



Strengthening Resilience of Water Supply in Honiara

Part I: Project Information

Name of Parent Program

Climate Resilient Urban Development in the Pacific

GEF ID

Project Type

FSP

Type of Trust Fund

LDCF

CBIT/NGI

☐ CBIT

☐ NGI

Project Title

Strengthening Resilience of Water Supply in Honiara

Countries

Solomon Islands

Agency(ies)

ADB

Other Executing Partner(s):

Solomon Island Water Authority (SW)

Executing Partner Type

Government

GEF Focal Area

Climate Change

Taxonomy

Focal Areas, Climate Change, Small Island Developing States, Climate Change Adaptation, Climate resilience, Mainstreaming adaptation, Disaster risk management, Community-based adaptation, Stakeholders, Type of Engagement, Partnership, Consultation, Information Dissemination, Private Sector, Financial intermediaries and market facilitators, Communications, Awareness Raising, Behavior change, Education, Civil Society, Community Based Organization, Gender Equality, Gender Mainstreaming, Sex-disaggregated indicators, Gender-sensitive indicators, Women groups, Beneficiaries, Gender results areas, Participation and leadership, Access and control over natural resources, Access to benefits and services, Capacity Development, Capacity, Knowledge and Research, Knowledge Exchange, Learning, Adaptive management, Indicators to measure change, Innovation, International Waters, Freshwater, Aquifer, Influencing models, Deploy innovative financial instruments, Strengthen institutional capacity and decision-making, Demonstrate innovative approach, Convene multi-stakeholder alliances, Local Communities, Sustainable Cities, Integrated Programs, Urban Resilience, Enabling Activities

Rio Markers**Climate Change Mitigation**

Climate Change Mitigation 0

Climate Change Adaptation

Climate Change Adaptation 2

Submission Date

12/7/2020

Expected Implementation Start

6/1/2021

Expected Completion Date

12/31/2027

Duration

78In Months

Agency Fee(\$)

412,844.00

A. FOCAL/NON-FOCAL AREA ELEMENTS

Objectives/Programs	Focal Area Outcomes	Trust Fund	GEF Amount(\$)	Co-Fin Amount(\$)
CCA-1	1.1. Technologies and innovative solutions piloted or deployed to reduce climate related risks and/or enhance resilience	LDCF	2,624,000.00	84,194,000.00
CCA-1	1.2 Innovative financial instruments and investment models enabled or introduced to enhance climate resilience	LDCF	1,135,000.00	
CCA-2	2.1 Strengthened cross-sectoral mechanisms to mainstream climate adaptation and resilience	LDCF	429,000.00	
CCA-2	2.3 Institutional and human capacities strengthened to identify and implement adaptation measures	LDCF	399,156.00	8,623,000.00
Total Project Cost(\$)			4,587,156.00	92,817,000.00

B. Project description summary

Project Objective

To improve efficiency, accessibility, climate change and disaster resiliency, and sustainability of safe water and sanitation in Honiara

Project Component	Financing Type	Expected Outcomes	Expected Outputs	Trust Fund	GEF Project Financing(\$)	Confirmed Co-Financing(\$)
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Project Component	Financing Type	Expected Outcomes	Expected Outputs	Trust Fund	GEF Project Financing(\$)	Confirmed Co-Financing(\$)
Demonstrating/ deploying climate resilient urban services: water supply, sanitation and disaster reduction	Investment	1. Continuous, safe, and climate resilient urban water supply ensured	<p>1.1 Volume of water treated for the GHA increased by 5 MLD (ADB financed)</p> <p>1.2 Improved quality and resiliency of water supply from Kongulai Spring through turbidity removal (LDCF financed)</p> <p>1.3 Eleven (11) km of new water trunks installed and 2 new storage reservoirs built to enhance climate resilience (ADB financed)</p> <p>1.4 Seventy (70) km of new water supply mains installed, and 10 km of the existing water supply mains upgraded to ensure reliable delivery to households (ADB financed)</p> <p>1.5 7,500 prepaid water meters installed (ADB financed)</p>	LDC F	1,260,000.00	53,150,000.00

Project Component	Financing Type	Expected Outcomes	Expected Outputs	Trust Fund	GEF Project Financing(\$)	Confirmed Co-Financing(\$)
Demonstrating/ deploying climate resilient urban services: water supply, sanitation and disaster reduction	Investment	2. Effective, efficient, safe and climate resilient urban sanitation services provided (All outputs ADB financed)	2.1 Three ocean outfalls rehabilitated and a new outfall constructed 2.2 Six new sewer pump stations constructed and two sewage pump stations rehabilitated 2.3 New septage treatment facility (60 m3/day) constructed 2.4 New sewer pipes (7 km) built	LDC F		20,580,000.00
Facilitating climate resilient urban planning and development	Technical Assistance	3. Awareness and behaviors of hygiene and water conservation in GHA enhanced and sustained (All outputs ADB-financed)	3.1 Ten thousand (10,000) persons are reached with gender-sensitive awareness and behavior programs of hygiene and water conservation 3.2 At least 80% of children aged 5–15 years have improved awareness of hygiene and water conservation. 3.3 Three thousand (3,000) women and girls are provided with menstrual hygiene training and products	LDC F		2,530,000.00

Project Component	Financing Type	Expected Outcomes	Expected Outputs	Trust Fund	GEF Project Financing(\$)	Confirmed Co-Financing(\$)
Facilitating climate resilient urban planning and development	Technical Assistance	<p>4. Solomon Islands Water Authority is financially and technically sustainable</p> <p>(All outputs ADB-financed)</p>	<p>4.1 Water tariff framework with regular review is set up and reviewed</p> <p>4.2 All SW staff have updated knowledge on technical, financial or O&M</p>	LDC F		3,480,000.00

Project Component	Financing Type	Expected Outcomes	Expected Outputs	Trust Fund	GEF Project Financing(\$)	Confirmed Co-Financing(\$)
Facilitating climate resilient urban planning and development	Technical Assistance	5. Management of Honiaria's watershed area strengthened and made resilient to climate change (LDCF financed)	5.1 Capacity for planning and informed decision making is strengthened through improved understanding of watershed biophysical and social boundaries, resources, and processes (LDCF financed) 5.2 Interagency and inter-sectoral coordination and governance mechanisms support development of integrated, climate-responsive catchment management plans (LDCF financed) 5.3 Communities empowered to implement on-the-ground climate change adaptation solutions for effective management, protection, and restoration of the forest and riparian habitats of the watershed. (LDCF financed)	LDCF	3,110,000.00	
Sub Total (\$)					4,370,000.00	79,740,000.00
Project Management Cost (PMC)						
				LDCF	217,156.00	13,077,000.00

Project Management Cost (PMC)

Sub Total(\$)		217,156.00	13,077,000.00
Total Project Cost(\$)		4,587,156.00	92,817,000.00

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

Sources of Co-financing	Name of Co-financier	Type of Co-financing	Investment Mobilized	Amount(\$)
GEF Agency	Asian Development Bank	Grant	Investment mobilized	9,000,000.00
GEF Agency	Asian Development Bank	Loans	Investment mobilized	28,000,000.00
GEF Agency	Asian Development Bank	Loans	Investment mobilized	15,000,000.00
Donor Agency	European Union	Grant	Investment mobilized	20,347,000.00
Recipient Country Government	Government of Solomon Islands	In-kind	Recurrent expenditures	11,470,000.00
Others	Solomon Water	In-kind	Recurrent expenditures	9,000,000.00
Total Co-Financing(\$)				92,817,000.00

Describe how any "Investment Mobilized" was identified

Source: <https://www.adb.org/sites/default/files/project-documents/51271/51271-001-rrp-en.pdf> * EU grant is €18 million (US\$20.35 equivalent at appraisal in May 2019). Solomon Urban Water Supply and Sanitation Sector Project Cofinancing Info: <https://www.adb.org/projects/51271-001/main#project-documents>

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

Agency	Trust Fund	Country	Focal Area	Programming of Funds	Amount(\$)	Fee(\$)
ADB	LDCF	Solomon Islands	Climate Change	NA	4,587,156	412,844
Total Grant Resources(\$)					4,587,156.00	412,844.00

E. Non Grant Instrument

NON-GRANT INSTRUMENT at CEO Endorsement

Includes Non grant instruments? **No**

Includes reflow to GEF? **No**

F. Project Preparation Grant (PPG)

PPG Required

☐

PPG Amount (\$)

PPG Agency Fee (\$)

Agency	Trust Fund	Country	Focal Area	Programming of Funds	Amount(\$)	Fee(\$)
Total Project Costs(\$)					0.00	0.00

Part II. Project Justification

1a. Project Description

1. Background Information

1.a. Solomon Islands and Honiara

The Solomon Islands is a small island developing state (SIDS) in the South West Pacific Ocean. With a population of about 687,000, the Melanesian country is composed of over 900 islands spread across 9 provinces (Figure 1). Many of the islands are small and many are in atoll settings. A few are larger, mountainous, and of volcanic origin.

The economy of Solomon Islands is largely based on services (approximately 40 percent of GDP), agriculture (approximately 15 percent of GDP) and forestry (approximately 15 percent of GDP). The manufacturing sector remains very small. Much of the population depends on subsistence agriculture for their livelihoods.

The country is one of the most vulnerable to the adverse impacts of climate change – ranked among the top 40 most vulnerable global nations in the ND-GAIN 2016 Index. This is due in large part to the fact that the majority of the population lives within 1.5 km of the coastline and the islands are regularly exposed to extreme rainfall events.

High poverty rates, excessive dependence on foreign aid, and remoteness make the Solomon Islands particularly vulnerable to climate variability and change. The country is officially classified as a Least Developed Country (LDC) and also a Fragile and Conflict-Affected Situations (FCAS) country, with the second lowest GDP per capita in Oceania.^[1] An estimated 25% of Solomon Islanders live below the international poverty line of \$1.90 per person per day in 2011 purchasing power parity terms. The country has a very high unemployment rate of around 92%, although many find revenue in the informal sector.

Figure 1: Map of Solomon Islands



Honiara is the capital city and largest urban area of the Solomon Islands. The city is located on the northern coastline of Guadalcanal Island, amidst rugged mountains and valleys. Administered by the Honiara City Council (HCC), it covers approximately 23 km² and is divided into 12 wards.

Honiara lies within the Greater Honiara Area (GHA), which covers 133 square kilometers and includes portions of Tandai Ward and Malango Ward in Guadalcanal Province. As shown in Figure 2, GHA can be divided into two general geographical zones. The first zone, located in the south and west, is characterized by hilly grasslands incised by narrow

forested valleys. The elevation rises along the southern border of GHA. In this zone, residences are located on ridges and along valleys, and many are at risk from landslips and flash floods.

The second zone is an alluvial plain, which varies in width from 200 m in parts of central and western GHA to roughly 2 kms in eastern GHA. The central business district, the majority of national and city administrative buildings, and almost all major commercial developments are located within this zone. To the east, a central feature is the Lungga River, which comes down from the hills and crosses large stretches of flat land before reaching the coast. The area to the east of the Lungga River, known as Henderson (where the airport is located), is particularly low-lying and prone to flooding.

Figure 2: Map of Honiara City and Greater Honiara Area



Legend

- Major Rivers
- ▭ Greater Honiara
- ▭ Honiara City

Elevation (m)

- 0
- 125
- 250
- 375
- >500

Map produced for this Report
 Based on data from Ministry of Lands,
 Housing and Survey
 Greater Honiara from Honiara Urban
 Expansion Report
 Geographic Projection: WGS84



1 0 1 2 km

In 2018, Honiara's municipal population was estimated at over 86,000.[2]² Including the peri-urban populations of Tandai and Malango, the overall population of GHA is estimated at around 115,000. On average, GHA residents are both young[3]³ and relatively poor. Honiara's poverty levels are even higher than the national average, in part due to a higher cost of food and non-food goods and services.[4]⁴

In GHA, most of the poor live in informal settlements. Making up nearly 25% of GHA's population, informal settlers live on marginal land such as on river banks, steep and unstable slopes, and on the edge of swamps, and therefore tend to be more exposed to natural hazard risks. Informal settlements also lack centralized urban services, notably water supply and sanitation.

The rapid expansion of informal settlements accounts for much of the population growth of the GHA. The pull factors of jobs and education continue to attract a larger number of people from the provinces, most of whom locate in the informal areas. Migration is expected to accelerate, as more and more rural-dwellers choose to move to Honiara. Under a medium-growth scenario, GHA's population is projected to reach 235,000 by 2030 and 300,000 by 2050,[5]⁵ making Honiara one of the most rapidly growing cities in the Pacific.

Unfortunately, investments in urban infrastructure have not been commensurate with the growing urban population, so parts of Honiara have experienced decreasing rates of access to basic urban services, such as electricity, public water supply and sanitation, solid waste collection, and drainage. Furthermore, urban planning, management and development has been ad hoc, and budgets for operations and maintenance have historically been inadequate.

COVID situation.[6]⁶ The government's public health response to COVID-19, including closing the borders, prevented entry of the disease into the country until the first case was reported in October. While the disease has not yet spread further, the country is at risk of rapid spread because of its weak public health system, insufficient testing and tracing systems, and underdeveloped water supply and sanitation services.

In addition, the Solomon Islands economy is experiencing a significant contraction as a result of the COVID-19 pandemic, and this is beginning to feed through to lower government revenues. Exports have been hit hard, which is problematic given that exports represent 42% of GDP. In addition, income-generating opportunities are scarce and mostly based on natural resources. When tropical cyclone Harold struck in early April 2020, the country's thin capacity was stretched even further by having to respond to two shocks simultaneously.

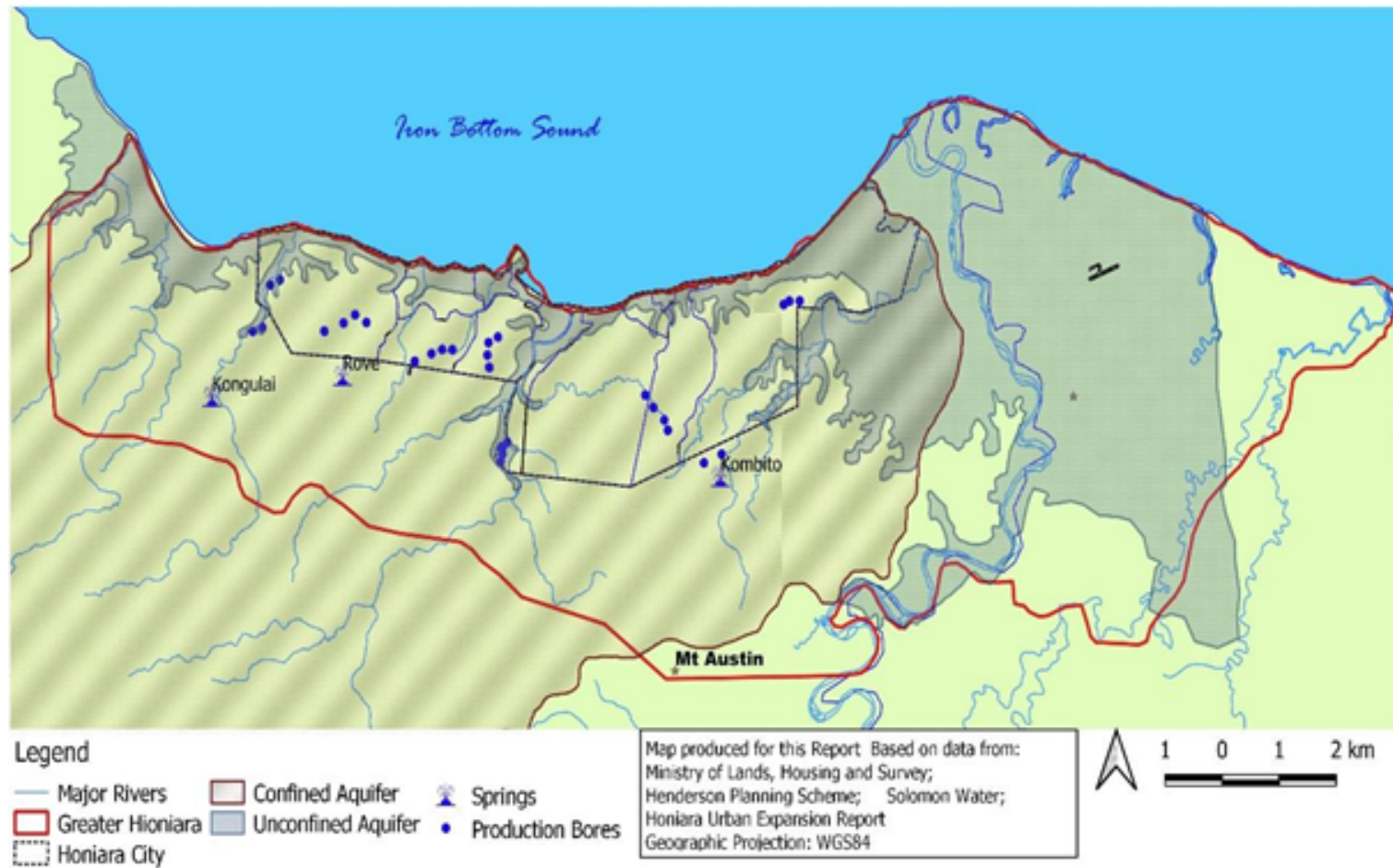
The government, the private sector, and the community are not well equipped to deal with the wide-ranging implications of COVID-19. The formal social protection system is limited in both programs and coverage, and therefore the government's ability to directly support the poorest and most vulnerable through existing programs is constrained. Without action, a continuing contraction in government revenues, coupled with increases in government expenditure, particularly for public health preparedness and response, will develop into a fiscal crisis.

1.b. Water Supply in Honiara

Current water supply. The hydrology around GHA is dominated by one large river (Lungga), a series of small rivers, and significant groundwater resources. As shown in Figure 3, there are also two types of freshwater aquifers – a deep, confined fractured rock aquifer and a shallower, unconfined unconsolidated sedimentary aquifer. The rivers and groundwater are likely to be connected in a complex manner. Springs from groundwater are a source to many local, small rivers and water courses. In addition, lying below the rivers, water may flow in underground rivers, some of which may also enter the groundwater aquifers or may rise to the surface elsewhere.^[7] These complex connections have not yet been mapped.

The Solomon Island Water Authority, trading as Solomon Water (SW), is the state owned enterprise mandated to provide reliable and safe water supply and sewerage services in urban areas in the Solomon Islands, including in GHA. The water distribution system provides drinking water to approximately 60% of GHA households. The current upper limit of water supply production is estimated at 32.5 million litres per day (MLD), with another 10 MLD to be added in the next few years. This supply of water is only enough to serve average daily demands until around 2027.^[8]

Figure 3: Boundaries of Aquifers in Greater Honiara Area



As shown in Figure 3, SW currently extracts water from three spring-fed surface water sources (Kongulai, Rove, and Kombito) and operates 25 bores across 7 bore fields. About 60% of the supply comes from the springs, mostly from Kongulai, which is the single largest source of GHA's water supply (accounting for 40% of the total). Since Kongulai Spring is Honiara's most elevated source, it enables a sizable portion of the city's water supply to be fed by gravity, which reduces pumping to high-level zones. With the high costs of energy in Honiara, this significantly reduces SW's cost of operation and aids the economic sustainability of the water supply. Thus, Kongulai Spring will continue to be a key source of Honiara's water supply even when new sources are developed.

