrality (LDN) framework within IW programming. It applies technical innovations in groundwater analysis in volcanic systems, through a combination of volcanology, remote sensing, spring mapping, and fracture analysis.</p> <p>Efforts to apply remote guidance to training at scale is potentially innovative, given constraints of highly a distributed target population combined with possible enduring COVID-19 constraints.</p>	<p>During PIF stage, apart from the IW funding, also LD funding was being considered for this project (for Vanuatu). Shortly before the PIF submission the LD allocation was removed as the funds committed by the country were not available. The projects outcomes, outputs and activities were then reviewed to be fully aligned with the IW focal area as this is the only source of funds for the project. All the references to the LD funds were removed from the PIF except from one paragraph which was overlooked and was then transferred into the PDO (the paragraph after Table 1).</p>
<p>Have all the key relevant stakeholders been identified to cover the complexity of the problem, and project implementation barriers?</p> <p>Roles are identified for key government actors in the three countries, but only in a very preliminary manner for categories of civil society and private sector actors. Considerable consultation will be required (and is planned) during PPG stage.</p>	<p>Extended consultations were conducted with stakeholders during the PPG phase to further define roles and responsibilities, to obtain feedback on the proposed project activities, and to assess the needs and engagement strategies with women, youth and PWD organizations at community, district, and provincial level. These are described in detail in the Stakeholder Engagement Plan and the Institutional Arrangements.</p>

<p>Have gender differentiated risks and opportunities been identified, and were preliminary response measures described that would address these differences?</p> <p>Preliminary but with good indications of need to challenge traditional gender roles and encourage development of women's skills and involvement in water management practices.?</p>	<p>Gender differentiated risks and response measures have been identified and described in the Stakeholder Engagement Plan and GESI Action Plan.</p>
<p>Do gender considerations hinder full participation of an important stakeholder group (or groups)? If so, how will these obstacles be addressed?</p> <p>Not yet identified specifically.</p>	<p>Not identified in the GESI Analysis conducted during PPG.</p>

<b>COUNCIL COMMENTS</b>	<b>RESPONSES</b>
<b>GERMANY</b>	
<p>Urbanization has been identified as a main factor of natural resource degradation in the project area. The proposal could provide more details, however, on how the absolute population increase in Melanesia challenges the implementation logic.</p>	<p>Population increase and climate-related migration from coastal areas towards island interiors was added as another pressure potentially shifting groundwater demands spatially and temporally.</p>
<p>The cooperation of FAO and SPC seems very worthwhile considering their extent of regional and country experience. The involvement of other stakeholders, such as the civil society (as described in Component 2, (iii)) could be explicated furtherly, e.g. the suggested consultative participatory process.</p>	<p>Stakeholder engagement during the PPG phase and expected involvement during project implementation are presented in the stakeholder engagement plan. Additional information was added describing the potential involvement (or revival) of national water committees, inter-ministerial committees, and catchment management committees in overseeing national activities related to governance reforms and hard interventions under project Component 3.</p>
<b>USA</b>	
<p>We recommend collaboration with USAID's Pacific American Fund in this region</p>	<p>Collaboration with USAID's Climate Ready Programme during the PPG phase allowed the recruitment of a GESI specialist and of an ESS specialist. As a result, a GESI analysis was conducted and a GESI Action Plan was developed. Additional collaboration with the Pacific American Fund will be explored through our contacts at the Climate Ready Programme.</p>