Water is provided to roughly 10,000 households and 3,000 commercial properties through a reticulated network into six independent supply zones across GHA.^[9]⁹ This supply system includes many inadequately sized trunk mains and reticulation pipes, which contribute to poor water pressure across most of the supply system. The system also includes several storage reservoirs and pumps. For those households serviced by SW in Honiara, water is available for 22 hours a day on average. The water supply gap is primarily due to high non-revenue water (NRW) of 58% of water production, down from 62% in 2018.^[10]¹⁰

The 40% of households in GHA that are not provided water through the reticulated system get their drinking water from a number of sources, including public taps, standpipes, tube wells, boreholes, springs, and collected rainwater. The long-term strategy is to connect these customers to the centralized system, but this process will be gradual.

Future water supply. SW's 30 Year Strategic Plan (2017–2047) focuses on two water supply components: (i) upgrading the existing network, which will lead to reduction of non-revenue water, optimization of network operations, modernization, and improved service in areas already covered by SW's centralized service, and (ii) expanding the network to all areas of GHA, including informal settlements that are not currently covered.

To achieve the latter, the Strategic Plan estimates that the future source capacity will need to be increased to around 100 MLD over the next 20 years to cater to population growth, and the Lungga River is identified as the preferred source. As the largest river in Guadalcanal and with a mean flow of around 3,300 MLD, it has long been considered a long-term supply source for Honiara, but as discussed below, there are growing threats to this potential future water source.

Developing the Lungga River as Honiara's main water source will require the construction of a river intake and pump station, raw water rising mains from the river intake to the water treatment plant (WTP), a WTP located adjacent to the intake, and water pump station and trunk mains to deliver treated water into the existing water supply system.

2. Adaptation Problems

The baseline project (see below) will assist SW in achieving many of their short to medium-term objectives (e.g. reducing non-revenue water, enhancing water conservation management, and upgrading the existing water production and treatment capacity), but it will not address Honiara’s growing flooding problem, which is threatening the city’s water supply (see Annex G).

Since 1966, Honiara has experienced significant flood events roughly every 3.5 years, with the frequency increasing in recent years. Flooding occurs as a result of both cyclones and excessively heavy wet season rainfall, and Honiara’s terrain amplifies this flooding. The large catchment areas that lie upstream of the city contribute to severe riverine flooding downstream, while the steep terrain that flank the streams around Honiara means that localized flash flooding can occur during high intensity events. Rainfall has also been associated with the risk of landslips in the more rugged areas of the city.

A climate risk assessment conducted for the baseline project (a summary of which is included in Annex H) identified climate risks for Honiara’s water supply. Two of the most severe risks are related to extreme rainfall:

- Extreme precipitation events may cause turbidity that undermine performance of Kongulai Spring; and
- Extreme precipitation leading to increased floods that may directly or indirectly (through erosion) physically undermine existing and newly constructed infrastructure (e.g. trunk mains, distribution pipes).

As detailed in Annex I, extreme rainfall is projected to increase in frequency and intensity due to climate change. These projections, shown in Table 1, are based on the Clausius-Clapeyron (CC) relationship, which suggests that per 1°C of annual maximum daily temperature change, there is a ~6.5% increase in extreme rainfall. The projections also incorporate recent research on “Super CC” scaling, where changes to extreme rainfall are found to be 1.5 to 3 times greater than changes expected based on the CC rate alone.

Table 1: Projected percentage increase in extreme rainfall

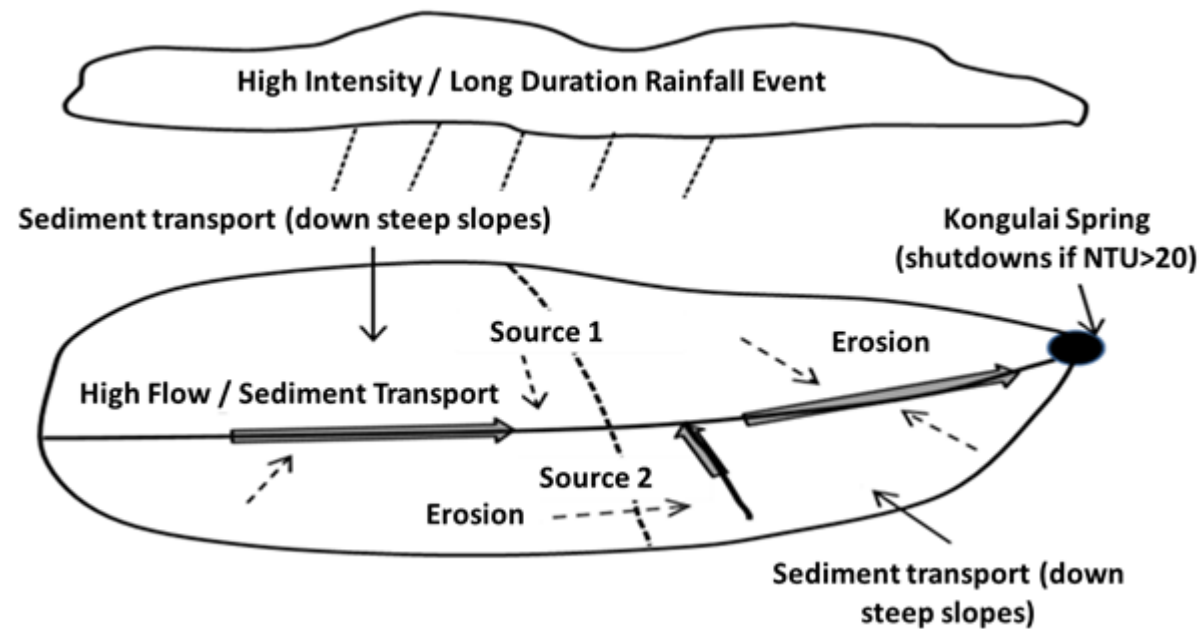
RCP	Time horizon	Change in extreme rainfall – Clausius-Clapeyron scaling (% increase)		Change in extreme rainfall – Super Clausius-Clapeyron scaling (%) ^a	
		Lower bound	Upper bound	Lower bound	Upper bound
RCP6.0	2070	6.5	11.7	9.8	17.6
RCP8.5	2070	11.7	16.9	17.6	25.4

High turbidity at current and future water sources. Flooding events are increasingly causing water supply interruptions due to high turbidity at the three spring sources (Kongulai, Rove, and Kombito). Measured in nephelometric turbidity units (NTUs), turbidity is caused by suspended chemical and biological particles, which can have both water safety and aesthetic implications for drinking water supplies.

While all three spring sources are affected, turbidity is the worst at Kongulai, which is influenced by surface water and currently untreated other than dosing of chlorine (sodium hypochlorite) for disinfection. Per Solomon Water's policy, Kongulai Spring should be shut down when turbidity exceeds 20 NTUs, which happens frequently after even moderate rainfall events.

Figure 4 shows a basic model of rainfall and sediment transport. Kongulai Spring is connected with sinkholes further inland that are within separate river catchments.^[11] These sinkholes are part of an extensive cave system, which are believed to be the major source for Kongulai Spring. Whenever it rains, sediment from different land use sources travels through this system, causing high turbidity hours later at Kongulai Spring.

Figure 4: Basic Model of Rainfall and Sedimentation Transport



Based on the projections presented in Annex I, turbidity at Kongulai may exceed 20 NTUs for up to 50% of rain days by 2070 (or for an additional ~55 rain days compared to present). Unless something is done to address the turbidity issues that will worsen with climate change, Honiara's water supply will experience increasingly frequent service interruptions and Solomon Water will face significant loss of revenue and additional costs in managing disconnections and reconnections.^[12] In addition, given the established rainfall-turbidity relationship (also explained in Annex I), the maximum (extreme) NTU values are also expected to increase, which is problematic from a water treatment perspective (see below).

The turbidity problem also poses a potentially severe problem with Honiara's future main water source. Like Kongulai, the Lungga River will only be viable as a future water source if full treatment is implemented for the uncontrolled river source. An analysis of raw water quality in the Lungga noted that seasonal turbidity (with weather effects, sediment transportation) is a possible issue in line with catchment properties and climatic conditions.[13]¹³

Since average values of raw water quality parameters are typically used to decide on the overall treatment process and the sizing of associated treatment units, turbidity variations can be problematic to the eventual design. This is also the case with Kongulai, but would be more severe with Lungga given the size of the flow and potential for much greater variations. This problem threatens the viability of Lungga as a water source, which is problematic given the absence of other alternative water sources.

Extreme flooding and Honiara's water supply infrastructure. The other climate change risk to Honiara's water supply is extreme flooding combined with riverbank erosion and landslides. Such an extreme event occurred in April 2014, when a slow-moving tropical depression passed over Honiara. In a three day period, 613 mm of rainfall was recorded, with the highest one day total recorded at 318 mm.

Following the flooding, access to clean drinking water was a major concern for at least half of the 50,000 people estimated to have been affected by the flood.[14]¹⁴ Solomon Water needed to duplicate the Kongulai gravity main at White River at a cost US\$1.75 million. In addition, the replacement cost of water meters and distribution pipes was estimated at \$72,000 (US\$300 per destroyed house).[15]¹⁵ SW also incurred additional operating costs due to a variety of repairs to the water and sewerage infrastructure, higher electricity consumption, additional chemical dosing, and additional labour costs. These costs amounted to an estimated US\$125,000.

In 2019, an assessment was completed on the "Potential Climate Change Impacts to Flooding of Water Supply and Sanitation Infrastructure in Honiara." Prepared for the ADB baseline project (described below), the study projected that the frequency of catastrophic flooding events will increase due to climate change and recommended that infrastructure should be constructed for a design flood similar in size to the flooding that occurred in 2014.

The study used GIS modelling to identify areas within 100 m of rivers and 30 m from streams, where low slopes would allow flood waters to inundate and potentially impact existing Solomon Water infrastructure. Additionally, areas where slopes are steeper than 26° were identified as areas that would potentially be exposed to flash flooding and landslides during heavy rainfall events.

As shown in Annex G, the modelling identified almost 40 km of existing water supply pipes and another 1.5 km of proposed pipes (to be installed under the baseline project) that are potentially exposed to river or stream flooding. Another 1.7 km of existing water supply pipes are located on steep slopes. In addition, over 2.7 km of existing wastewater pipes and 12.8 km of proposed wastewater infrastructure (also under the baseline project) are located near rivers and streams and therefore potentially at risk from flooding.

3. Root Causes and Barriers to be Addressed

As explained in the Proposed Alternative Scenario, the project will seek to make Honiara's water supply more resilient to climate change by combining green and gray strategies. A holistic approach is required so that the city can mitigate the impacts of more extreme rainfall on its water supply and also more broadly on its critical infrastructure. In order to accomplish this, two key barriers must be overcome.

Lack of water treatment. An obvious barrier in addressing turbidity spikes at Kongulai Spring is the lack of proper water treatment, coupled with the lack of flexibility in the water supply system in Honiara. Since Kongulai currently accounts for 40% of Honiara's water supply and the water supply in Honiara runs at close to capacity at all times, increasingly-frequent shutdowns at Kongulai mean that a continuous and safe water supply will not be available to all consumers, and this situation will become gradually worse over time with climate change.

Even when Lungga comes on line to replace Kongulai as the main water source for Honiara, it will mainly help cover service expansion and population growth, so a reliable water supply at Kongulai will still be needed for decades to come. Solomon Water does not have the option of shutting down Kongulai during periods of high turbidity. Thus, appropriate water treatment is required at Kongulai to remove turbidity and also kill parasites, bacteria, and viruses before it is piped to homes and businesses.

In considering appropriate treatment options, it is important to consider that turbidity is not just an aesthetic element of water supply. It can also indicate the presence of pathogenic microorganisms and be an effective indicator of hazardous events throughout the water supply system, from catchment to point of use. High turbidity in source waters like Kongulai Spring can harbour microbial pathogens, which can be attached to particles and impair disinfection.

Large well-run municipal supplies in the developed world should be able to achieve turbidities of <0.5 NTU at all times and to average turbidities of ≤ 0.2 NTU. In lower resource settings, including small supplies, the aim should be to keep turbidities below 5 NTU. However, there are advantages to keeping turbidity lower than this after turbidity removal because of the recorded impacts on subsequent disinfection in the water treatment process.

Turbidity above 1 NTU reduces the efficacy of chlorination (which comes after turbidity removal) by increasing chlorine demand and potentially shielding microorganisms from inactivation. While there is evidence that disinfection can be achieved at higher turbidities, chlorine doses or contact times need to be increased to ensure that adequate chemical treatment is achieved.^{[16]¹⁶}

Another important point is that turbidity removal alone (as part of additional water treatment at Kongulai and eventually at Lungga) will not be sufficient to address turbidity, since high turbidity levels before treatment requires costly turbidity removal processes (e.g. high levels of flocculants, large sludge ponds). Therefore, to manage operating costs and reduce environmental impacts, controlling turbidity at the source will also be required. This leads to the next barrier.

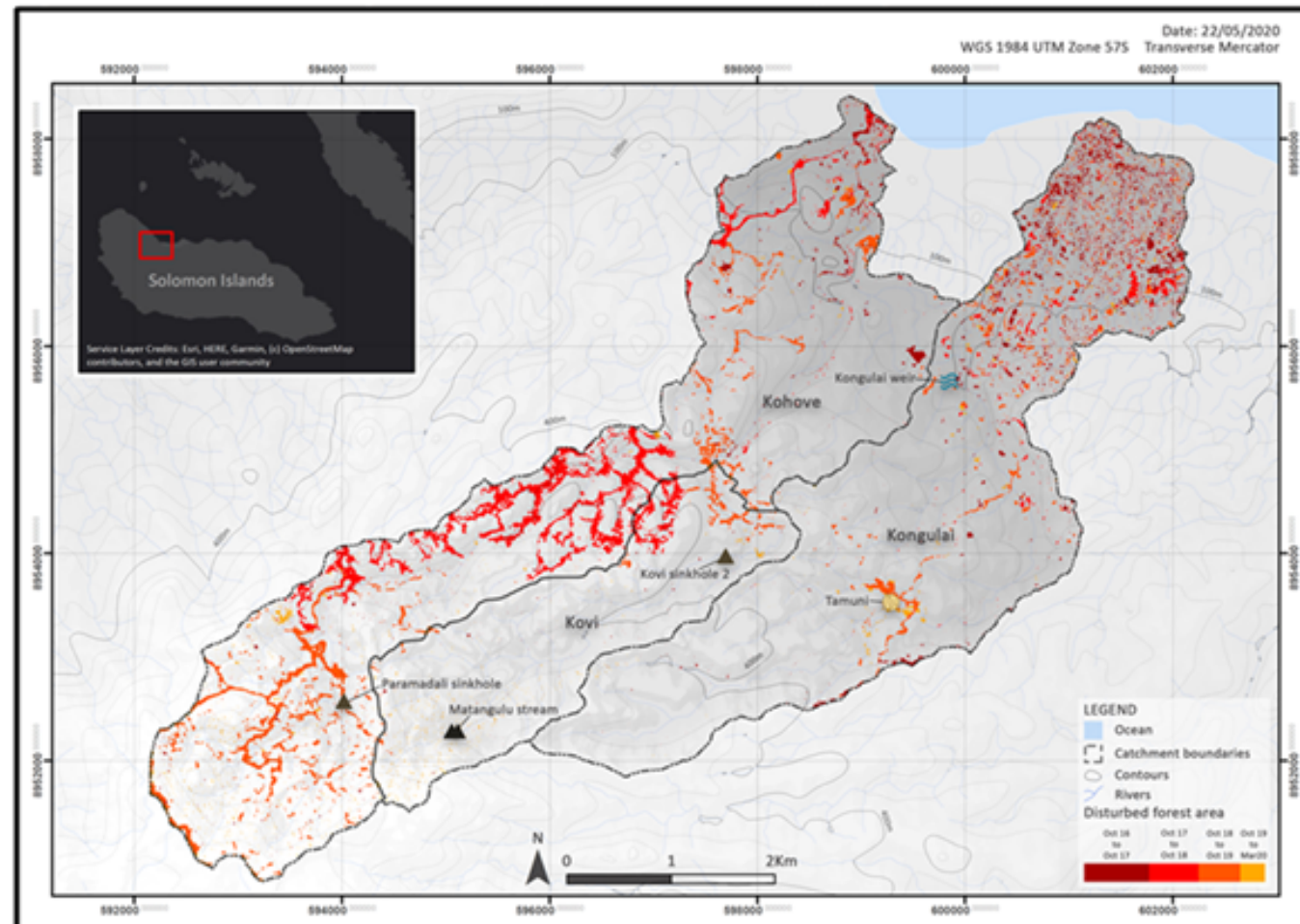
Unsustainable land management in catchment areas. The catchment areas feeding Honiara's water supply have become increasingly degraded through unsustainable land use activities, in particular from commercial logging. As detailed in Annex J, logging activities have increased over the past five years, causing a number of adverse impacts to watersheds, including greater turbidity and sediment loads (including at Kongulai Spring), higher rates of runoff and landslides during rainstorms, and changes in seasonal flow regulation. If logging is allowed to continue in the catchments feeding Honiara's water supply, Solomon Water will not be able to control turbidity and ensure a safe and secure water supply for Honiara's residents. This situation will worsen in the future, as extreme rainfall events are projected to become more frequent.

The catchment areas that pose the most immediate threat to Honiara's water supply are above the western part of the city. This area is composed of three distinct watersheds (*Kongulai, Kovi, and Kohove*) that cover about 32 km² and serve as the important water source area for the city. In particular, sink holes in the Kovi and Kohove watersheds provide important inflow for the Kongulai Spring. Most of these catchment areas fall on customary land, which is owned and managed under 'informal' customary decision-making by the locally recognized landowners.

As shown in Figure 5, logging has been most widespread in the upper Kohove and also in pockets in the lower Kongulai. Logging concessions have been granted in these watershed areas, but logging companies have not adhered to the country's Code of Logging Practice (COLP).[17]¹⁷ In this area, remote sensing data (2016-2020) reveals the following:

- 7.3% of total disturbance was on slopes above 30 degrees (against COLP);
- 25% of total disturbance was within 25m of streams (against COLP) and
- 42% was within 50m of streams; and 50% of total disturbance was above 400m elevation (against COLP and specific consent conditions).

Figure 5: Disturbed Areas in Vegetative Cover in Kongulai/Kovi/Kohove (Oct 2016-March 2020)



The catchment area of the Lungga River is 377 km², nearly twelve times the size of the Kongulai/Kovi/Kohove area (Figure 6). Several logging concessions are in operation in areas along the middle Lungga River, with levels of riparian zone degradation likely similar to the Kongulai/Kovi/Kohove watersheds (although there is currently no remote sensing data to confirm this).

Landowners have significant influence and rights over the use of the catchment areas, as their land ownership pre-dates urban development in Honiara. Hence, the only way to protect these areas is to compensate landowners for adapting their land use practices (or, conversely, to reward them for providing ecosystem services to other residents of Honiara). Therefore, any project that seeks to improve management of the catchment areas must engage with landowners as beneficiaries.

As discussed in more detail in Annex J, there are many barriers to engage landowners in a successful catchment management program (Outcome 5 was designed to address these barriers). Probably the biggest barrier is the high poverty and unemployment levels in Honiara. While logging is viewed as a major threat to the catchments, people will likely pursue this option unless an alternative is made available. This is true despite the perception that logging is mainly a short-term source of income with a lack of long-term benefits. The bottom line is that landowners need money and therefore have incentives to agree to logging company offers to log their forest, which are also perceived to be supported by the Department of Forestry.

Figure 6: The Lungga River Watershed



Source: Secretariat of the Pacific Community. 2012. Catalogue of Rivers for Pacific Islands.

4. Baseline Project

This section describes the activities to be supported by ADB, WB, and EU (with in-kind support from Solomon Water and the Government of Solomon Islands), which will be complemented by the GEF/LDCF support. The baseline project – Urban Water Supply and Sanitation Sector Project (UWSSSP) – will adopt a sector approach for developing sustainable, inclusive, and climate resilient water supply and improved sanitation in the greater Honiara area (GHA).^[18]¹⁸ At a cost of nearly \$93 million, it will support the government’s water and sanitation sector plan to increase access to piped water supply and sanitation service (especially among the poor households), reduce reliance on groundwater and rainwater harvesting, and ensure more efficient use of water. The project will also enhance hygiene awareness, promote water conservation and improve fecal sludge management.

To be implemented from November 2019 to June 2027, UWSSSP aims to improve the efficiency, climate change and disaster resiliency, and sustainability of safe water and sanitation in the Greater Honiara Area. As discussed in the Institutional Arrangement and Coordination section, a Project Management Unit (PMU) located in Solomon Water is responsible for implementing four project outcomes, as described below.

Outcome 1: Continuous, safe, and climate resilient urban water supply ensured. In GHA, selected subprojects in this output will include: (i) expanding the surface water intake with additional 5 million liters per day (MLD) and upgrading water treatment plant capacity in Kongulai (15 MLD); (ii) building new 11 km treated water trunk mains in Mataniko and White River areas; and (iii) building three new reservoirs (12 million liters). Additional subprojects will include rehabilitating 10km water pipes, expanding 70km of new water pipes, and building 6,000 new metered connections. The project also aims to reduce NRW to 30% or less and expand the water treatment capacity to enable SW to expand its service from 8,000 to 14,000 households (49% to 65%) with continuous water supply in GHA.

Outcome 2: Effective, efficient, safe and climate resilient urban sanitation services provided. Selected subprojects in this output will include: (i) rehabilitating and upgrading three ocean outfalls and building two new ocean outfalls; (ii) building six new sewage pump stations and rehabilitating both King George VI and Point Cruz sewage pump stations; and (iii) building a new septage treatment facility (60 m³/day). The additional subproject will expand sewer systems by 7km to connect 3,000 new households.

Outcome 3: Awareness and behaviors of hygiene and water conservation in GHA enhanced and sustained. The subproject in this output will design and deliver a gender-sensitive education program to raise community awareness about water conservation, environmental protection, and hygiene practices, including in informal settlements (at least 50% are women). The costs of delivering water supply and sanitation services and the need for water and sanitation tariffs will be highlighted. Menstrual hygiene education and products will also be provided to women and girls.

Outcome 4: Solomon Islands Water Authority is financially and technically sustainable. The subprojects in this output will include: (i) preparing and implementing financial management policies, including tariff management framework and tariff review process; (ii) designing and implementing capacity building programs for SW staff, including technical training and on-the-job training; (iii) designing and implementing preventative maintenance programs and asset management; (iv) expanding SW's telemetry system; and (v) introducing and implementing SW personnel incentive schemes. Since SW is responsible for all urban water supply and sewage service, Outcome 4 will support SW to continue the recovery of its annual operations and maintenance costs, asset depreciation costs, and debt servicing costs.

Under Outcomes 1 and 2, climate proofing of the newly installed infrastructure will be part of the baseline project. The detailed design of the infrastructure (which has not yet occurred) will incorporate measures to ensure that exposed infrastructure will be able to withstand more frequent and stronger flood events. These “downstream” climate proofing measures could include: ensuring pipes cross rivers and streams on substantial bridges and ensuring the sections on approaches are protected; regrading/redesigning local drainage or constructing embankments retaining walls or other protective structures where pipes are located near streams or steep terrain; and raising structures so they are above flood waters.

However, the baseline project does not include “upstream” measures to limit the severity of the flooding or the turbidity issues at Kongulai Spring. Without such measures, Honiara's water supply will remain vulnerable to climate change.

COVID-19 Response. In addition to UWSSSP, ADB is also supporting the Government of Solomon Islands in implementing a countercyclical public expenditure program to respond to COVID-19. The government has approved a total of \$54 million, comprising two components: a COVID-19 preparedness and response plan (\$16.5 million) and an economic stimulus package (\$37.5 million). The first component has allocations for health, education, and social protection measures. The second component has allocations for additional social protection measures, including through: targeted investments in agriculture, fisheries, and tourism; support to small businesses and state-owned enterprises; and bringing forward infrastructure projects.

The support to state-owned enterprises includes a \$600,000 capital injection into Solomon Water to ensure that its service delivery is not compromised and its balance sheet is strengthened. This comes as SW is starting an extensive capital works program, including the improvements planned under UWSSSP. See link for more information - <https://www.adb.org/sites/default/files/project-documents/54178/54178-001-rrp-en.pdf>

5. Proposed Alternative Scenario

5.a. General description

The GEF/LDCF funds will be used to help Solomon Water make Honiara's water supply more resilient to climate change, particularly more extreme rainfall. Aligned closely with the ADB's *Urban Water Supply and Sanitation Sector Project*, the funds will be used in two ways.

- First, the project will address turbidity spikes at Honiara's main water source through an engineering solution to remove turbidity, thereby mitigating the impacts of increased erosion and sediment transport during heavy rainfall events. This will be done as a resilience-building measure to the baseline investment under Outcome 1.
- Second, as an additional outcome (Outcome 5), the project will create a sustainable nature-based mechanism to protect the catchment areas that are vital to Honiara's climate resilience and current and future water supply. This mechanism will address turbidity at the source, and if scaled up, would also be an important component of Honiara's flood control and disaster management strategy to protect infrastructure for decades to come. This includes the water supply and sanitation infrastructure that will be constructed and rehabilitated under the baseline project.

The costs are summarized in Table 2 below, and shown in detail in Annex F.

Table 2: ADB-GEF Combined Contributions - Summary of Cost Estimates

Outcome	Amount (US\$)	
	Baseline	GEF LDCF
1: Continuous, safe, and climate resilient urban water supply ensured	53,150,000.00	1,260,000.00
2: Effective, efficient, safe and climate resilient urban sanitation services provided	20,580,000.00	
3: Awareness and behaviors of hygiene and water conservation in GHA enhanced and sustained	2,530,000.00	
4: Solomon Islands Water Authority is financially and technically sustainable	3,480,000	
5: Management of Honiaria's watershed area strengthened and made resilient to climate change*	0.00	3,110,000.00
Project management costs	13,077,000.00	217,156.00

TOTAL	92,817,000.00	4,587,156.00
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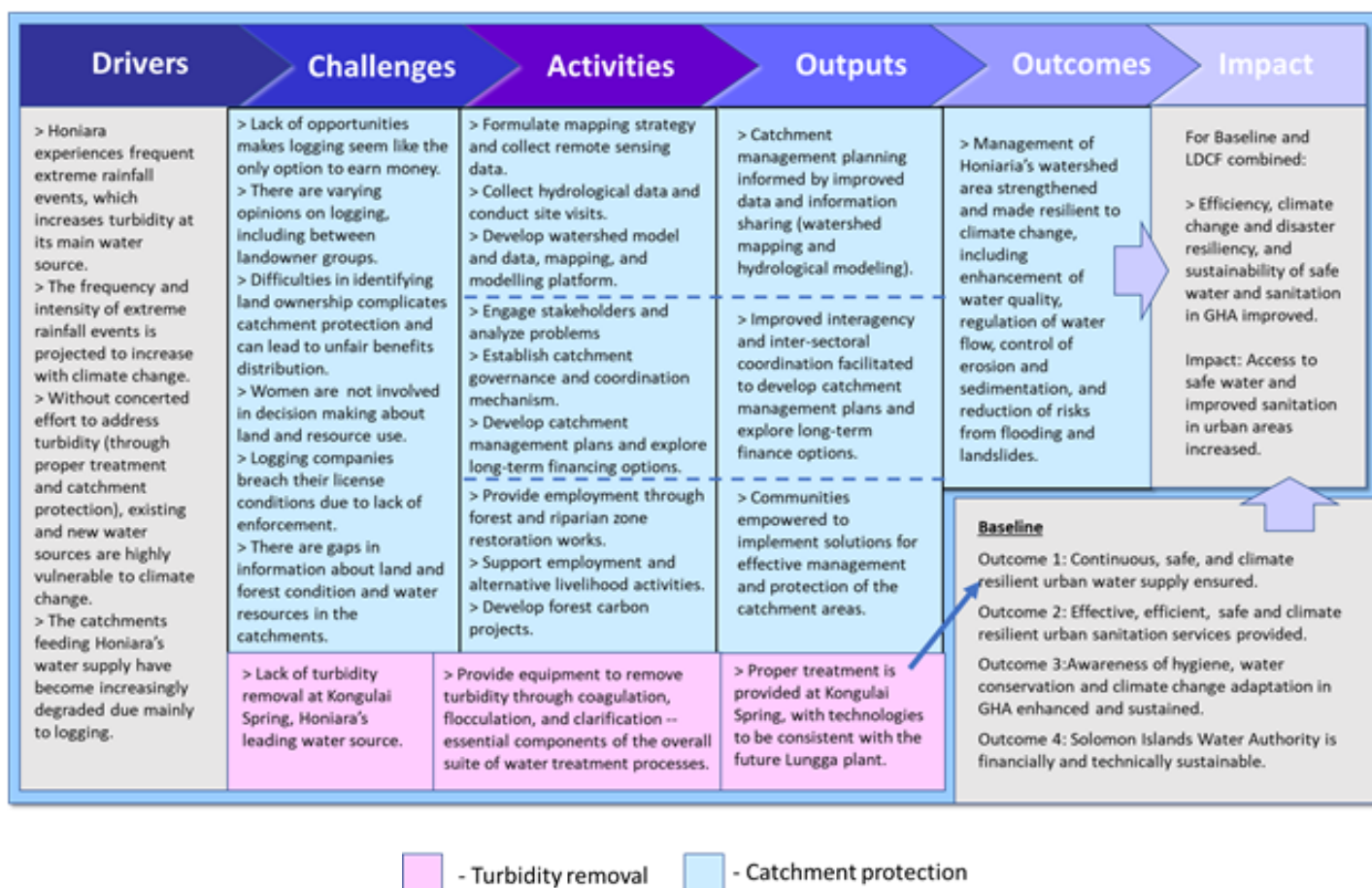
Note: For the baseline project, an additional \$13.08 million is set aside for contingencies and financial charges during implementation.

* Includes enhancement of water quality, regulation of water flow, control of erosion and sedimentation, and reduction of risks from flooding and landslides.

As shown in the Theory of Change (Figure 7), treating turbidity at Kongulai and improving watershed management will help ensure that safe water can be provided to Honiara residents continuously, including during high rainfall events. A key part of achieving this objective is ensuring that communities in charge of the catchment areas have a steady income other than the proceeds from logging operations, which threaten the water supply. This is consistent with ADB's support to the country's COVID-19 response, particularly support the poorest and most vulnerable. Even in normal times, reliable delivery of safe water supply services to individual households and communities is highly essential to maintain personal hygiene and good health, but this is even more critical during COVID-19.

The project therefore supports natural resources management practices that will improve resilience to climate change with livelihood elements. The project will not only seek to reduce the vulnerability of communities and improve resilience during the global pandemic, it will also have the potential to boost economic activity, generate income, create jobs, and reduce inequalities, which are all important aims during COVID-19 recovery and will tie into ADB's already-significant COVID support for the Solomon Islands.

Figure 7: Theory of Change



5.b. Changes in project design from the original PIF

The original child PIF envisioned that LDCF funds would be used for four purposes: 1) catchment protection; 2) awareness raising; 3) policy development; and 4) rainwater harvesting. Early in the project design phase, the project proponents (ADB and SW) decided to focus mainly on the first three priorities. This is because catchment protection was viewed as the most important component missing from the baseline project. Without watershed protection, the existing and future water sources will not be reliable and will remain highly vulnerable to climate change. In addition, catchment protection requires significant and focused resources to address the scale and complexity of the challenges

facing Honiara’s catchment areas. Another reason for this decision is that many informal settlements are already practicing rainwater harvesting without outside assistance. In addition, it was observed that rainwater harvesting was already being practiced at the household level throughout the city and thus did not require support.

The child PIF also stated that the LDCF funds would complement a \$30-35 million GCF grant to support a large-scale new water source (Lungga River) to cover large sections of the population, along with expansion of Honiara’s reticulated network (e.g. pumping stations, transmission pipes, short-term storage) and climate proofing measures. Ultimately, the GCF grant was not pursued, partly because improving existing sources (including removing turbidity) was viewed as a more immediate priority. Thus, it was determined that LDCF funds could be used to help support this immediate need. However, there are still firm plans for the Lungga River to be developed as Honiara’s main future water source, so protecting the Lungga River catchment will still be vitally important to protect this source and also reduce the risks of flooding and landslides.

GEF / LDCF supported Outcomes and Outputs are elaborated below:

5.c. Outcome 1 (Output 2 LDCF-financed)

GEF/LDCF will contribute to Outcome 1 (Continuous, safe, and climate resilient urban water supply ensured) by reducing the frequency of water supply disruptions due to turbidity spikes (Output 2 in Table B). More specifically, \$1.26 million will help equip the Kongulai Spring Water Treatment Plant (WTP), to be constructed under the baseline project, with the necessary technology to remove turbidity. Essential components include coagulation, flocculation, and clarification (see below). These technologies will ideally be consistent with the future Lungga plant, as this will aid in the efficient operation and maintenance of both plants. The target is to meet World Health Organization (WHO) guidelines on turbidity, which is under 1 NTU.

This cost is part of Outcome 1, which is estimated at \$53.15 million. Of that amount, \$49.54 million will cover investments, including civil works, materials, equipment, consultancy services, and taxes/duties. Thus far, there are six contracts for which the procurement activity is expected to commence over the life of the project. These contracts total over \$38 million, as summarized in Table 3. It is proposed that the funds from GEF/LCDF be used to contribute to the first procurement package.

Table 3: Outcome 1 Planned Procurement Packages

Procurement Package	Estimated Value (in US\$)	Relevant Output
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1) Augmentation and rehabilitation of Kongulai water treatment plant.	18.6 million (<i>part baseline and part GEF/LDCF</i>)	1) Volume of water treated for the GHA increased by 5 MLD. 2) Improved quality and resiliency of water supply from Kongulai Spring through turbidity removal
2) Honiara water supply trunk mains upgrade	4.7 million (baseline)	3) 11 km of new water trunks installed and 2 new storage reservoirs built to enhance climate resilience 4) 70 km of new water supply mains installed, and 10 km of the existing water supply mains upgraded to ensure reliable delivery to households
3) Honiara water supply distribution mains expansion program	4.2 million (baseline)	
4) Honiara water supply reservoirs	4.13 million (baseline)	
5) Leak detection and repair program	3.6 million (baseline)	
6) Service connection/meter replacement program	2.825 million (baseline)	5) 7,500 prepaid water meters installed

Based on procurement plan available at <https://www.adb.org/sites/default/files/project-documents/51271/51271-001-pp-en.pdf>

As shown above, a \$18.6 million contract will be awarded to improve treatment at Kongulai Spring. The cost breakdown is shown in Table 4. The water treatment plant (the fourth element listed) will have a maximum daily treated water capacity of 15,000 m³/d. The objective is to supply treated water 365 days per year to the existing water network. Table 5 shows a more detailed breakdown of the WTP construction costs, with the proposed GEF/LDCF contributing to 3b, 3c, and 3d.

Table 4: Costs for Kongulai Water Treatment

Element of Work	Estimated Cost (in US\$)
1) Main Contractors Preliminary & General – baseline	2,568,303
2) Bulk Earthworks including site wide cut, ponds and access road – baseline	1,132,402
3) Raw water pump station (building, mechanical, and electrical) – baseline	496,236
4) Treatment Plant – <i>part baseline and part GEF/LDCF</i>	4,416,344
5) Treated water reservoir tank and all associated works – baseline	3,264,195

6) Treated water pump station (building, mechanical, and electrical) – baseline	877,843
7) Pipelines (for raw water and treated water) – baseline	1,646,807
8) Auxiliary works – baseline	1,007,688
9) Others (provisional sums, off-site overheads)	3,190,182
Total	18,600,000

Source: Kongulai Spring Water Treatment Plant Preliminary Design Report, Prepared by Beca International Consultants Ltd, 28 August 2019.

Table 5: Breakdown of Kongulai Spring Water Treatment Plant Costs

Element of work	Estimated cost (in US\$)
1) Building – baseline	484,993
2) Plant Electrical – baseline	244,200
3) Plant Mechanical – <i>part baseline and part GEF/LDCF</i>	
a) Pipework – baseline	401,808
b) Coagulant Dosing (tanks and pumps) – <i>GEF/LDCF</i>	85,901
c) Flocculation tank – <i>GEF/LDCF</i>	404,580
d) Four clarifiers – <i>GEF/LDCF</i>	768,240
e) Filtration including filters, blowers, and pumps	1,508,760
f) Chlorine dosing	70,890
g) Compressed air and poly dosing	60,911
h) Other (valves, solenoids, regulators, chemical dosing)	386,067
Total	4,416,344

Source: Kongulai Spring Water Treatment Plant Preliminary Design Report, Prepared by Beca International Consultants Ltd, 28 August 2019.

Coagulant Dosing. Coagulation is a primary and cost effective process to effectively remove turbidity in water treatment plants. Aluminium chlorohydrate (ACH) is proposed as the coagulant, and the delivery method and required dose rates will be confirmed by bench-scale testing to be carried out during more detailed design. ACH will be stored in two bulk tanks located in the WTP building, with the dose point and a static mixer to provide rapid mixing located in the raw water pump station.

Flocculation. Flocculation is required following coagulation to provide mixing, which causes collisions between coagulated particles. This causes particles to grow into larger flocs, which improve settlement in the following clarification process. Flocculation will be achieved using hydraulic flocculation, which avoids the use of electric mixers commonly used, and hence simplifies the process, improving reliability and energy efficiency.