<p>We also recommend greater clarity at the next phase of project development on whether the feasibility studies for groundwater will be in large towns / higher population islands, or will it focus on small islands and towns.</p>	<p>The technical-economic feasibility studies under Project Output 1.1.2 will be focusing on newly identified and/or poorly developed aquifers with high development potential to address the needs identified during the Theory of Change.</p> <p>The activities under Component 2 however (diagnostic analyses, aquifer management plans) will focus on high-value, potentially over-exploited, priority aquifers identified by the countries. These high-value aquifers may underly or be in the vicinity of urban centers (e.g. Honiara aquifer in the Solomon Islands).</p>
<p>We further recommend greater clarity and a justification at the next phase of project development on why this project is not focused on spring water development? Spring water, although smaller in volumes, is a significant and largely under-developed resource for remote communities. It is significantly less costly and easier to manage than boreholes. These are especially abundant in Vanuatu, Solomon Islands and Fiji.</p>	<p>Spring water development for water supply / agriculture was indeed considered for Fiji under Project Output 3.1.3 and a provision has been made in the budget (up to \$100,000). This project will provide baseline information on existing significant springs recognizing their value for water supply and for the environment. These valuable resource will be incorporated into proposed aquifer management plans to promote their protection.</p>
<p>There have been failed borehole development projects in other regions of the world. How will this project build off of those projects to ensure success?</p>	<p>The project will build on lessons learnt from the Pacific and other regions and industry best practice to increase drilling success. Drilling will be guided by geophysical investigations conducted under this project to ensure success.</p>

<b>PIF COMMENTS</b>	<b>Responses</b>
<p>Is the project/program aligned with the relevant GEF focal area elements in Table A, as defined by the GEF 7 Programming Directions?</p> <p>Partly, the project is fully aligned with the IW focal area, but it seems that project can still be strengthened to capture the LD financing that Vanuatu has allocated to the project, but which has NOT been included at all in the budget. Please address</p>	<p>Kindly note that shortly before the submission in the GEF portal, the LD allocation for Vanuatu was removed from the project because we realized that the funds committed by the country were not available. All the references to these funds have been removed from the PIF. The projects outcomes, outputs and activities have been reviewed to be fully aligned with the IW focal area as this is the only source of funds for the project.</p>
<p>This project will be assisting pacific countries in implementing the first Strategic Action Programme ever formulated, based on funding from the GEF IW FA. One of the ever important issues in the SAP, were aquifer pollution. The presentation of the rationale for the investment, seem to be founded around the TWAP, and the implementation of the SAP. However, the SAP itself seems to have been omitted. Please make sure that references are correct.</p>	<p>The references to the Strategic Action Programme (SPA) have been reviewed and updated.</p>
<p>Please revise objective, an objective is to describe in concise terms what project will be delivering. "the project objective is to..." . Expanding the role may be important, but it would seem even more appropriate if the project would contribute to conservation of ground water resources, improved management of ground water resources, more sustainable use of ground water resources or limit pollution to pacific sids aquifers. Please carefully reformulate objective.</p>	<p>The overall objective of the project, as well as the wording of the outcomes and outputs have been reviewed following the indications of GEFSEC.</p>
<p>The new reformulated Objective should then be reflected upon in the components and their outcomes and outputs.</p>	
<p>Please ensure that proposed activities and associated outputs, are fully aligned with the national IWRM plans and their implementation (as identified and initiated under the PACIFIC IWRM project).</p>	<p>Text was added to ensure that the proposed activities and associated outputs are fully aligned with the national IWRM plans and their implementation (as identified by GEF ID 2586).</p>
<p>Considering that Vanuatu has allocated funding to the project, this should also be reflected upon in the results framework, budget etc.</p>	<p>Kindly Refer to see section 1: the LD STAR funds proposed by Vanuatu have been removed from the project together with the related activities.</p>