Clarification. Lamella plate clarifiers will be used, providing separation of the flocculated material from the water. These are placed at an angle that minimizes sludge accumulation on the plates and increase the effective settlement area of the clarifier, reducing the physical size of the process tanks. Sludge will accumulate in a hopper in the base of the clarifier, and will discharge on a timer. Sludge is discharged to ponds, where the solids are separated, and supernatant discharged back to the stream.

It is important to note that the design of the WTP, specifically the sludge ponds, is based on 5 NTU raw water turbidity. Since turbidity commonly exceeds 5 NTU (as discussed above), turbidity removal must be accompanied by significant measures to reduce turbidity through watershed protection, as covered in the next section.

5.d. Outcome 5

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With \$3.11 million from the GEF/LDCF, the project will add a fifth outcome (Management of Honiara's watershed area strengthened and made resilient to climate change) with three distinct but interrelated outputs:

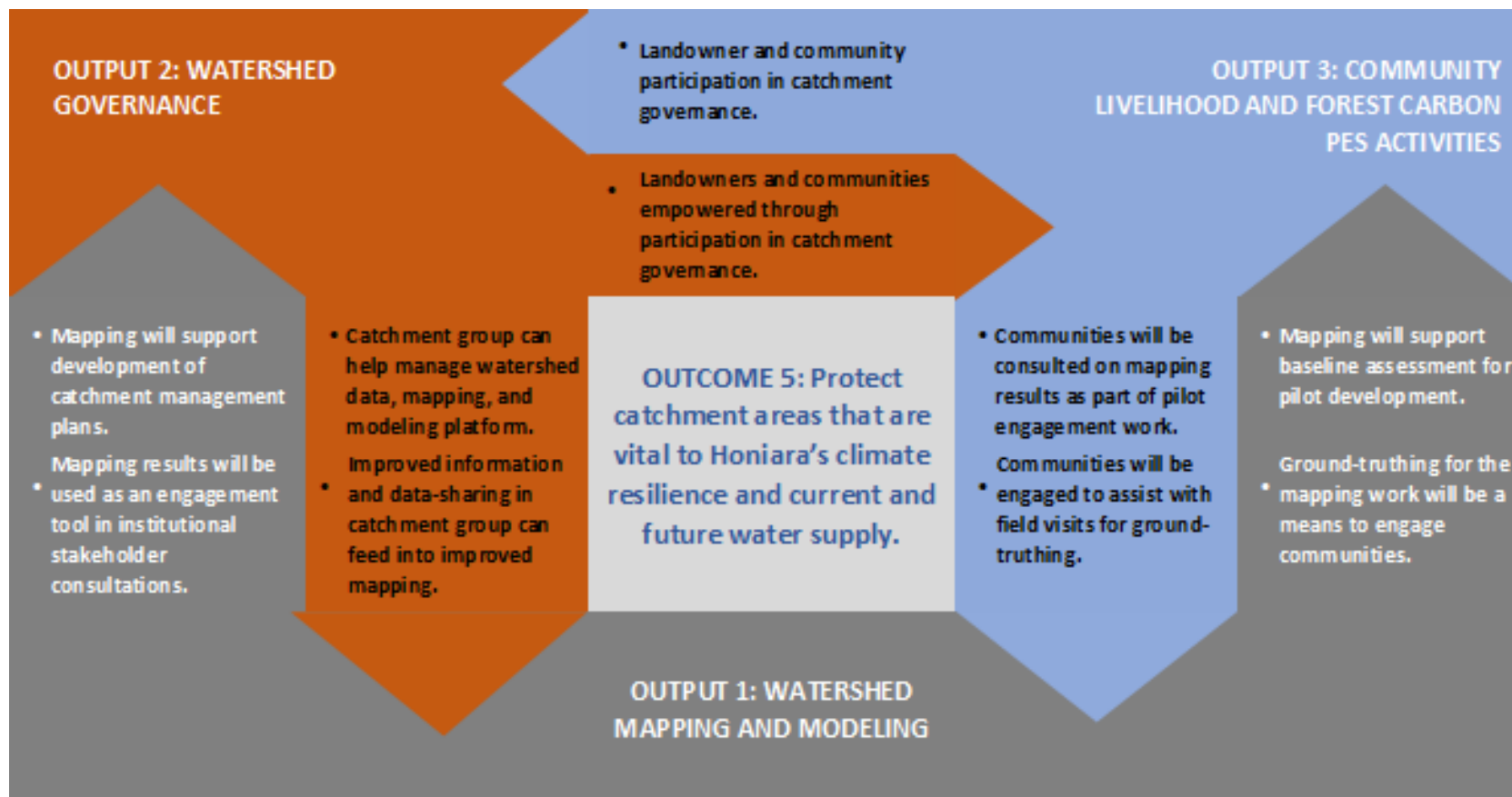
- Output 1 will strengthen capacity for planning and informed decision making by gaining an improved understanding of watershed biophysical and social boundaries, resources, and processes. Watershed data, mapping, hydrological modeling and information sharing will help build a more comprehensive understanding of the watersheds.
- Output 2 will help facilitate interagency and inter-sectoral coordination and governance and support development of integrated climate-responsive catchment management plans to provide for long-term management of Honiara's catchments.
- Output 3 will empower communities to implement on-the-ground solutions for effective management, protection and restoration of the forest and riparian habitats of the watershed. There are three main options: providing landowner employment through forest and riparian zone restoration works; developing forest carbon payment for ecosystem services (PES) projects, and supporting employment and alternative livelihood activities.

As shown in Figure 8, the three output areas will be mutually reinforcing. Output 1 activities will focus on improving the understanding of Kongulai/Kovi/Kohove and Lungga catchments and will enable better decision-making and planning of any activity or intervention taking place in the catchments. This will be of particular value as a pre-cursor to Output 2, which will focus on improving inter-sectoral coordination and catchment management planning. The data, mapping and modelling work under Output 1 will also provide many of the baseline data requirements for Output 3, which will support on-the-ground forest protection, reforestation, and restoration activities.

Output 2 activities will focus on establishing effective inter-sectoral knowledge sharing, coordination and planning for better catchment management. This will build on the mapping and community-based work delivered through Outputs 1 and 3. The main phases of this work will include inclusive education to build understanding and buy-in, establishment of governance and institutional arrangements to facilitate coordination, and development of catchment management plans to guide improved land management and decision-making within the catchments.

Given the large geographical scale of the watersheds surrounding Honiara, the project will initially focus on the Kongulai/Kovi/Kohove catchments due to their connection to the immediate water quality issues impacting Honiara's present water supply. Furthermore, consultation and analysis undertaken during project design phase suggests these catchments offer an easier pathway for project development with respect to land ownership and landowner participation. As such, these areas are best placed to demonstrate the 'proof of concept' to other potential participants. The Lungga is the next priority area, as it a site for future water supply development.

Figure 8: Across Outcome 5 Outputs



Solomon Water will manage this work, as it has the authority to manage catchment areas for the purpose of protecting Honiara's water quality, per the Solomon Islands Water Authority Act of 1992. This will include hiring a full-time Project Support Specialist, who will be embedded within the PMU – see section on Institutional Arrangement and Coordination and terms of reference (TOR) in Annex K.

Output 5.1: Watershed maps and hydrological models developed

This output will focus on comprehensively mapping and modelling Honiara's watersheds, undertaking field visits to ground-truth mapping work, and facilitating uptake to relevant government and community stakeholders. Some initial catchment mapping has been completed by the University of Queensland, but this assessment work will be expanded.

A third-party service provider (or providers) with the requisite scientific capacity will be identified and recruited for this work (see TOR in Annex K). The preferred choice is a research institute or centre within academia, since such an organization would be incentivized – through the potential research opportunities afforded by such work – to produce high quality outputs beyond a simple pay-for-services contract. Furthermore, the possibility of obtaining co-financing via research funding is greater with such an organization and would strengthen outputs. A research institute would also be well-placed to assist in building research linkages and technical capacity with Solomon Islands government agencies, personnel, and academia, which is an important co-benefit envisioned of this work.

Guided by SW and in consultation with key ministries (e.g. Ministry of Forestry, Ministry of Lands), the service provider will help implement this output in four activity areas (described below), thereby supporting several key aspects of project development and improved watershed management. These are as follows:

- *Develop a more detailed understanding of the biophysical environment of the targeted watersheds.* Remote sensing data, mapping technologies and hydrological modelling approaches, combined with ground-truthing of mapping and modelling results, will provide a more accurate picture of the watersheds. Mapping will include core baseline data, including: watershed boundaries and topography; description of hydrological system (including surface and ground water interaction); underlying geology and soils (e.g. erosion risks); land use; forest types, and biodiversity assessment.
- *Identify priority areas.* Assessment of land-use change (e.g. forest disturbance through logging) and impacts of changes on hydrological functionality will help identify priority areas for conservation and restoration activities (e.g. identification of priority riparian zone restoration areas).
- *Support communication and collaboration on data collection and sharing, joint decision-making and planning with relevant government agencies.* This will be achieved by involving relevant agencies in data collection and analysis via sharing and discussing mapping and hydrological modelling results.

Activity 5.1.1. Formulate mapping and modelling strategy and collect remote sensing data. Based on previous mapping and hydrological modelling work done for these watersheds, the service provider will make recommendations on a mapping strategy and indicators that would accord with program needs. It will also propose additional activities that will be required to confirm results, such as site visits or on-site collection of hydrological data, and cost estimates for these.

The service provider will then focus on collecting and collating available remote sensing data covering the target watershed areas. A preliminary assessment of desired outputs is as follows:

- *Mapping, data layers:* This will include watershed boundaries, forest and vegetative cover, forest structure, forest and vegetation disturbance (various time periods based on available data), topology (slope & altitude), geology and soils, available cadastral layers, including logging and other land-use licenses, and measures of soil erosivity.
- *Hydrological modelling:* SWAT modelling, with priority on developing climate change scenarios regarding turbidity and flood risk.

Activity 5.1.2. Collect hydrological data and conduct site visits. The service provider will install hydrological monitoring equipment in select locations in the targeted watersheds to collect sufficient data to contribute to meaningful modelling and assessment of the water system. The monitoring equipment will incorporate current best practice in flexible and adaptive technical solutions, including satellite uplink to a cloud server. The service provider will also conduct maintenance as part of community-partnerships building, which could involve creating several community-based positions to manage hydrological monitoring equipment. Finally, the service provider will conduct site visits to ground-truth the remote-sensing data that is collected.

Activity 5.1.3. Develop watershed model. After the service provider collects remote-sensing and hydrological data, it will develop a model of the target watersheds as a means to better identify priority areas for restoration or protection (i.e. those that provide important watershed ecosystem services such as flood mitigation).

Once preliminary mapping and modelling results are developed, they will be shared with watershed communities and government stakeholders as part of consultations and engagement for piloting work. This will allow communities and stakeholders to examine mapping results, identify the need for refinements or additional mapping outputs, and determine the need for additional data or site visits for calibration. These initial results will also be used to begin discussions with communities on the strategy for near-term riparian zone restoration work.

Following the community and government stakeholder consultations, the service provider will develop a final set of maps and hydrological modelling results. It will also produce a final report that will analyse land-use impacts on hydrological functionality (mainly turbidity and flood risk), examine how these results vary across climate-change impact scenarios, and identify specific areas in the watersheds for project interventions to improve watershed ecosystem services.

Activity 5.1.4. Create data, mapping, and modelling platform. The final stage of this output will involve the creation of a watershed data, mapping, and modelling platform, which will be based on the model developed in the previous stage and will allow for regular updating of land-use data via remote sensing applications. The system will be developed with an eye towards cost-effectiveness and sustainability.

For regular updates on remote sensing data, [Planet](#) or similar platforms might be used, which would require either an annual enrolment fee or partnership with research groups that have pre-existing access. This output will also include training of key technical staff in select government agencies and SW to facilitate uptake.

Output 5.2: Watershed governance improved

Output 2 will facilitate improved watershed governance by supporting improved interagency, intersectoral and community-inclusive communication, joint decision-making, and information-sharing. It will also explore options to strengthen finance by leveraging pre-existing government, donor and private sector funding streams (via either pooling or better aligning them). The aim is to address gaps in institutional cohesion, coordination, and funding that have all contributed to unsustainable upper watershed land-uses, which have in turn led to Honiara's decreasing resilience to climate change impacts (increased flood risk and severity, increasing water supply costs).

In particular, the project will create a multi-stakeholder coordination group to support integrated catchment management in key upper watershed areas over the long-term. For this purpose, the project will hire a Catchment Management/Institutional Expert that will be placed in the PMU of Solomon Water (SW). This expert will initially be full-time and will then provide part-time targeted assistance after the second year of the project (see TOR in Annex K). While mainly focusing on Output 2, this expert will also bridge Output 1 and Output 3 by, for instance, helping in the process of selecting the catchment communities to participate in Output 3 and advising on the forest and social impact baseline work (see below).

Activity 5.2.1. Stakeholder engagement and problem analysis. SW, led by the Catchment Management/ Institutional Expert, will engage with government, other institutional stakeholders, and catchment communities to raise awareness and build support for improved catchment planning, management and governance. The main focus of this activity is educative and designed to increase inter-sectoral understanding and collaboration. The current problems impacting water supply and climate resilience in the catchment are complex, being influenced by a broad range of factors and involving multiple stakeholders.

Consultations will thus focus on building a systematic understanding of how various activities interact to impact on land use, water management, and water security for the GHA. This 'systems approach' will assist the project proponents and stakeholders to understand the complex issues and the role various actors play in the system. This activity aims to build support for the establishment of an inclusive governance approach and institutional arrangements for improving catchment planning and management. It will also result in the selection of communities that will participate in Output 3 activities.

Activity 5.2.2. Catchment governance and coordination. The Catchment Management/Institutional Expert will engage stakeholders in a planning process to design an interagency and inter-sectoral group to coordinate activities that affect the catchment, catchment communities and water security for the greater Honiara area. Various models will be examined, such as a ‘water fund’ arrangement and catchment management or catchment advisory committees.

The preferred arrangement will consider existing institutional arrangements and the solution most likely to be effective and sustainable within the local context (e.g. within resourcing and capacity limitations, and sensitive to government needs and community expectations). An appropriate host agency will be selected to provide executive support to the catchment group (e.g. MECDM or SW).

The terms of reference of this ‘catchment planning group’ will be determined by its members. However, its role is expected to include:

- Information sharing and awareness raising on catchment-level issues, including climate change adaptation;
- Sharing of data relevant for forward-looking, resilient catchment management approaches (e.g. maps, cadaster, land capability, forest resources, population demographics);
- Coordination of government and non-government projects and activities;
- Coordination on issues relating to legislation, regulation, compliance and enforcement;
- Providing a forum for multiple stakeholder participation in catchment planning (e.g. for development of Resilient Catchment Management Plans); and
- Contribution to governance of a catchment protection trust fund (see below).

Activity 5.2.3. Facilitate catchment management planning. Working with the catchment planning group, the Catchment Management/Institutional Expert will also facilitate development of two catchment management plans, one for the Kongulai, Kovi, and Kohove catchments (3,200 hectares combined) and the other for the Komarindi sub-catchment, which makes up more than one-third of the Lungga watershed (or roughly one-third of 37,700 hectares). Together, these areas make about 16,500 hectares.

Climate change adaptation will be integrated into the catchment management plans. This will include integrating the watershed mapping and hydrological modelling (undertaken in Output 1) to gain a detailed picture of the climate risks facing the catchment, particularly more intense rainfall that leads to flooding and increased landslides, and identify particularly vulnerable areas in the catchment. The adaptation approach needs to include robust solutions that will work in a range of possible climate scenarios and strike a balance between intermediate and long-term needs.

A key focus of the activity will be building ownership of the catchment management plan with stakeholders, and hence its development will proceed through a participatory and consultative process. SW have already identified development of a catchment management plan in their 30-year strategic plan.^{[19]¹⁹}

However, it may be of strategic value to facilitate broader ownership in the plan and hence commitment to its implementation.

The content of the plan will be determined through the development process, but it will likely include the following elements:

- Catchment description (natural resources & processes, population, land use and tenure etc)
- Identification of threatening processes, hazards or issues impacting the catchment
- Relationship with relevant legislation and policy
- Stakeholder description, coordination & engagement
- Financing (to ensure resourcing for plan implementation)
- Objectives, activities and outputs for implementation
- Key areas for enforcement / enforcement plan
- Coordination with other SIG activities or plans (e.g. disaster planning)
- Activities for monitoring performance, plan improvement and review

Activity 5.2.4. Explore the creation of a catchment management fund. A final activity will focus on exploring options to catalyze additional sources of finance via a trust fund mechanism and/or by better leveraging pre-existing government, donor and private sector funding streams (via either pooling or better aligning them). This fund could draw upon multiple sources of funding to ensure its sustainability. Current envisioned sources of funds are as follows:

- Beneficiary Pays (water surcharges): Solomon Water has indicated a willingness to increase tariffs to directly support upper watershed nature-based investments. This increase could be included in the proposal to be submitted to Ministry of Finance and Treasury and Ministry of Mines, Energy and Rural Electricity in August 2020. A surcharge of SBD 10-15 cents/m³ to the water tariff would generate around SBD 788,000 to SBD 1,340,000 per year (~US\$94,000-US\$161,000 per year).^{[20]²⁰}
 - Beneficiary Pays (private sector support): The business case for water fund development, once more fully developed, will be used to approach key private sector beneficiaries of watershed ecosystem services in Honiara to promote the case for making additional financial contributions to the fund to mitigate their business risk associated with water supply and climate risk.
 - Donor Support: International donors and related initiatives will also be approached to identify potential synergies and joint fund-raising opportunities to support water fund and watershed management activities and development.
-

Output 5.3: Community livelihood and forest carbon PES activities supported

Landowning communities are key stakeholders in the upper watershed areas critical for Honiara's water supply and climate resiliency. These communities play a central role in land use decisions, including partnering with logging companies on logging license applications through government channels.

Pursuing alternatives to logging must therefore involve helping communities delink their livelihoods from the logging sector. To accomplish this, the project will focus on building effective watershed-protection partnerships with communities to develop improved, diversified and climate-resilient non-timber-based livelihoods that leverage nature-based finance opportunities.

As discussed below, there will be four main types of on-the-ground community interventions:

- Establishing baselines (forest and social impact) to set the stage for voluntary and participatory planning processes and monitoring activities;
- Providing employment to landowner communities through forest and riparian zone restoration works;
- Developing forest carbon PES projects (for the international voluntary carbon market), which will target protection of key threatened forest areas in the watershed; and
- Supporting employment and development of alternative sustainable livelihood activities (including job readiness) that are consistent with watershed protection and sustainable land use.

As detailed in the Stakeholders section, landowning communities have been informed about the project and are interested in participating, but the final selection of communities has not yet been undertaken. As part of a bottom-up approach, selection will be in part based on communities' willingness to engage in project activities. Once selected, participating communities will have significant input into the measures (or combination of measures) that will be implemented from among the three listed above. The details of these measures, such as the type of livelihood activities and design of specific restoration measures, will be determined as part of the project.

It is also important to note that while forest carbon PES projects are generally developed to achieve climate mitigation outcomes, the project will 'bundle' multiple impacts by using forest carbon financing to incentivize catchment protection. **Thus, forest carbon PES will be implemented as a climate change adaptation strategy, which is one of the innovations of the project** (see Section 9).

This output will be led by collaboration between the non-government and private sectors to form a “subproject development team” (as mentioned throughout this section). This team will be composed of experts from the following:

- An non-government organization (NGO) with a strong presence in Solomon Islands and significant donor experience in community mobilization related to watershed management/protection will be engaged to lead the team (see TOR in Annex K);
- As needed, community-based organizations will be subcontracted under this NGO to support the forest restoration and/or livelihood outputs. For instance, women’s saving clubs or other women groups (e.g. church groups) could be engaged in the development of livelihood activities; and
- A private sector PES subproject developer will be contracted to provide more specialized expertise in developing and implementing forest carbon finance subprojects (see TOR in Annex K).

As discussed in the Stakeholder and Knowledge Management sections, the subproject development team will have a strong commitment to two-way learning and “informed participation”, whereby both project proponents and participants learn from each other.

Activity 5.3.1. Develop forest and social baseline for participating communities.

Building on the analysis conducted under Output 1 and working with the Catchment Management/ Institutional Expert, the subproject development team will complete a detailed forest inventory and forest change analysis to describe the baseline conditions against which Output 3 subproject impacts can be measured. This assessment will focus specifically on areas to be included in the Output 3 activities (i.e. restoration works, forest carbon PES, and livelihood support).

A social impact baseline will also be required for these areas to: gain a more detailed understanding of the demographics within the participating communities (including land tenure, tribal structure, and membership); identify strengths and needs of those living in the communities; and inform improved ways to engage marginalised members of the community and the design of livelihood interventions.

The social impact baseline will be established through a household survey. The survey will be designed to determine baseline conditions around a number of the parameters linked to land management, decision making, livelihoods, gender and wellbeing. These will include but not be limited to the following:

- Participation in decision making;
- Involvement in financial management and benefit sharing;
- How the landscape within the catchment supports communities through food, water security, housing materials and access to traditional medicines and other forest-based products;
- Access to education, health care and employment;
- Income; and
- Daily routine.

Importantly, the social impact baseline data must be gender disaggregated to allow for an accurate understanding of gender disparity within the catchment communities. Determination of interviewees as belonging to the traditional landowning groups or as migrants to the catchment will also build a more clear understanding of the needs of the target group.

Informed by the social baseline, the project will pursue a voluntary and participatory planning process by means of the Project Participation Protocol (PPP). As discussed in more detail in the Stakeholders section, the PPP prescribes a participatory and transparent process of project development and management and is considered a minimum requirement for project engagement. It offers a means of reducing internal risk and enabling project participants to participate in decisions concerning project development, implementation and management, consistent with the principles of free, prior and informed consent (FPIC).

As explained in the monitoring section, the social baseline data will also support monitoring and evaluation of project impacts. Activities that aim to improve conditions for marginalized community members will be implemented against selected indicators, which will be monitored on an annual basis.

Activity 5.3.2. Provide landowner employment through forest and riparian zone restoration works. The project will start restoration works as soon as possible in the project cycle. The works will focus on roughly 60 hectares of high priority degraded sites that are directly impacting turbidity levels and affecting current water supply (identified through Output 1 activities). This will include repairing erosion hotspots on roads and streams caused by logging tracks and direct seeding and replanting riparian areas in proximity to potable water sources.

Involving landowner communities will ensure that benefits from watershed protection activities will begin to flow in the near term, which is required to build trust and commitment to reject logging. Landowner payments will exceed minimum wage standards, and hence will compete favourably with logging labour that has typically poor

conditions and often pays below minimum wages. The intervention will thus address a key driver of landowner decisions to pursue unsustainable logging, which is the need for income in the near term.

5.3.2.1. Provide institutional support. The locally-based NGO will facilitate employment of landowners or other watershed community members. In this capacity, the NGO will: (a) recruit, administer and supervise employment of local people; (b) train workers in forest restoration; (c) plan and implement effective (best practice) restoration activities, and (d) ensure appropriate workplace health and safety standards are met.

5.3.2.2. Mobilize landowner labour. The project will recruit landowner and other members of watershed communities to provide labour for restoration activities. This “green jobs” model is preferred to an approach that relies on use of machinery (e.g. earth moving equipment) because it will achieve complimentary objectives of delivering direct benefits to landowners, while building their capacity, knowledge and trust in project interventions. Employment tasks undertaken will include site preparation, weeding, fencing, planting, and maintenance of restoration sites.

5.3.2.3. Produce or acquire seedlings. The project will engage a local service provider to supply appropriate species for replanting. The service provider could be from the private sector, NGO or an existing government agency (e.g. Department of Forestry or Botanic Gardens). In general, the plant species used will be local natives identified / selected through participatory consultations. However, exotic species (e.g. grasses) suitable to address erosion may be used, subject to appropriate environmental safeguards to prevent introduction of invasive weeds.

The GEF grant will finance restoration activities during the first three years of the project. However, by the third year, grant finance could be subsidized in certain areas by income generated through forest carbon activities, potentially ‘blended’ with local finance provided by SW (possibly raised through customer tariffs). Landowner employment in restoration works could be a pathway to longer-term sustainable employment, for instance as a forest ranger under a forest carbon project (as explained below).

Activity 5.3.3. Develop forest carbon PES subprojects. Payment for ecosystem services involves provision of payments to landowners in return for delivery of catchment protection and/or restoration outcomes. A core feature of PES financing is the ability to use the private sector to cover subproject implementation costs (including land management activities) and opportunity costs to landowners (e.g. for giving up logging). The aim is to provide long-term finance for watershed management activities and incentivise sustainable land use, which will increase resilience to climate change impacts.

Forest carbon PES subprojects generate finance through the production of carbon assets. While forest carbon subprojects are generally developed to achieve climate mitigation outcomes, the subprojects will ‘bundle’ multiple impacts by using forest carbon financing to incentivise catchment protection. Using climate change mitigation financing to achieve adaptation and watershed management outcomes is recognised internationally.[21]²¹ The FAO suggests that carbon balance is a powerful indicator to appraise the impact of watershed projects.[22]²² Carbon offset standards allow forest carbon subprojects to measure and report various ‘co-benefits’ (e.g. watershed protection, biodiversity conservation and social outcomes) that can increase the price of carbon credits sold in the market.

The project will employ a model for landowner engagement derived from the Nakau Programme, which has designed a methodology for forest carbon PES that has been successfully implemented in Melanesia for adaptation outcomes, including in the Solomon Islands. As described in more detail in the Stakeholder Engagement section, the Nakau Methodology Framework defines a voluntary and participatory planning process, which enables communities to participate in decisions concerning project development, implementation and management, consistent with the principles of free, prior and informed consent (FPIC). The Nakau Programme also offers potential for co-financing through private sector investment, which will ideally include ‘off-take agreements’ for purchase of PES credits produced by the project (see Private Sector section).

The forest carbon PES activities will be delivered using a ‘grouped subproject approach,’ which will commence with two inception subprojects in the Kongulai/Kovi/Kohove catchments. During the first 2-3 years of the project, the inception subprojects will be fully developed to ‘market stage.’ Under the grouped subproject approach, one additional site (either in Kongulai/Kovi/Kohove or in Lungga) can then be developed as a sub-project without the need to undertake every subproject development step required for the inception subprojects. In this manner, Output 3 PES subprojects are designed to enable effective expansion or replication from the outset.

5.3.3.1. Prepare forest carbon PES sub-projects. A Project Idea Note (PIN) document will be a key output of this activity area. The PIN describes the subproject and provides an overview of how the subprojects will operate. It allows a subproject to be registered with a carbon PES standard as a ‘subproject in development.’ This activity will consist of five distinct steps, as follows:

- 1) Incorporate findings from the forest baseline to determine areas to be included in forest carbon PES subprojects (at high resolution) and the social baseline to gain an improved understanding of social factors in targeted communities.
- 2) Plan for women’s empowerment and participation. A gender expert will be engaged as part of the subproject development team to develop women’s empowerment and participation plan to guide women’s engagement in aspects of the project. As detailed in the gender section, catchment women are marginalized in decision-making, but are disproportionately impacted by watershed degradation and unsustainable developments. Women’s participation is a key strategy for developing fair benefit distribution arrangements from alternative livelihoods.

- 3) Empower landowner participation and education for free, prior and informed consent (FPIC). An FPIC process will be developed and applied to key decision points in the subproject. Initially, this will involve investment in education to ensure landowner participants are able to make informed decisions. The education effort will be tailored to the audience. Key community representatives and leaders will have a deeper engagement in education for climate change adaptation, improved land management and participation in PES. The broader catchment population will gain increased awareness via their leaders and subproject representatives and will be reached through more generalized awareness actions, such as videos, posters, and media.
- 4) Establish community engagement focal point. The subproject development team will work with the landowner communities to establish a representative group that will act as a focal point for engagement and participation in project development. This will include ensuring the group has a broad mandate from community members and fairly and transparently represents community interests.
- 5) Develop financing plan. Next, the subproject development team will develop a financing plan targeting the private sector. The plan will include access to PES markets, sales and marketing of PES units, and strategy to enable future private capital investment (for subproject replicating and scaling). The plan aims to secure sustainable financing for project activities beyond the GEF funded period and provide opportunities to replicate / scale the subprojects.

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5.3.3.2. Develop forest carbon PES sub-projects. The subproject development stage will build on the activities above to design the required elements of forest carbon project. The main outputs from this activity area will include a Project Description Document (PDD) suitable for carbon standard validation and land recording to enable the necessary protection of the subproject areas. This activity will consist of nine steps, as follows:

- 1) Formulate Benefit Sharing Plan (BSP). The BSP is required to ensure income received from PES sales is provided to participant communities in a fair, timely and transparent manner. An effective BSP will translate PES benefits into sustainable community development outcomes, cover landowner opportunity costs, and maintain a strong incentive for participant communities to maintain commitment to conservation activities.
- 2) Land use planning. The subproject development team will employ a participatory process to develop a land use plan (at project scale) to strategically select areas of the catchment to be protected and / or restored. Land use planning will safeguard important resources for landowners (e.g. garden areas), while ensuring that protected areas will contribute to watershed management objectives.
- 3) Conservation / land management planning. The plan developed will guide work by landowners to protect forest and water resources. It will include management objectives, management zones, management rules or by-laws, and actions to increase enforcement of forest protection rules.
- 4) Establish Protected Area. A legal instrument to protect project areas is required to support 'subproject permanence,' and in particular to protect important forest areas against logging, mining or land clearing. Implementation of this activity will involve assessment of available instruments and application of the instrument in consultation with landowners and stakeholders.
- 5) PES accounting. The PES subproject team will apply existing PES accounting methodologies to quantify PES outcomes (e.g. annual tons of CO₂ reductions from the project). PES accounting requires application of a methodology that compares a baseline (business as usual) scenario where there is no intervention with the outcome caused by the project intervention.
- 6) Develop subproject monitoring plan. Monitoring plans for each subproject are required to demonstrate achievement of PES outcomes for emissions abatement and associated watershed protection outcomes. Ecological and social dimensions of the project (e.g. governance) will be monitored.

- 7) Establish landowner participants' business entity. Prior to this point, landowners' participation will be focused through a mandated landowner representative group. This will transition to establishment of a legally constituted group (e.g. association or landowner company) that can hold carbon rights, sign PES contracts, receive carbon payments, and hold liabilities.
- 8) Implement free prior and informed consent (FPIC) process. The FPIC process is a key safeguard to ensure landowner participation in projects is fully informed and voluntary. The FPIC process will apply a methodology developed for other PES programs in the region.
- 9) Execute financing plan. The PES subproject team will implement the financing plan developed under Activity 2.1. This includes a significant focus on sales and marketing of PES units. Execution of the financing plan occurs prior to other execution activities (see 2.3) because of the lead-time required to establish purchase agreements with buyers prior to production of PES units.

5.3.3.3. Execute forest carbon PES sub-projects. This stage involves executing subproject agreements, submitting subproject documents or standard certification, and putting subproject plans into action (e.g. monitoring plan, conservation management plan, benefit sharing plan etc.). During the implementation of community subprojects, the subproject development team will monitor, support and build landowner capacity for good governance, financial management, and land management actions. Landowners will also be supported to reinvest PES finance into development of further sustainable livelihood activities, as described below. Upon implementation, sales of forest carbon credits will be transacted, which will allow the subproject to realize financial gains. This activity will consist of five steps:

- 1) Execute project agreements. The subproject development team will work with participant communities to execute subproject agreements, including PES agreements and emissions reduction (sales) agreements, allowing for due FPIC process. This will also involve appointment of a PES sales and registry agent to act on the landowners behalf.
- 2) Implement monitoring, reporting, and verification regime and conservation management plans. The subproject development team will work with communities to develop monitoring reports so that the subproject can undergo independent audit to validate the methodology and verify ecosystem service outcomes. The audit services will be outsourced to a certified body approved by the applicable PES Standard.
- 3) Implement governance, management and benefits-sharing system. The subproject development team will support landowner participants to establish a monitoring and reporting regime (for land management, benefit sharing and governance) tied to disbursement of PES payments. The SOP will ensure that payments are tied to subproject implementation performance and allow provision of targeted support to landowners to build their capacity.
- 4) Provide technical support for land management. Support and training will be provided to assist landowners to undertake community ranger or watershed warden positions. The role of rangers is to implement activities under the conservation management plans, including monitoring activities and enforcement. Ranger work will also contribute to the restoration works started in Activity Area 1.
- 5) Facilitate subproject replication and scale. The inception PES subprojects will be designed using a 'grouped project approach' that will allow for further subprojects to be added to the group at reduced cost. The output of this activity will be integration of the grouped approach in the subproject design (PD) and a report on opportunities for project replication.

Activity 5.3.4. Support employment and alternative livelihood activities. Interventions that increase landowners' economic participation and reduce poverty address a main driver for logging, which is the need for income. This intervention will thus provide access to business and employment education and training, networking and partnership development with the private sector, and provide access to start-up capital for small enterprise development.

In practice, the livelihood activities may include assistance to individual, family-run or community groups. Opportunities for education and training will include a focus on increasing landowners' capacity to find employment in Honiara, noting that most landowners reside in the peri-urban areas around the city and are not necessarily living and working on their customary land. Also, as discussed in the Gender Equality and Women's Empowerment section, employment and livelihood activities provide an opportunity to address gender inequalities within the catchment communities.

5.3.4.1. PES investment to support livelihoods and employment. The project team will work with landowners to co-design a benefit sharing mechanism (for PES income) that targets re-investment of PES finance into sustainable alternative livelihood activities and employment. The focus of this activity is to produce a landowner community livelihood, education and training plan that will guide investment of PES funds that are earmarked for community benefit. This will contribute to sustainably financing livelihood development and employment initiatives beyond the GEF grant funded period for the duration of the PES project (> 30 years).

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5.3.4.2. Facilitate sustainable enterprise development. The subproject development team will facilitate access to training and support and provide seed funding for the development of new micro-enterprises (e.g. at family scale), targeting watershed landowner communities. The nature of these activities will depend on the needs and interests expressed by participants during consultation and joint planning, but possibilities include high-value non-timber forest products (NTFPs), tree nurseries, apiculture and eco-tourism. The project will provide assistance to beneficiaries to design project ideas and will develop a selection criteria and process to determine projects that will receive support. Where possible, partners with relevant industry expertise will be engaged to provide support for new enterprise development. For example, if communities decide cocoa is a priority, the project would then seek to engage cocoa industry expertise for support.

5.3.4.3. Support education and training for employment. Funds will be made available from the GEF project (initially) and then from PES financing to establish and maintain a fund to provide education and training opportunities for watershed landowner communities. The activity will focus on establishing, administering and establishing institutional (governance) arrangements for this fund. The scope of education and training activities supported will be decided in consultation with beneficiaries, but may include school fee support, technical and vocational training, and higher education. Existing education and training service providers will be engaged to deliver the education and training, and where possible an existing provider may be engaged to manage scholarships.

6. Alignment with GEF Focal Area

The project aligns with, and contributes to, the LDCF objectives and outcomes as explained in Table 6. The project will focus on the first and second LDCF objectives. While the project will also work with national-level institutions, mainly MIA and NDMO, the project will not directly improve the National Adaptation Plan (NAP) process and therefore will not achieve outcomes under LDCF's third objective area.

Table 6: Alignment to GEF/LDCF Objectives and Outcomes

Objectives	Outcomes	Alignment
CC-A 1, Reduce vulnerability and increase resilience through innovation and technology transfer for climate change adaptation	1.1 Technologies and innovative solutions piloted or deployed to reduce climate-related risks and/or enhance resilience	<p>The main ways the LDCF grant will achieve this outcome is as follows:</p> <ul style="list-style-type: none"> - <u>Outcome 1 (Turbidity Removal) and Outcome 5 (Output 3)</u> a) identifying, designing, and implementing a mix of green and gray interventions that will make Honiara's current and future water supply more resilient to climate variability and change (GEF Output 1.1.1); b) diversifying and strengthening the livelihoods and income sources of landowners (GEF Output 1.1.2); - <u>Outcome 5 (Output 1)</u> c) improving data/information systems, such as-watershed mapping and hydrological modeling (GEF Output 1.1.3); <u>Outcome 5 (all outputs)</u> d) strengthening natural ecosystems (GEF Output 1.1.4);
	1.2 Innovative financial instruments and investment models enabled or introduced to enhance climate resilience	<p><u>Outcome 5 (Output 3)</u></p> <p>The project will develop forest carbon pilots in select communities (GEF Output 1.2.2).</p>
CC-A 2, Mainstream climate change adaptation and resilience for systemic impact	2.1 Strengthened cross-sectoral mechanisms to mainstream climate adaptation and resilience	<p><u>Outcome 5 (Output 2)</u></p> <p>The project will mainstream climate adaptation and resilience in a number of ways, including:</p> <ul style="list-style-type: none"> a) developing catchment management plans (GEF Output 2.1.1); b) supporting cross-sectoral institutional partnerships (GEF Output 2.1.2), and c) establishing monitoring and evaluation systems (GEF Output 2.1.3).

	2.2 Adaptation considerations mainstreamed into investments	<u>Outcome 5 (Output 2)</u> The project will mainly address this sub-output by supporting an institutional coordination mechanism (in the form of a catchment group) that could help manage a catchment management fund (GEF Output 2.2.2)
	2.3 Institutional and human capacities strengthened to identify and implement adaptation measures	<u>Outcome 5 (all outputs)</u> Capacity building will be a central feature of the project, both in terms of identifying appropriate adaptation responses (GEF Output 2.3.1) and raising awareness (GEF Output 2.3.2).