<p>Please carefully assess if the \$15 mio investment mobilized will be in the form of a grant or in reality will be parallel in-kind financing.</p>	<p>Text has been added to the PIF to explain the rationale behind the USD 15M grant co-financing committed by PSC. The institution confirmed that this co-financing should be considered as grant according to the GEF guideline on co financing ? i.e. the USD 15M are ?Resources provided without expectation of repayment?.</p>
<p>Please address following: There is not proportionality in the co-financing contribution to PMC ? it should be around 5% as it is the GEF contribution. Hence, for a co-financing of \$23,100,000, the expected contribution to PMC must be around \$1,155,000 instead of \$300,000.</p>	<p>The co-financing has been redistributed in order to contribute for approx. 5% to PMC - the new contribution to PMC has been set to \$1,200,000.</p>
<p>Amounts in Portal for the GEF Financing (\$6,000,000) and Agency Fee (\$570,000) are higher than amounts allocated in the LoEs ? The only LoE that accurately reflects the amounts in Portal is Vanuatu?s. As two out of the three LoEs (Fiji and Solomon Islands) have a lower amount, the solution is either (i) reduce the amounts requested in Portal as presented in these two LoEs (GEF Financing: \$5,636,947 ? Fee: \$535,510 ? PPG: \$150,000 ? PPG Fee: \$14,250); or (ii) leave the amounts in Portal with new LoEs for Fiji and Solomon Islands identical to Vanuatu?s.</p>	<p>New LoEs for Fiji and Solomon Islands identical to Vanuatu?s have been uploaded. Figures and now consistent for all the LOEs.</p>
<p>LD financing has been included in Vanuatu LOE, however, this funding has not been accounted for in the results framework. Please address.</p>	<p>The references to LD STAR (Vanuatu) funds have been removed from the project (kindly refer to the response given in section 1)</p>
<p>Section on global environment benefits explains project?s contribution through indicator 7 but no target has been provided. Please revise.</p>	<p>Targets for indicator 7 have been provided. These take into account the peculiar situation of SIDS, yet reflect the project's contributions to the improved cooperative management of the SWE</p>
<p>Please include all focal areas including \$ to the project</p>	<p>The references to LD STAR (Vanuatu) funds have been removed from the project (kindly refer to the response given in section 1)</p>
<p>Please ensure that the underlying rationale for IW investment is clear (the 1997 Pacific IW SAP, that clearly identified aquifer pollution, alongside the national IWRM plans formulated and enacted through the Pacific IWRM investment).</p>	<p>References to the 1997 Pacific IW SAP, aquifer pollution and the national IWRMs have been added.</p>

<p>Please add Theory of Change</p> <p>Adequately Addressed. However, it is expected that the ToC will be further developed and elaborated upon during the PPG process.</p>	<p>Theory of Change prepared and uploaded. This reflects the new objective, outcomes and outputs prepared following the advice included in this Review Sheet.</p>
<p>Full alignment with IW, but LD financing seems to have been omitted in project budget and components.</p>	<p>The references to LD STAR (Vanuatu) funds have been removed from the project (kindly refer to the response given in section 1)</p>
<p>Incremental reasoning is to illustrate the "additionality" that the investment will bring, on top of the baseline. The paragraph included focuses more on what the project will do. what will happen in a scenario where GEF would not invest?</p> <p>Addressed. However it is noted that the incremental rationale needs to be further strengthened during the PPG process</p>	<p>The incremental reasoning has been rephrased focusing on additionally and on the value added of this GEF investment, i.e. what would happen in a scenario where GEF would not invest in these 3 SIDS.</p>
<p>The global environment benefits are not necessarily the same as the core indicators. eg the rationale for GEF IW is to further transboundary cooperation on shared resources. Since this investment will not fit squarely into indicator 7, please add description here. Further, Core indicator 3 and 7 is mentioned, but not reported on in Core Indicator table. On the other hand Core Indicator table lists Core Indicator 11, which is not mentioned in paragraph, please add. Please ensure consistency between text and table.</p>	<p>The global environment benefits section has been updated to explain the benefit brought by the transboundary cooperation on shared resources. References to Core indicator 3 have been removed and consistency between the text and the table have been reviewed.</p>
<p>The stakeholder matrix only includes official entities. These may indeed be central for a successful implementation of the investment, but it would seem that local stakeholder groups and natural resource users would be equally important. Please expand.</p>	<p>The stakeholder matrix has been reviewed and relevant local stakeholder groups and natural resource users have been included.</p> <p>Gender Equality and Women's Empowerment</p>
<p>This is a very generic description of the private sector stakeholders. Please expand</p>	<p>The text on the private sector stakeholders has been expanded providing few concrete examples of potential private investors</p>