7. Incremental/additional Cost Reasoning

The baseline project design represents a technically viable approach to improve access to water supply and sanitation services in GHA. Engineering designs are built on past studies, including the 30 Year Strategic Plan and the 5 Year Action Plan. Until the implementation of a new major water production system (Lungga), recommended by the 30 Year Strategic Plan in the mid-2020s, the additional water demand from SW’s customers will be met by reducing non-revenue water, enhancing water conservation management (including installing prepayment meters), and upgrading the existing water production and treatment capacity.

These intermediate steps are part of a transformative approach to improving the water network in Honiara. Recent government efforts to overhaul the management of this network, focusing on financial sustainability, customer orientation and the reform of SW, have established the basis for such transformation. A modern, customer-friendly, reliable, resilient and financially viable water supply and sanitation network can now be envisaged. With the help of GEF and other international partners, this paradigm shift of water supply and sanitation on Honiara can be consolidated and ultimately achieved.

While the baseline project targets water users and improved water supply and treatment infrastructure, the LDCF project intervention will focus on mitigating the impacts of extreme rainfall, which is projected to increase in frequency and intensity. It will do so in two ways. First, it will provide the necessary investment to remove turbidity as part of water treatment, and second, it will target ‘green infrastructure’ (healthy catchment landscape) that moderates water quality and flow.

In practical terms, the latter will lead to improved water quality (e.g. reduced turbidity), and reduced damages and losses due to flooding events. This in turn will protect downstream water supply infrastructure and reduce water treatment costs, thus increasing reliance and reducing water security risks. The project will also address the underlying drivers of land degradation and water security risk, which is the need to provide alternative sustainable livelihood options to communities, in order to reduce reliance on logging or other activities that cause watershed degradation – which could otherwise continue unabated in the absence of the GEF intervention.

8. Adaptation Benefits

As explained above, the project will put in place the conditions to achieve long-term sustainable restoration, protection and management of Honiara's key upper watershed areas in the Kovi/Kohove/Kongulai watersheds and replication in the Lungga watershed. In the long-run, establishing these conditions will mean that Honiara will face reduced risk of infrastructural damage and human fatalities due to extreme flood events caused by climate change. This is due to the important flood-mitigation functions of healthy upper watershed forests and riparian zone ecosystems, much of which have been degraded due to unsustainable logging practices.

Honiara will also benefit from improved long-term stable and sustainable delivery of potable water, as turbidity is reduced and shutdowns at Kongulai Spring will no longer be necessary. In addition, seasonal water flow will be better regulated and aquifer recharge will be improved. In addition, Solomon Water will benefit from increased revenue and reduced costs related to operations and maintenance of the water treatment infrastructure.

The project will also deliver improved, diversified, sustainable and resilient livelihoods for participating communities, allowing them to better adapt to climate change impacts. The project is expected to contribute to achievement of the following United Nations Sustainable Development Goals that are relevant for building resilience of landscapes and communities: 1: Reduction of poverty; 4: Quality education; 5: Gender equality; 6: Clean water and sanitation; 8: Decent work and economic growth; 9: Industry, innovation and Infrastructure; 11: Sustainable cities and communities; 13: Climate action; 14: Life below water; and 15: Life on land.

The project will also deliver co-benefits. The forest carbon PES projects (part of Output 3) will likely be of similar or larger size to the Drawa project in Fiji that covers 1,500 Ha. The Fiji project produces annual emissions savings of 18,800 t/CO₂. Hence, the emissions reductions from the project would be of a similar order and estimated to exceed 500,000 tons of CO₂ over the life of the project.

9. Innovativeness, Sustainability, and Potential for Scaling Up

Innovation. As earlier stated, forest carbon PES will be used as a climate change adaptation strategy, and only secondarily to achieve climate mitigation outcomes. The project will employ an emerging local model for forest carbon PES that has been designed to finance watershed management activities on customary lands in Melanesian countries,

including in Solomon Islands. This model, developed and implemented by the Nakau Programme, employs forest carbon outcomes as a proxy for watershed management, and utilises finance raised from international carbon offset buyers to cover watershed management costs, while compensating landowners for giving up rights to log their forest.

While the forest and water sectors have long been recognized to have important synergies, funding flows and investment activities for these sectors often remain quite distinct and “siloeed.” To address this problem, the project will ‘bundle’ multiple impacts by using forest carbon financing to incentivise catchment protection, which has direct linkages to climate change adaptation. Forest protection carbon revenues are only delivered to communities once defined activities in the catchment management plan are satisfactorily undertaken by the local landowning entity. These revenues provide a sustainable long-term financing system for catchment protection, thereby bundling climate resilient catchment protection/management with climate mitigation.

Further impacts of the project are also ‘bundled’ here, resulting from long-term financing by carbon markets (see section on Private Sector for information on potential buyers). These include measurable livelihood impacts, as carbon payments provide employment and investment opportunities for local communities in livelihood diversification. The generation of forest carbon finance also provides measurable biodiversity benefits within the catchment. Seen this way, the use of carbon financing for forest protection finances the main objective of catchment protection, which is bundled with climate mitigation, social development and biodiversity outcomes.

Conversely, forest carbon projects often struggle to source sufficient financing for forest restoration activities given the large upfront investment required. This project intends to undertake riparian restoration, and will therefore subsidise the upfront capital costs (planting, weeding fencing etc.) normally required to deliver carbon abatement gains from restoration activities. The investment, co-financed by SW is justified by the impact it will have on avoiding additional treatment costs and water supply shutdowns. However the investment may also lead to could produce larger carbon revenues, thereby supporting local landowning groups to maintain restoration actions past the initial investment. The investment in restoration is thus seen here to provide a ‘stacking’ approach, augmenting forest carbon revenues.

Sustainability. Sustainability is a central consideration in program design and sequencing. At the national level, the government’s commitment is ensured by the strong alignment between the project’s outputs and SW’s 30-Year Strategic Plan, which has been endorsed by government. On behalf of government, SW will take responsibility for the sustained impact of the project at an operational level. SW is a state-owned enterprise created under the Solomon Islands Water Authority Act of 1992 with the mandate and responsibility for the water supply and wastewater network of Greater Honiara and the provincial capitals including the protection of catchment areas.

At the community level, three key prerequisites exist for establishing long-term, meaningful and sustainable positive changes in forest management and protection:

- establishing long-term trust with communities;
- demonstrating that forest carbon PES is a viable alternate source of revenue that is competitive with logging royalties; and

- supporting communities to offset their opportunity costs of foregone logging revenue during the project development stage.

Establishing the conditions for sustainable and permanent forest protection via forest PES requires funding of up-front program development costs. Projects elsewhere in the Solomon Islands and Melanesia show that such projects can indeed become financially self-sufficient. However, to be truly sustainable, it must be shown that forest carbon finance can compete with logging royalties (see estimate in Benefits section). If this can be demonstrated, the project should be able to catalyze community interest and willingness to expand forest carbon projects throughout the watershed.

For water treatment at Kongulai, one of the main design objectives is to provide an installation that is sustainable. This includes costs of operation, energy use, and ability to operate and maintain using the available resources. While the plant will treat expected water quality during high rainfall events (including removing turbidity) and also meet World Health Organisation (WHO) Guidelines, it will use technologies and processes that are relatively low in complexity to meet performance requirements. This will aid the future operability and maintainability of the plant, including minimizing costs. As mentioned above, water treatment processes will ideally be consistent with the future Lungga plant, as this will aid in the efficient operation and maintenance of both plants.

Scaling up. As discussed above, the Honiara Watershed Management Project approach includes improving catchment management through interventions that provide benefits to incentivise customary landowners to participate in alternative livelihood activities and engage in better land management practices. However, it is acknowledged that a phased approach will be required, as the watershed areas around Honiara are extensive and barriers are significant. Program interventions are thus envisioned to be scaled up in several ways.

Riparian zone restoration work. An initial step towards scaling up interventions to the middle Lungga River watershed is envisioned to involve community engagement in riparian zone restoration work similar to that under piloting in the Kongulai/Kovi/Kohove watersheds. Several logging concessions are in operation in areas along the middle Lungga River, with levels of riparian zone degradation likely similar to Kongulai/Kovi/Kohove watersheds.

Once mapping work under Output 1 is able to identify these priority areas for restoration, and the relevant land-owning groups are clarified (which will be an important goal in the community consultations and baseline development activities for the piloting work under Output 3), these groups will be approached and engaged/employed to conduct such restoration work, with this to be leveraged to discuss longer-term partnerships and community piloting.

Community pilots. An explicit part of community piloting in two locations will be the development and ongoing refinement of a framework, developed initially during the baseline assessment work, for scaling up pilot activities. Pilots will be conducted with the community-specific context in mind, but also with an eye towards how interventions can be generalized to other areas around Honiara and also other watersheds in the Solomon Islands.

For instance, pilot development will provide insights into the international market capacity and demand for forest carbon PES opportunities, including the associated markets and standards (both government and private sector), which will help to develop and revise piloting approaches to facilitate scaling up. Marketing activities (e.g. for forest carbon credits) will also be used to assess future opportunities that can be utilized as piloting interventions are scaled up.

In addition, carbon finance will be developed using methodologies that will allow for additional projects to be added into the land area for generating land based carbon credits. Developing two pilots in separate locations and linking these from the beginning within this grouped approach will serve as a means to test and refine the application of this methodology and framework. A candidate methodology for this is the “grouped projects” approach in the Verified Carbon Standard (VCS) under Verra (<https://verra.org/grouped-projects/>) or the Plan Vivo Standard.

While this approach will entail moderately higher initial fixed costs in the near term, it will reduce transaction costs over the long run as area generating carbon finance is increased across the Lungga River watershed. Importantly, early financial returns to landowning communities will create incentive for others to join thereby assisting the scaling up effort.

Also feeding into the goal of scaling up, piloting work will also be utilized as a platform for demonstrating and communicating to other non-pilot communities in the target watersheds – via both formal and informal channels – the feasibility of conservation finance-based approaches to deliver tangible livelihood benefits that can compete with logging-based income. This community consultation and awareness-raising will thereby help ensure that the other groups in the watershed will become well-informed about the specifics of program approaches and will be more receptive to developing subsequent forest carbon finance and watershed protection partnerships.

Scaling up to other watersheds in Solomon Islands. The proposed forest carbon PES activities offer significant potential for replication in other catchment areas. In the near term replication opportunities would focus on the Lungga watershed and can be facilitated by applying a grouped project methodology (see above). In the longer term, the approach could be extended to other areas in the Solomon Islands where SW is operating, or has plans to extend its urban water supply network. A key outcome of this work is thus envisioned to be uptake by SW and application to its other water supply operations – where appropriate – of the community-centric nature-based approaches for watershed and water supply climate resiliency that are developed and refined through this project.

[1] In 2019, GDP per capita was \$2,281, and in 2020, it is estimated at \$2,131 (contraction of about 6.5%).

[2] Solomon Islands National Statistics Office (NSO).

[3] 58% of the city's population is less than 25 years old and a third of the population is less than 15 (Solomon Islands Government, 2017).

[4] The basic needs poverty line in Honiara is estimated at \$2.49 per person per day.

[5] These figures are based on projections from the Ministry of Lands, Housing and Survey (MLHS) and NSO's medium population growth projection for the country.

[6] Source: Asian Development Bank. June 2020. Proposed Countercyclical Support Facility Loan and Grant Solomon Islands: COVID-19 Rapid Response Program. Report and Recommendation of the President to the Board of Directors.

[7] Shaun Kies-Ryan, Solomon Water, Vulnerability of current and future groundwater sources, October 2018.

[8] It is assumed that the required source capacity will be in line with average day demands in the short term, while future source capacity will eventually need to be in line with peak day demands.

[9] SW also provides sewerage services in GHA to approximately 10% of the residents.

[10] SW. 2018. *Non-Revenue Water Reduction Strategy Report*. Honiara.

[11] The primary source of water is understood to be from the Kovi Sinkhole, approximately 2 km upstream from the spring, where a moderate percentage of the river leaves the stream and enters the groundwater system.

[12] Solomon Water's revenue stream is directly linked to usage, meaning any limitations on supply directly impacts revenue and business performance.

[13] Asian Development Bank and Solomon Water, Lungga River Water Source Scheme Feasibility Report, October 2018.

[14] Trundle and McEvoy (2016): The Honiara Urban Resilience and Climate Action Plan, UN-Habitat's Cities and Climate Change Initiative, Honiara, Solomon Islands.

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- [16] Keegan A, Wati S, Robinson B (2012). Chlorine disinfection of human pathogenic viruses in recycled waters (SWF 62M-2114). Smart Water Fund.
- [17] Ministry of Forests, Environment and Conservation, The revised Solomon Islands code of logging practice, May 2002, available from: <https://theredddesk.org/countries/laws/code-logging-practice>
- [18] The project will also focus on five other towns of Auki, Gizo, Noro, Munda, and Tulagi, but project activities in these towns are not discussed under the baseline.
- [19] Solomon Islands Water Authority (2017) 30 year Strategic Plan 2017 – 2047, Main Report
- [20] Based on the Medium-growth scenario from Hunter H₂O. 2017. *30 Year Strategic Plan – Main Report*. Honiara: Solomon Islands Water Authority.
- [21] Lozатели, B. Fedele, G., Fayolle, V. and Baglee, A. (2016) "Synergies between adaptation and mitigation in climate change finance", International Journal of Climate Change Strategies and Management, Vol. 8 Issue: 1, pp.112-128
- [22] Bernoux et.al (2011) Carbon sequestration as an integral part of watershed management strategies to address climate change issues; Policy brief.

Annex G: Impacts of Extreme Rainfall in Honiara (Flooding and Turbidity)

This annex discusses current and future flooding in Honiara and the risks that flooding poses to human settlements and infrastructure, particularly to the city's water supply. The focus is on extreme rainfall, which is the main climate-related cause of worsening floods and is projected to become more frequent and severe with climate change.

A. Extreme rainfall and current flooding impacts in Honiara

The Solomon Islands has a typical tropical island climate. Air temperatures in the Solomon Islands show very little seasonal variation, and are closely linked to sea-surface temperatures. Rainfall in the Solomon Islands is typically high and is affected by the West Pacific Monsoon (WPM), the South Pacific Convergence Zone (SPCZ) and the Intertropical Convergence Zone (ITCZ). Further, rainfall experiences significant year-to-year variations, due mainly to the influence of the El Niño-Southern Oscillation (ENSO).

Extreme rainfall events already contribute to both flash flooding and riverine flooding across Honiara. The large catchment areas that lie upstream of the city contribute to severe riverine flooding downstream, while the steep terrain that flank the streams around Honiara means that localized flash flooding can occur during high intensity events. Rainfall has also been associated with the risk of landslips in the more rugged areas of the city.

Since 1966, significant flood events occur roughly every 3.5 years, with the frequency increasing in recent years. Flooding occurs as a result of both cyclones and excessively heavy wet season rainfall.

- Tropical cyclones (TC) that have reportedly caused city flooding include TC Angela (1966), TC Glenda (1967), TC Carlotta (1972), TC Kerry (1979), TC Bernie (1982), TC Namu (1986), TC Ului (2010), TC Yasi (2011), and TC Harold (2020).
- Recent flooding caused by heavy rainfall (non-TC events) have occurred in 2008, 2009, and 2010, 2012, 2014, and 2019.

The most extreme rainfall event on recent record was the April 2014 floods, a result of extreme rainfall caused by a slow-moving tropical depression. Over a three day period, 613 mm of rainfall was recorded, with the highest one day total recorded at 318 mm. Roughly 240 houses were destroyed, and 22 people lost their lives in flooding along the Mataniko River, where residences were located on dangerously low ground. The total economic value of the flooding's impact was estimated at nearly \$108 million, equivalent to 9.2 percent of the GDP of Solomon Islands at the time.[1]

Damage to infrastructure. Flooding combined with riverbank erosion can impact urban infrastructure, such as roads, bridges, and water supply infrastructure. Following the 2014 flooding, access to clean drinking water was a major concern for at least half of the 50,000 people estimated to have been affected by the flood.[2] Solomon Water needed to duplicate the Kongulai gravity main at White River at a cost US\$1.75 million. In addition, the replacement cost of water meters and distribution pipes was estimated at \$72,000 (US\$300 per destroyed house).[3] SW also incurred additional operating costs due to a variety of repairs to the water and sewerage infrastructure, higher electricity consumption, additional chemical dosing, and additional labour costs. These costs amounted to an estimated US\$125,000.

More recently, TC Harold impacted the Solomon Islands in early April 2020. It brought strong winds accompanied by heavy rains, river flooding, rough seas, high oceans waves and coastal flooding including storm surges. In GHA, the Mataniko and Lungga rivers were swollen, and roads and even bridge segments were washed out.

Impacts of moderate flooding on water quality and supply. Moderate flooding events are also a problem in Honiara, as they lead to water interruptions due to high turbidity. While all three spring sources (Kongulai, Rove, and Kombito) are affected, turbidity is the worst at Kongulai, which is influenced by surface water^[4] and currently untreated other than dosing of chlorine (sodium hypochlorite) for disinfection.

Turbidity is caused by suspended chemical and biological particles, which can have both water safety and aesthetic implications for drinking water supplies. Measured in nephelometric turbidity units (NTU), turbidity can indicate the presence of pathogenic microorganisms and be an effective indicator of hazardous events throughout the water supply system, from catchment to point of use. High turbidity in source waters like Kongulai Spring can harbour microbial pathogens, which can be attached to particles and impair disinfection.

Prior to 2019, turbidity was only measured after heavy rainfall. From these limited measurements, it was observed that turbidity increases quickly after a few hours of rain and can even exceed 150 NTUs during storm events. At the moment, these turbidity spikes can only be mitigated by shutting down the spring in order to maintain minimum water quality requirements for the health of the community. Per Solomon Water's policy, shutdowns should occur when turbidity exceeds 20 NTUs and boil water notices should be issued at above 5 NTU.

Solomon Water began taking more regular measurements in February 2019 (and daily measurements in April 2019) after it was observed that turbidity spikes at Kongulai were becoming more frequent, which was causing more regular service interruptions, loss of revenue, and additional costs in managing disconnections and reconnections.^[5] In December 2019, this monitoring was replaced by 24/7 monitoring.^[6]

This daily monitoring allowed for a comparison between maximum daily turbidity and rainfall (aggregated over 24 hour, 48 hour and 72 hour periods). While the turbidity dataset is limited to just 14 months, a statistically significant correlation at the 99% level was found, with the strongest correlation with 48 hour rainfall (see Annex I).

Since Kongulai currently accounts for 40% of Honiara's water supply and the water supply in Honiara runs at close to capacity continuously, frequent shutdowns at Kongulai mean that a continuous water supply is not available to all consumers. As discussed below, increased rainfall intensity due to climate change will worsen this situation.

Like Kongulai, the Lungga River will only be viable as a future water source if full treatment is implemented for the uncontrolled river source. An analysis of raw water quality in the Lungga noted that seasonal turbidity (with weather effects, sediment transportation) is a possible issue in line with catchment properties and climatic conditions.^[7]

Since average values of raw water quality parameters are typically used to decide on the overall treatment process and the sizing of associated treatment units, turbidity variations can be problematic to the design. This is also the case with Kongulai, but would be more severe with Lungga given the size of the flow and potential for much greater variations. This problem threatens the viability of Lungga as a water source, which is problematic given the absence of other alternative water sources.

B. Projected future impacts of extreme rainfall

Projected future rainfall. The primary climate change component that affects water supply is changes in rainfall patterns (intensity, frequency, and duration) as a result of increased temperatures. The interplay and variability of ENSO, SPCZ, ITCZ and WPM and knowledge gaps in understanding exactly how these phenomena operate and interact make modelling future behaviour and associated rainfall changes extremely challenging. As such, large uncertainties and low levels of confidence exist in projected rainfall change, including intensity, duration and frequency, as well as how drought may manifest in the future.

Despite the lack of consistency in the models pertaining to overall rainfall, the frequency and intensity of extreme rainfall events is projected to increase. That is because there is greater confidence in the magnitude and directionality of temperature change. Maximum daily temperature change can be used as a proxy to infer how future rainfall intensity may change, important for modelling future changed to turbidity. For this reason, changes in maximum daily temperatures were assessed (as summarized in Annex I) and are projected to increase across all climate models and future climate scenarios.

The assessment used the Clausius-Clapeyron (CC) relationship, which suggests that per 1°C of annual maximum daily temperature change, there is a ~6.5% increase in extreme rainfall. We also incorporated recent research that has identified “Super CC” scaling, where anthropogenic climate change-induced changes to extreme rainfall are 1.5-3 times greater than changes expected based on the CC rate alone. The projections, explained in detail in Annex I, are shown in Table 1.

Table 1: Projected percentage increase in extreme rainfall

RCP	Time horizon	Change in extreme rainfall – Clausius-Clapeyron scaling (% increase)		Change in extreme rainfall – Super Clausius-Clapeyron scaling (%) ^a	
		Lower bound	Upper bound	Lower bound	Upper bound

RCP6.0	2070	6.5	11.7	9.8	17.6
RCP8.5	2070	11.7	16.9	17.6	25.4

Projected future turbidity. Increased intensity and frequency of extreme rainfall events, which is projected with climate change, will further increase turbidity, making Honiara’s water supply unreliable and unsafe if measures are not taken. As detailed in Annex I, Table 2 compares the proportion of rain days where NTU >20 (i.e. shutdown threshold), NTU >50, and mean NTU relating to projected future turbidity. These projections are for 2070 because the design life of the water treatment plan (described below) is 50 years.

For the 2019-2020 baseline, 35% of rain days resulted in NTU >20. This is a substantial proportion of rain days. However, compared with projected changes under RCP6.0 by 2070, 45-50% of rain days are expected to result in NTU >20. This is an increase of up to 15% compared to the 2019-2020 baseline, meaning shutdowns may occur for an additional ~55 rain days, compared to present, accounting for around half of all rain days. For NTU >50, around 13% of rain days exceeded this threshold for the 2019-2020 baseline but could increase to over a quarter of rain days (~26%) under RCP6.0 by 2070. The average turbidity on rain days increases from 38 NTU (which is already well above the 5 NTU (boil water notice) and 20 NTU (shutdown thresholds)) to 43 NTU under RCP6.0 by 2070.

For RCP8.5 conditions by 2070, similar increases in the proportion of rain days where NTU >20 and >50 are observed compared to RCP6.0 conditions. Regardless of future scenario, both suggest that up to 50% of rain days may exceed NTU >20. Given the established rainfall-turbidity relationship, the maximum (extreme) NTU values are also expected to increase, which is potentially problematic from a water treatment perspective.

Table 2: Projected Turbidity at Kongulai Spring

Metric	RCP6.0 – 2070		RCP8.5 – 2070		Baseline (2019-2020)
	LB	UB	LB	UB	
Proportion (%) of rain days where NTU >20	45.1	50.1	44.1	49.6	34.9
Proportion (%) of rain days where NTU >50	21.2	25.7	20.2	25.1	13.1

Mean NTU	37.0	43.3	36.4	43.1	38.1
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LB=Lower bound; UB = Upper bound

Fluvial flooding impacts. More extreme rainfall will also cause worsening flash flooding in Honiara, increasing the risks to residential housing, commercial buildings, critical infrastructure. A recently-completed Honiara Flood Risk Management Study and Plan[8] conducted hydrological modelling for peak flows in the catchments for the Lungga River, Mataniko River, and White River based on projected increases in extreme rainfall. Using projections from BoM/CSIRO under RCP8.5, the study assumed a 19.2% increase in the historical 1 in 20 AEP storm depth by 2090 (equivalent to a 43 mm depth increase).

The study concluded that the percentage increase in peak flows for different annual exceedance probabilities (1 in 5; 1 in 100) would be in the range of 31% to 45%, which is much higher than the rainfall increase. The reason for this is that a significant proportion of the incident rainfall is lost to infiltration and soil moisture storage. Any additional rainfall on top of a near-saturated catchment will mostly run off with little loss. Therefore, the peak flow increase will always be disproportionately greater than the rainfall increase.

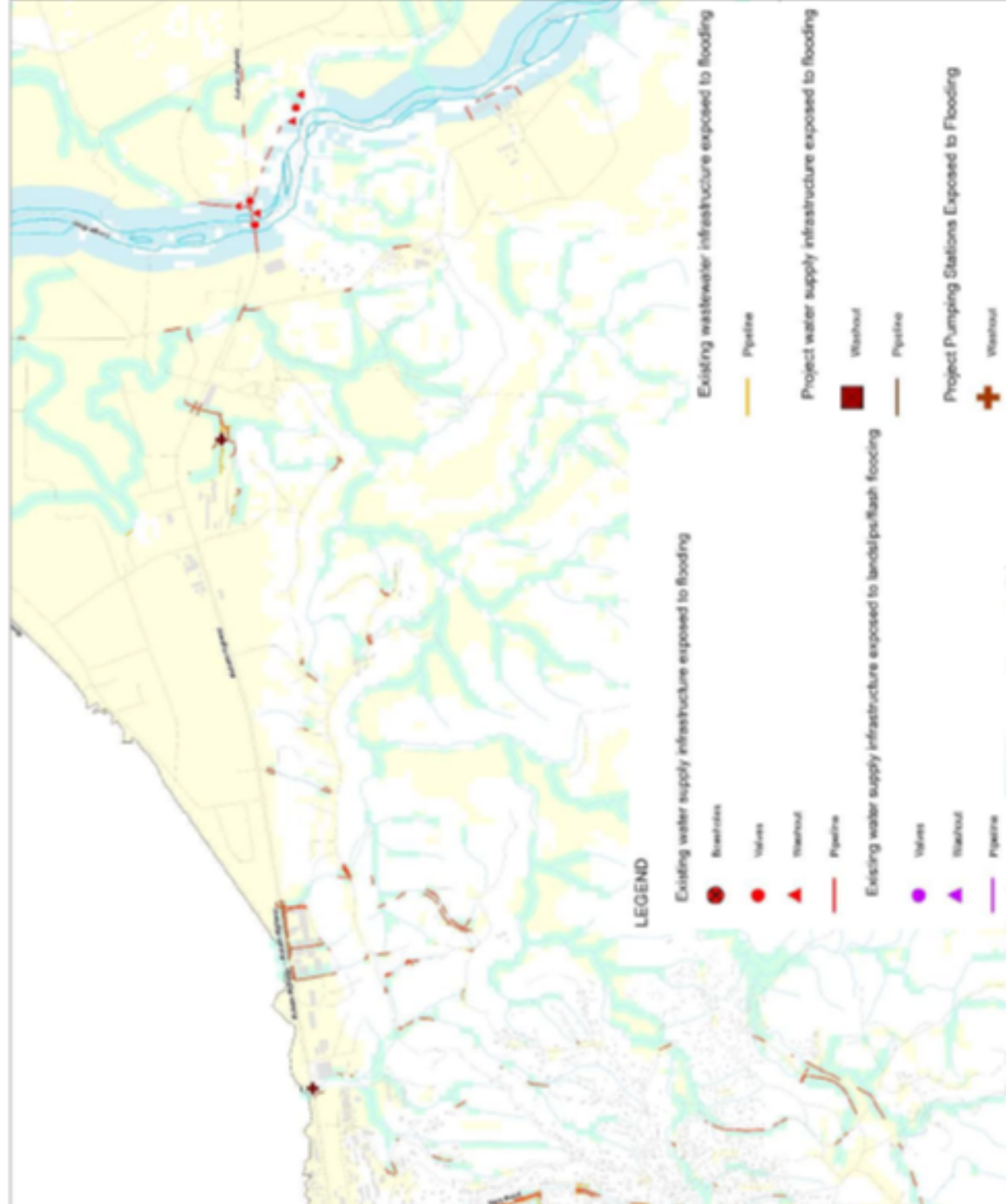
In 2019, a separate study was completed – “Potential Climate Change Impacts to Flooding of Water Supply and Sanitation Infrastructure in Honiara.” Prepared for the ADB baseline project (described below), the study projected that the frequency of catastrophic flooding events will increase due to climate change and recommended that infrastructure should be constructed for a design flood similar in size to the flooding that occurred in 2014.

The study used GIS modelling to identify areas within 100 m of rivers and 30 m from streams, where low slopes would allow flood waters to inundate and potentially impact existing Solomon Water infrastructure. Additionally, areas where slopes are steeper than 26° were identified as areas that would potentially be exposed to flash flooding and landslides during heavy rainfall events.

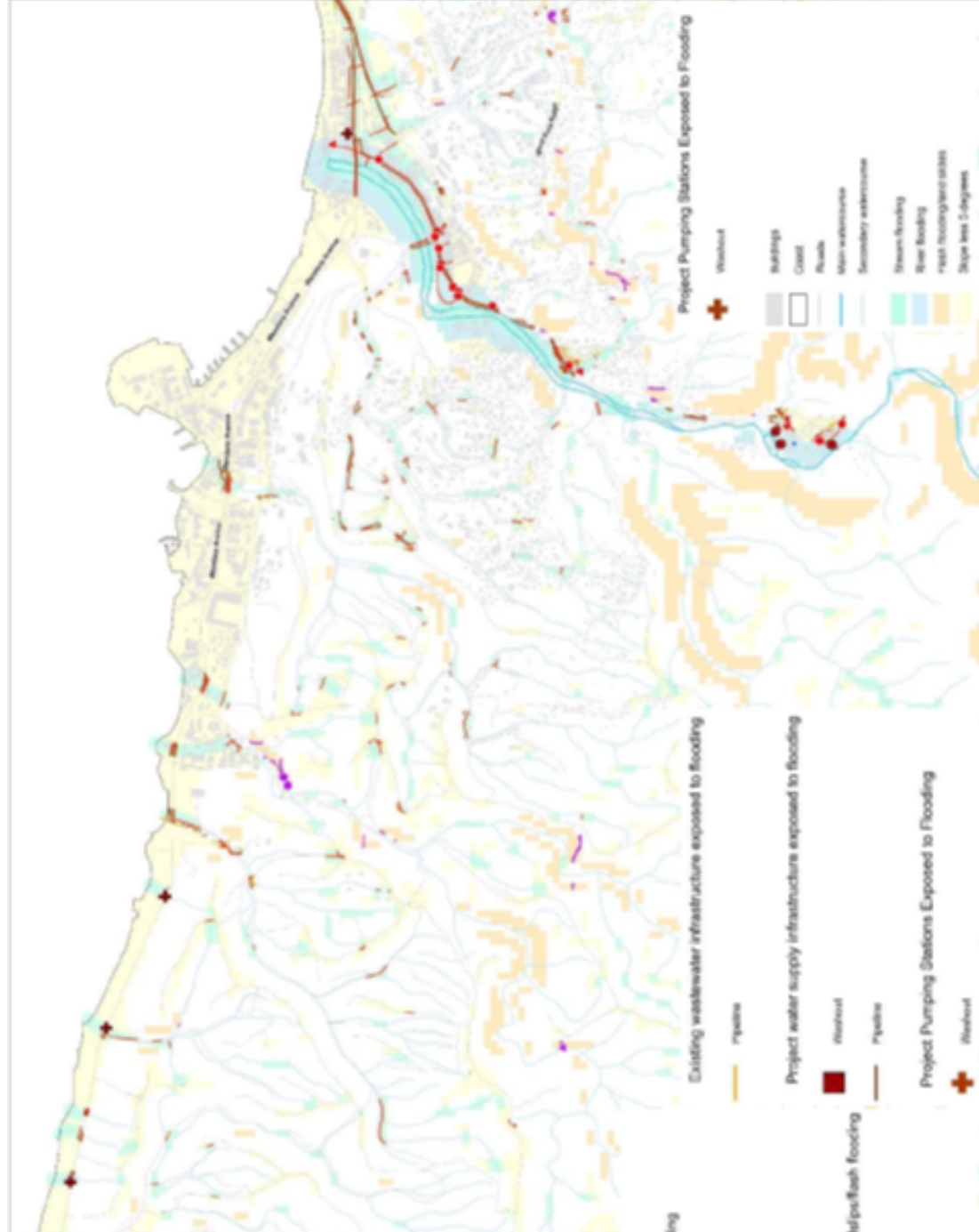
As shown in the maps below, the modelling identified almost 40 km of existing water supply pipes and another 1.5 km of proposed pipes (to be installed under the baseline project) that are potentially exposed to river or stream flooding. Another 1.7 km of existing water supply pipes are located on steep slopes. In addition, over 2.7 km of existing

wastewater pipes and 12.8 km of proposed wastewater infrastructure (also under the baseline project) are located near rivers and streams and therefore potentially at risk from flooding.

Map of modelled flood prone areas and exposed existing and project infrastructure in east Honiara



Map of modelled flood prone areas and exposed existing and project infrastructure in west Honiara



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- [1] World Bank. Rapid Assessment of the Macro and Sectoral Impacts of Flash Floods in the Solomon Islands, April 2014.
- [2] Trundle and McEvoy (2016): The Honiara Urban Resilience and Climate Action Plan, UN-Habitat’s Cities and Climate Change Initiative, Honiara, Solomon Islands.
- [3] Government of the Solomon Islands (GoSI) (2014). Rapid Assessment of the Macro and Sectoral Impacts of Flash Floods in the Solomon Islands, April 2014. World Bank, Washington, DC.
- [4] The primary source of water is understood to be from the Kovi Sinkhole, approximately 2 km upstream from the spring, where a moderate percentage of the river leaves the stream and enters the groundwater system.
- [5] Solomon Water’s revenue stream is directly linked to usage, meaning any limitations on supply directly impacts revenue and business performance.
- [6] Set up by the University of Queensland, this monitoring was interrupted in late May 2020 due to damage to the equipment and has not yet been repaired because COVID has limited travel into the Solomon Islands.
- [7] Asian Development Bank and Solomon Water, Lungga River Water Source Scheme Feasibility Report, October 2018.
- [8] Tonkin & Taylor International Ltd, *Honiara Flood Risk Management Study and Plan*, Prepared for The World Bank Group, November 2019.

Annex H: Summary of Climate Change Assessment for Baseline Project

BASIC PROJECT INFORMATION

Project Title:	Solomon Islands: Urban Water Supply and Sanitation Sector Project (UWSSSP)
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Project Cost (\$ million):	92.82
Location:	Honiara and other cities
Sector:	Water and other urban infrastructure and services
Theme:	Inclusive economic growth, environmentally sustainable growth
Brief Description:	<p>UWSSSP will improve access to safe water and improved sanitation in urban and peri-urban areas of Solomon Islands. About 152,000 (24%) of the Solomon Islands population live in urban and peri-urban areas, the largest of which is greater Honiara, with an estimated population of about 105,000. Based on medium growth projections, Solomon Islands urban population may grow to 430,000 by 2050 while the population of greater Honiara is expected to surpass 300,000. Specifically, the four Outputs are:</p> <p>Output 1 - Secure and safe urban water supplies. New and rehabilitated infrastructure for water supply, treatment, distribution and storage infrastructure for Honiara, and potentially in the urban areas of Auki, Noro, Gizo, Munda and Tulagi. This may include infrastructure in flooding and rainfall affected zones. Water supply is from springs, rivers and wells.</p> <p>Output 2 - Effective, efficient and safe urban sanitation services. New and rehabilitated infrastructure for waste water collection, treatment and dispersal for Honiara. This may include infrastructure in flooding and rainfall and coastal incursion affected zones</p> <p>Output 3 - Enhanced awareness of hygiene and water issues and sustained improved hygiene behavior.</p> <p>Output 4 – Improved financial and technical sustainability of water management utility (Solomon Water, SW).</p>

Source: Asian Development Bank (Feasibility Study)

SUMMARY OF CLIMATE RISK SCREENING AND ASSESSMENT

Solomon Islands is highly vulnerable to natural hazards, including severe tropical storms and sea surges. Climate change projections indicate that climate related risks will increase. The ADB Concept Paper (October 2017) determined that the climate change impacts on the project would be **high**. Hence, no AWARE report was prepared, but a full climate risk assessment was directly undertaken.

Sensitivity of Project Component(s) to Climate or Weather Conditions and the Sea Level

Initially, all potential climate related risks were considered for the two project Outputs that have infrastructure components (i.e. Outputs 1 and 2). The following table summarizes the climate related risks for which it was determined that additional investigation was necessary (and the pertinent project Outputs).

Climate related risk with potential impacts	UWSSSP Output Sensitivity	
	1: Water Supply	2: Sanitation
Reduced precipitation levels can decrease the availability of both surface water and groundwater.	X	
High-intensity precipitation may increase erosion.	X	X
Larger sediment loads may result in more rapid sedimentation of storage reservoirs, reducing storage capacity.	X	
Changes in the amount of rainfall may affect the performance and operation of water systems.	X	
Increases in precipitation may put pressure on urban drainage systems while sewerage systems may become more difficult to operate and maintain if precipitation levels and discharge decline.	X	X
In other instances (particularly in warm areas), the efficiency of these processes may be reduced if critical thresholds are exceeded.		X
Temperature increases may result in a reduction of surface water availability by decreasing runoff and increasing evaporation from lakes and reservoirs.	X	
Higher temperatures may increase agricultural water demand due to decreasing.	X	

Increases in periods of intense heat may result in higher water demands for domestic and industrial uses.	X	
Service disruptions may increase due to breakdowns in water distribution pipelines from extreme events, such as unseasonal precipitation patterns and flash floods.	X	
The structural integrity of basic water infrastructure may deteriorate due to floods and periods of intense heat and cold.	X	X
Increases in the intensity of floods may result in the contamination of water sources and may increase the incidence of waterborne and water-related diseases		X
Saline intrusion in low-lying coastal areas may contaminate aquifers and force currently secure water sources out of use.	X	
Coastal storms in combination with sea-level rise can damage coastal water supply and wastewater treatment facilities.	X	X
Ocean discharge from treated wastewater outfalls can be impaired by sea-level rise, particularly during high tides or storm surges.		X

Climate Risk Screening

Using the table from Section A above, the level of risk for each climate factor for each project component and each project sub-component was determined. Risk level was determined as a function of (i) the likelihood of the hazard happening and (ii) the consequences of the hazard happening. Taking into account projected climate change, the following project sub-components were determined to face either *high* or *extreme* climate risks:

Water supply for Honiara

- Extreme precipitation leading to increased floods that may directly or indirectly (through erosion) physically undermine the newly constructed infrastructure, this risk applies to:
- the new source (Lungga river: intake, water treatment plant, storage, pumping stations and uphill transportation, associated channels to transport water to the network); and
- the rehabilitated and expanded storage, transportation and distribution reticulated network (Honiara trunk mains, storage tanks and distribution pipes);
- Extreme precipitation events may cause turbidity that undermine performance of Kongulai spring;

- Reduced short-term precipitation may decrease water volume available from Kongulai spring;
- Coastal storms in combination with sea-level rise can damage coastal water supply facilities (distribution pipes);
- Larger sediment loads may result in more rapid sedimentation of storage reservoirs, reducing storage capacity, and;
- Climate change (through increased consumer demand) may lead to need for larger sizing of storage tanks, to act as buffer to increase rainfall variability.