The risks identified does not include a climate risk screening, please provide. Please see GEF STAP guidance. In general it is remarkable that climate change is not even mentioned in the risk matrix, considering the central role climate change plays in the pacific islands. Further, It is noted that COVID 19 has been identified, but please expand on the potential short, medium and long term impacts on this proposed investment.	The Climate Risk Screening for the project has been uploaded in the portal. A specific section on climate change risk has been added to the risk matrix. The text on COVID-19 has been reviewed indicating specific potential short, medium and long term impacts on this proposed investment
Considering that Vanuatu have allocated STAR financing to the project, it should be captured in the RF and proposed activities.	The references to LD STAR (Vanuatu) funds have been removed from the project (kindly refer to the response given in section 1)
Please note the opportunities for collaboration with IWLEARN and its SIDS component.	Output 4.1.4 has been reworded to reflect better contribution to IWLEARN activities, including sharing of results globally focusing on SIDS (by using 1% of the IW funds in full coordination with the IWLEARN project).
Please append the ESS document	ESS document has been appended

**ANNEX C: Status of Utilization of Project Preparation Grant (PPG).  
(Provide detailed funding amount of the PPG activities financing status  
in the table below:**

PPG Grant Approved at PIF: <b>150,000 USD</b>			
<i>Project Preparation Activities Implemented</i>	<i>GETF/LDCF/SCCF Amount (\$)</i>		
	<i>Budgeted Amount</i>	<i>Amount Spent to date</i>	<i>Amount Committed</i>
5013 Consultants (International Consultant for Climate Risk Assessment ? see Annex I3)	7,500	0	7,500
5014 Contracts: Letter of Agreement (LoA) with SPC to carry out the PPG phase, including:			
SPC staff to develop thematic reports, identification of pilot sites, development of the Project Document, workshops, etc.	81,510	97,333	7,499

Travels to support consultations with the countries	33,470	3,704	
Workshop to support the project development process	5,800	5,150	
Consultants to support Vanuatu, Fiji and Solomon Islands	21,720	28,814	
<b>Total</b>	<b>150,000</b>	<b>135,001</b>	<b>14,999</b>

**ANNEX D: Project Map(s) and Coordinates**

**Please attach the geographical location of the project area, if possible.**

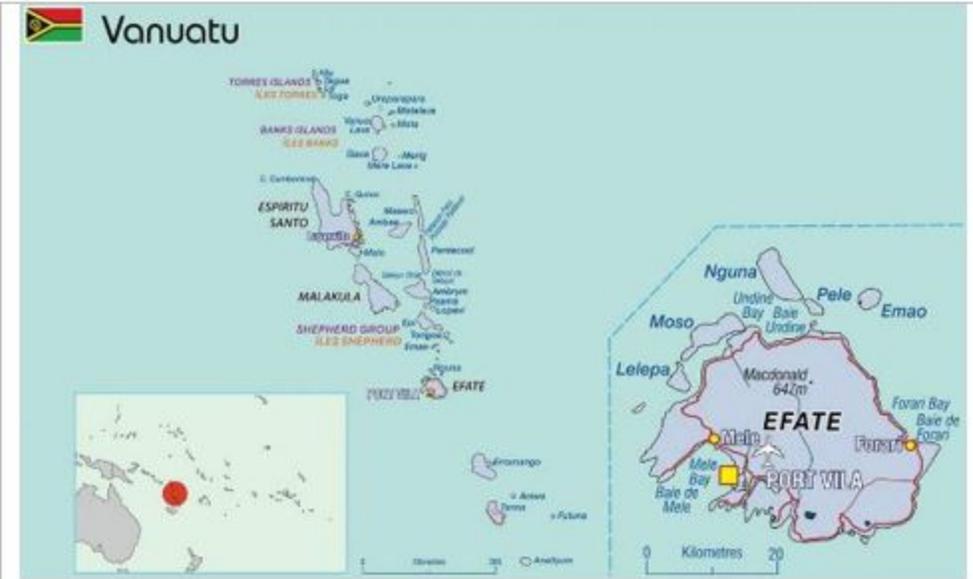
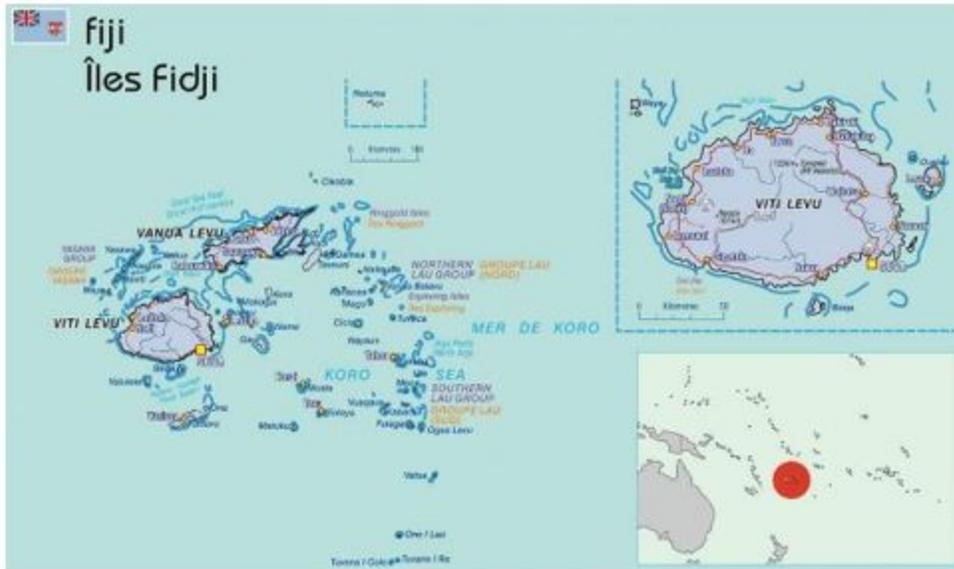


Figure 19. Map of Vanuatu and Sarakata catchment, Santo Island, Vanuatu





Yaqara valley aquifer, Viti Levu, Fiji



Figure 21 Map of Fiji Islands and Yaqara valley aquifer, Viti Levu Island, Fiji

**ANNEX E: Project Budget Table**

Please attach a project budget table.

**Enhancing water-food security and climate resilience in volcanic island countries of the Pacific**

Responsible Entity	FAO Cost Categories	Component 1	Component 2	Component 4		PMC	Operational Partner Budget	FAO Support Services	Total GEF
		Outcome 1.1	Outcome 1.2	Outcome 3.1	M&E				
<b>5011 Salaries professionals</b>									
SPC	Chief Technical Adviser	88,458	88,458	165,622		88,458	83,431		514,428
SPC	Technical Specialist	180,198	180,198	288,317		72,079			720,792
SPC	Technical Support Officer	11,519	11,519	13,823		9,215			46,077
SPC	Data and GIS Officer	28,452	28,452	28,452		28,452			113,807
SPC	Communication Officer	14,226	14,226	14,226		14,226			56,903
SPC	GESI Officer	6,776	6,776	6,776		6,776			27,105
SPC	Procurement Officer	0	0	0		0	45,176		45,176
SPC	Regional Project Administrator	0	0	0		0	78,989		78,989
<b>5011 Sub-total salaries professionals</b>		<b>329,629</b>	<b>329,629</b>	<b>517,216</b>	<b>0</b>	<b>219,207</b>	<b>207,596</b>	<b>0</b>	<b>1,603,277</b>
<b>5013 Consultants</b>									
<b>Sub-total international Consultants</b>									
<i>Detailed national consultants - show job title for each profile</i>									
		0	0	0		0	0		0
SPC	National Coordinators (1/country, total of 3)	137,559	137,559	137,559		137,559			550,238
SPC	National Consultants (Groundwater specialists, Community Engagement Specialists)	18,177	27,266	31,810		13,633			90,885
<b>Sub-total national Consultants</b>		<b>155,736</b>	<b>164,825</b>	<b>169,369</b>	<b>0</b>	<b>151,192</b>	<b>0</b>	<b>0</b>	<b>641,123</b>
<b>5013 Sub-total consultants</b>		<b>155,736</b>	<b>164,825</b>	<b>169,369</b>	<b>0</b>	<b>151,192</b>	<b>0</b>	<b>0</b>	<b>641,123</b>
<b>5650 Contracts</b>									
<i>Detailed- show "service provider/vendor" for each contract</i>									
SPC outsourcing	Drilling including mobilisation	326,256	0	398,757		0			725,013
SPC outsourcing	water quality analysis	30,797	0	10,266		0			41,063
SPC outsourcing	Small investment infrastructure development (bores/springs) 4per country	0	0	277,231		0			277,231
SPC outsourcing	Spring surveys one per country (delivered)	44,348	0	0		0			44,348
SPC outsourcing	Structural Geology Analysis for three countries	20,448	0	0		0			20,448
SPC outsourcing	Aquifer Diagnostics and Economic Analysis (1 aquifer for each country)	61,345	0	0		0			61,345
SPC outsourcing	Drilling supervision and logging each country	41,391	76,869	0		0			118,260
SPC outsourcing	Aquifer conceptualisation for identified aquifer system in each country	0	35,785	0		0			35,785
SPC outsourcing	Aquifer management plans (1 per country)	0	46,009	0		0			46,009
SPC outsourcing	Land use management intervention	0	0	13,140		0			13,140
SPC outsourcing	Drilling standardisation and training	0	0	25,560		38,341			63,901
SPC outsourcing	Hydrogeological training development	0	0	0		49,275			49,275
SPC outsourcing	National Policy and Legislation Strengthening	0	0	0		46,861			46,861
SPC outsourcing	Auditing	0	0	0		0	57,000		57,000
SPC outsourcing	Financial spot checks	0	0	0		0	20,070		20,070
FAO support	Mid Term Review (MTR)	0	0	0	65,000	65,000		65,000	65,000
FAO support	Terminal Evaluation (TE)				65,000	65,000		65,000	65,000
FAO support	Independent Monitoring and Evaluation				33,450	33,450		33,450	33,450
FAO support	Terminal Report				6,550	6,550		6,550	6,550
<b>5650 Sub-total Contracts</b>		<b>524,584</b>	<b>158,662</b>	<b>724,954</b>	<b>170,000</b>	<b>304,476</b>	<b>77,070</b>	<b>170,000</b>	<b>1,789,747</b>
<b>5021 Travel</b>									
SPC	International travel	81,735	65,025	58,240	10,000	65,154			270,154
SPC	National travel	135,855	92,461	242,315		10,087			480,718
SPC	Other Travel (for training/workshops and meetings, incl IW learn)	5,168	27,688	60,173		99,401			192,431
<b>5021 Sub-total travel</b>		<b>222,758</b>	<b>185,174</b>	<b>360,728</b>	<b>10,000</b>	<b>174,642</b>	<b>0</b>	<b>0</b>	<b>943,302</b>
<b>5023 Training</b>									
SPC	Local Workshops for consultations (stakeholders)	14,783	43,362	9,855		0			68,000
SPC	National Drillers training workshop	0	0	0		11,498			11,498
SPC	National Drilling standards workshop	0	0	15,768		0			15,768
SPC	Hydrogeological training	0	0	0		26,280			26,280
SPC	National Aquifer conceptualisation workshop	0	18,725	0		0			18,725
SPC	National policy and legislation support workshop	0	0	0		0			0
SPC	Drillers operational planning workshops	0	0	5,256		0			5,256
SPC	International and Regional workshops	0	0	0		41,391			41,391
<b>5023 Sub-total training</b>		<b>14,783</b>	<b>62,087</b>	<b>30,879</b>	<b>0</b>	<b>79,169</b>	<b>0</b>	<b>0</b>	<b>186,917</b>
<b>5024 Expendable procurement</b>									
SPC	Shipping (equipment and drill rigs)			292,913		0			292,913
SPC	Communication and awareness					82,125			82,125
SPC	Other Expendable (telemetry, imagery data, tools, office supplies, printing, etc)	20,847	20,847	20,847		20,847			83,389
<b>5024 Sub-total expendable procurement</b>		<b>20,847</b>	<b>20,847</b>	<b>313,760</b>	<b>0</b>	<b>102,972</b>	<b>0</b>	<b>0</b>	<b>458,426</b>
<b>6100 Non-expendable procurement</b>									
SPC	Equipment (wq sampling, stream flow, drilling, telemetered loggers and geophysics)	37,186		86,768					123,954
<b>6100 Sub-total non-expendable procurement</b>		<b>37,186</b>	<b>0</b>	<b>86,768</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>123,954</b>
<b>5028 GOE budget</b>									
SPC	ICT (computers, printers, internet, ICT support)	35,136	35,136	47,404	0	27,914			145,589
SPC	Facilities (rent, utilities, maintenance, consumables, sundries)	28,244	28,244	35,254	0	15,923			107,666
<b>6300 Sub-total GOE budget</b>		<b>63,380</b>	<b>63,380</b>	<b>82,658</b>	<b>0</b>	<b>43,837</b>	<b>0</b>	<b>0</b>	<b>253,255</b>
<b>TOTAL</b>		<b>1,368,903</b>	<b>984,604</b>	<b>2,286,332</b>	<b>180,000</b>	<b>1,075,494</b>	<b>284,666</b>	<b>170,000</b>	<b>6,000,000</b>

<b>SUBTOTAL Comp 1</b>	<b>1,368,903</b>
<b>SUBTOTAL Comp 2</b>	<b>984,604</b>
<b>SUBTOTAL Comp 3</b>	<b>2,286,332</b>
<b>SUBTOTAL Comp 4</b>	<b>1,075,494</b>
<b>Subtotal</b>	<b>5,715,333</b>
<b>Project Management Cost (PMC)</b>	<b>284,666</b>
<b>TOTAL GEF</b>	<b>6,000,000</b>

Includes 180,000 USD for M&E

**ANNEX F: (For NGI only) Termsheet**

Instructions. Please submit an finalized termsheet in this section. The NGI Program Call for Proposals provided a template in Annex A of the Call for Proposals that can be used by the Agency. Agencies can use their own termsheets but must add sections on Currency Risk, Co-financing Ratio and Financial Additionality as defined in the template provided in Annex A of the Call for proposals. Termsheets submitted at CEO endorsement stage should include final terms and conditions of the financing.

NA

**ANNEX G: (For NGI only) Reflows**

Instructions. Please submit a reflows table as provided in Annex B of the NGI Program Call for Proposals and the Trustee excel sheet for reflows (as provided by the Secretariat or the Trustee) in the Document Section of the CEO endorsement. The Agency is required to quantify any expected financial return/gains/interests earned on non-grant instruments that will be transferred to the GEF Trust Fund as noted in the Guidelines on the Project and Program Cycle Policy. Partner Agencies will be required to comply with the reflows procedures established in their respective Financial Procedures Agreement with the GEF Trustee. Agencies are welcomed to provide assumptions that explain expected financial reflow schedules.

NA

**ANNEX H: (For NGI only) Agency Capacity to generate reflows**

Instructions. The GEF Agency submitting the CEO endorsement request is required to respond to any questions raised as part of the PIF review process that required clarifications on the Agency Capacity to manage reflows. This Annex seeks to demonstrate Agencies' capacity and eligibility to administer NGI resources as established in the Guidelines on the Project and Program Cycle Policy, GEF/C.52/Inf.06/Rev.01, June 9, 2017 (Annex 5).

NA