Sanitation in Honiara

- Ocean discharge from treated wastewater outfalls can be impaired by sea-level rise, particularly during high tides or storm surges;
- Increased precipitation and floods may directly or indirectly (through erosion) physically undermine the new sanitation infrastructure (pumps, pipes and outfalls);
- Increased precipitation and floods may directly or indirectly (through erosion) physically undermine the newly created septage facilities;
- Increases in the intensity of floods may result in the contamination of water sources and may increase the incidence of waterborne and water-related diseases.

Climate Risk and Adaptation Assessment

For each project sub-component determined to be at high or extreme risk to climate or climate change, the project design was assessed and the measures taken to adapt and to ensure resilience were assessed. A gap analysis was undertaken and recommendations provided. As appropriate, further additional adaptation measures were recommended. The costs of measures already taken and of the measures planned to ensure resilience were determined. However, it is noted that in some cases it is too early to know the details of the measures required, hence a recommendation was made to undertake further studies, sensitivity analysis, and in some cases analysis of climate data during the **detailed design** stage.

The recommendations are summarized in the following table:

Climate Risk	Measure already incorporated	CRA recommendation (additional measures)
1.1.1 Water supply - Honiara new water source and treatment at Lungga River (this is not a core project)		

Intake Location: There are potentially additional CC costs due to the choice of intake location.	-	
Intake design: There may also be additional costs due to modifying the intake design to: (i) allow for provisions for extreme low flows during drought; and (ii) ensure protection from more frequent substantial floods.		
1.1.2 Water supply – Honiara - Sufficient supply to all areas of Honiara		
Extreme precipitation leading to increased floods that may directly or indirectly (through erosion) physically undermine the newly constructed infrastructure, i.e. - the pumping stations and the uphill transportation channels.	-	<p>Initial studies suggest that no modification is necessary for climate change.</p> <p>However, during detailed design of the pumping stations and uphill transportation channels, ensure that they are resilient to the expected floods, erosion and landslides, taking into account the projected level and flow of extreme floods for the year 2050.</p>
1.1.3 Water supply – Honiara - Improved quality of water supplied from existing water sources (Kongulai Spring).		
Extreme precipitation events may cause turbidity that undermines the performance of Kongulai spring.	Existing design allows for a 25% increase in frequency of turbidity events due to climate change, and for an increase in shutdowns due to turbidity events.	At the detailed design stage, further study is necessary to confirm: (i) the projected frequency/intensity of turbidity events and (ii) the required climate proofing measures.
1.1.4 – 1.1.6 Water supply - Honiara trunk main augmentation		

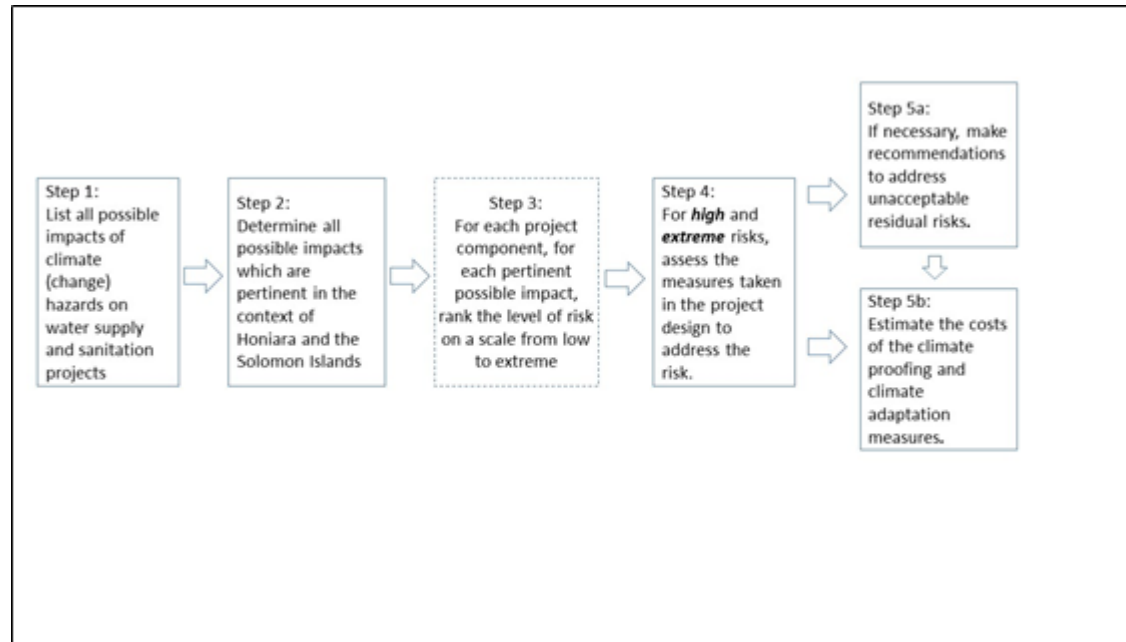
Increased precipitation and floods may directly or indirectly (through erosion) physically undermine the augmented and newly constructed trunk mains that transport water.	Existing design allows for additional scour stops to prevent increased erosion during floods due to climate change and increased protection of outlets etc.	At the detailed design stage, further confirmation is necessary that no additional changes to the design are required because of climate change (e.g. need for additional scour stops to prevent increased erosion resulting from higher rainfall intensity) or to the specifications.
1.1.7, 1.1.8 Water supply - Honiara clearwater storage augmentation		
Increased precipitation and floods may directly or indirectly (through erosion) physically undermine the augmented and newly constructed storage tanks.	-	<p>Initial studies suggest that no modification is necessary for climate change.</p> <p>At the detailed design stage, further study is necessary – using the topographic studies – to confirm that flood/storm risks are low and/or not increased by climate change.</p>
1.1.9., 1.2.1, 1.2.2 Water supply - Honiara (i) water network expansion program and (ii) NRW reduction and mains renewal program		
Increased precipitation and floods may directly or indirectly (through erosion) physically undermine the new infrastructure (distribution pipes).	3.965km of pipes and channels have been designed to be fully climate resilient.	<p>Initial studies suggest that no further modification will be necessary for climate change.</p> <p>At the detailed design stage, ensure that all infrastructure is resilient to the expected floods, erosion and landslides, taking into account the projected levels of extreme floods for the year 2050. This should include topographic surveys and flood risk mapping.</p>

Coastal storms in combination with sea-level rise can damage coastal water supply facilities (distribution pipes).	-	<p>Initial studies suggest that no modification will be necessary for climate change.</p> <p>At the detailed design stage, ensure that all infrastructure is resilient to storm surges, to sea overtopping and to sea floods, taking into account the projected sea levels and storm surges for the year 2050.</p>
2.1 Sanitation – Honiara sewer rehabilitation and expansion program.		
Ocean discharge from treated wastewater outfalls can be impaired by sea-level rise, particularly during high tides or storm surges.	Existing design practice should protect structure from all but catastrophic flooding, so no modification will be necessary for climate change.	During detailed design, and during the preparation of the studies (i.e. topographic survey; the bathymetric survey; the wave and current studies) ensure that the appropriate climate change parameters are taken into account, notably: (i) sea level rise of at least 0.5 m (this will have cost implications) and (ii) the increased risk of storm surge.
Increased precipitation and floods may directly or indirectly (through erosion) physically undermine the new sanitation infrastructure (pumps, transmission pipes, outfalls and collecting pipes). Note that this includes the expansion of the reticulated collection network into backlog areas.	4.884km of wastewater rising main channels and 7.993km of wastewater gravity main channels have been designed to be fully climate resilient.	<p>Initial studies suggest that no further modification will be necessary for climate change.</p> <p>At the detailed design stage for the pumping stations and pipes, ensure that they are resilient to the expected floods and any landslides, taking into account the projected levels of extreme floods for the year 2050. This should include flood risk mapping.</p>
2.2 Sanitation – Honiara septage management (reedbed treatment plant)		

Increased precipitation and floods may directly or indirectly (through erosion) physically undermine the newly created septage facilities (reedbed treatment plant), or the increased flooding of the beds may lead to contamination of nearby land and water sources, and this may increase the incidence of waterborne and water-related diseases.	Minor additional costs are to be incurred to ensure that the floods do not cause damage to the infrastructure	<p>The final location and design type are not decided.</p> <p>During detailed design of the reedbed treatment plant, ensure that (i) the infrastructure is constructed to be physically resilient to the expected floods and any landslides, taking into account the projected levels of extreme floods for the year 2050 and (ii) the reedbed is protected from any flooding that would lead to leakage and contamination. This should include flood risk mapping.</p>
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Climate Risk Screening Tool and/or Procedure Used

The climate risk assessment methodology is summarized in the following diagram.



CLIMATE MITIGATION PLANS WITHIN THE PROJECT

The Project does not have activities aiming to reduce greenhouse gases per se. However, the project activities will lead to a reduction of emissions of greenhouse gases and reduced greenhouse gas emissions are an important co-benefit of this project. There are two principal sources of GHG emission reductions are: (I) introduction of a reed bed waste water treatment plant for the collected septage and (ii) decreasing NRW leads to increased efficiency of water supply so less power.

An initial first order estimate for (i), introduction of a reed bed waste water treatment plant for the collected septage, estimates the emission reductions to be in the order of 1,284 tCO₂/year.

For (ii), estimates were prepared based on a total production of 40 million liters per day (MLD). Reducing NRW from 61.5% to 40% in that case would lead to power savings of at least 823MW per year, for the same production volume. However, in order to provide a more conservative estimate of GHG Emission Reductions, a more conservative total

production is 20MLD is adopted. This would lead to power savings of at least 411.5 MW per year, which, using the emission factor of 0.4046 tCO₂/MWh (as determined through the analysis), would translate into GHG emission reductions of at least 166 tCO₂/year.

Hence, combining (i) and (ii), a conservative estimate of total GHG emission reductions is 1,450 tCO₂/year.

(Source: *Solomon Islands: Urban water supply & sanitation sector project (UWSSSP)*)

GHG Emission reduction calculations, V. Dheodhar, 2018 (prepared for the Project Feasibility Study).

(Note: some methodologies suggest considering the increase in overall GHG emissions due to increased energy use due to the increase in coverage. Using such a methodology, the World Bank estimated GHG emission reductions to be 1,109 tCO₂/year (Source: World Bank, Project Appraisal Document).

Annex I: On the relationship between rainfall and turbidity at Kongulai Spring

By Dr. Andrew Magee

A. INTRODUCTION

Kongulai Spring is a major water source for the greater Honiara region, accounting for approximately 40% of the water supply. Kongulai Spring is particularly susceptible to turbidity issues, which impacts water quality and can impact water supply to Honiara. Kongulai Spring is shut down if the turbidity exceeds 20 Nephelometric Turbidity Units (NTUs), and a boil water notice is issued when NTU exceeds 5, both of which are a frequent occurrence.

River turbidity is dynamic and is significantly influenced by periods of prolonged and/or heavy rainfall. The causal relationship between extreme rainfall and turbidity is well established in the scientific literature (Lee et al. 2016; Solano-Rivera et al. 2019). With climate change, atmospheric warming will drive increases in the magnitude of extreme rainfall, increasing the frequency and intensity of flash flooding and landslide events. As such, quantification of how future intense rainfall (and mean changes) might change is an important consideration for water quality.

This analysis quantifies the observed rainfall-turbidity relationship at Kongulai Spring using turbidity data from Kongulai Spring and daily rainfall data from Honiara. The analysis then applies this rainfall-turbidity assumption considering a range of plausible future climate scenarios to explore how turbidity and the frequency of shutdown days (NTU >20) may change in the future. Future climate change scenarios considered in this assessment include:

- Time horizon: 2070^[1]
- RCP scenarios: RCP6.0 and RCP8.5

B. SUMMARY OF METHODOLOGY

The analysis contained within this report is composed of three main components. These are summarized below:

1. Establish a relationship between turbidity and rainfall at Kongulai Spring

The rainfall-turbidity relationship is well established (Lee et al. 2016; Solano-Rivera et al. 2019). This analysis quantifies this relationship specific to the site at Kongulai Spring using an observed rainfall dataset (from Honiara) and turbidity record (collected at Kongulai Spring).

2. Calculate and apply climate change projections to rainfall at Honiara

This analysis accounts for a range plausible climate change projections for the Solomon Islands region, including RCP6.0 and RCP8.5 for the 2070 time horizon. Pacific Climate Futures Version 2.1 (Australian Bureau of Meteorology and CSIRO 2017) was used to extract mean rainfall changes and maximum daily temperature changes, the latter of which

is important in calculating how future extreme rainfall may change in the future. Extreme rainfall is particularly important when considering future turbidity. The climate change scenarios and Global Climate Model (GCM) outputs considered in this project are summarized in Section IV-A.

GCM projections for mean rainfall are uncertain (see Section IV-A for more information), so a lower bound (LB) and upper bound (UB) is considered for each RCP by 2070. As such, four plausible futures are considered and are summarized in Table 1.

Table 1: Climate change scenarios considered in this analysis

RCP scenario	Time horizon	Lower/upper bound (LB/UB)
RCP6.0	2070	LB
		UB
RCP8.5	2070	LB
		UB

Applying the mean and extreme rainfall scaling factors to the observed rainfall record at Honiara generates four plausible future rainfall time series. The methodology used in scaling the rainfall is outlined in more detail in Section IV-B.

3. Evaluate future rainfall-turbidity relationship

Using the established turbidity-rainfall relationship as per point 1, this is applied to the four plausible future rainfall time series generated in point 2. This will provide an understanding of how turbidity and the distribution of turbidity, including high-turbidity days and shutdown days ($\text{NTU} > 20$) might change in the future.

C. ESTABLISHING A RELATIONSHIP BETWEEN RAINFALL AND TURBIDITY AT KONGULAI SPRING

Rainfall and turbidity data

Daily rainfall data for Honiara (1st January 1980 – 31st August 2020) has been provided by the Solomon Islands Meteorological Service (SIMS).

Two independent turbidity datasets exist. The first dataset collected by the University of Queensland (UQ), Australia, extends from 6/12/2019 to 24/5/2020 (171 days) at sub-daily resolution. The second turbidity record collected by Solomon Water has continuous daily and sub-daily observations and extends intermittently between 10/6/2014 to 19/3/2020 with continuous daily observations starting on 10/2/2019 to 31/1/2020 (356 daily observations). For the common period (6/12/2019 to 31/1/2020), the UQ and Solomon Water datasets are correlated up to $r = 0.87$, statistically significant at the 99% level. As such, the Solomon Water turbidity dataset has been extended from 31/1/2020 to 24/5/2020 using the UQ dataset, to generate a longer turbidity record from 10/2/2019 to 24/5/2020 (470 daily observations). Where sub-daily turbidity values exist, the maximum daily turbidity value (NTU) is taken for that day.

Relationship between maximum daily turbidity and rainfall

To explore the relationship between maximum daily turbidity and rainfall, Table 2 summarizes the Pearson correlation coefficient for 24 hour, 48 hour and 72 hour rainfall. While all rainfall aggregation periods are correlated with maximum daily turbidity and are statistically significant at the 99% level, 48-hour aggregated rainfall results in the highest correlation at $r = 0.39$ (p-value < 0.00001 , significant at the 99% level). As such, 48-hour rainfall is selected for further analysis.

Table 2: Pearson correlation coefficient (r) between maximum daily turbidity at Kongulai Spring and 24, 48 and 72 hour aggregate rainfall for Honiara. * indicates statistically significant relationship at the 99% level.

Rainfall aggregation period	Pearson correlation coefficient (r)
24 hours	0.33*
48 hours	0.39*
72 hours	0.37*

The observed rainfall-turbidity linear relationship for 48-hour rainfall rain days[2] as established between 10/2/2019 and 24/5/2020 (equation 1) is:

$$y = 2.1307x + 4.2113$$

[Eq. 1]

Where:

x = 48-hour rainfall

The linear relationship between rain days (48-hour rainfall where rainfall >0mm) and maximum daily turbidity will be applied to rainfall scaled to account for future climate change (see Section V-A).

Table 3 compares turbidity statistics for all rain days and extreme rainfall days (where rainfall is greater than 99th percentile rainfall). Mean turbidity for all rain days is 38.1 NTU, which increases to 259.7 NTU for extreme rainfall days (where 48-hour rainfall ≥ 79.8 mm), exceeding the 20 NTU shutdown threshold by over 12 times. The percentage of time that turbidity exceeded 5 NTU (boil water notice) for all rain days and extreme rainfall days (99p) increased from 77% to 100%. For 20 NTU (shutdown), 35% of all rain days exceeded this threshold, while 60% of extreme rainfall days exceeded 20 NTU. Table 2 confirms that extreme rainfall does increase NTU statistics and the incidence rate of high turbidity days at Kongulai Spring.

Table 3: Turbidity (NTU) statistics for Kongulai Spring and percent of time that turbidity exceeded 5 NTU (boil water notice) and 20 NTU (shutdown) for all rain days and extreme rain days (>99th percentile, 99p).

	Mean (NTU)	Median (NTU)	Standard Deviation (NTU)	Percent of the time that turbidity exceeded 5 NTU (boil water notice)	Percent of the time that turbidity exceeded 20 NTU (shutdown)
All rain days	38.1	10.4	121.4	77%	35%
Extreme rainfall days (99p) ^a	259.7	74.6	19.65	100%	60%

^a Note only 5 rain days were defined as extreme between 10/2/2019 and 24/5/2020

D. APPLYING CLIMATE CHANGE PROJECTIONS TO HONIARA RAINFALL

Climate change projections for the Solomon Islands are presented in Section IV-A. These projections are considered and applied to the observed rainfall record for Honiara to understand how climate change may impact future rainfall. The rainfall-turbidity relationship established in Section III is then applied to the future rainfall record to quantify how turbidity may change in the future.

Climate change projections for the Solomon Islands

Climate change scenarios have been derived from Pacific Climate Futures Version 2.1 (Australian Bureau of Meteorology and CSIRO 2017), which include projections from CMIP5 global climate modelling experiments. Projections from up to 43 global climate models (GCMs) are available for 13 future time periods, across 21 individual locations across the Pacific Islands Region. Projections are available at a range of monthly, sub-seasonal and seasonal time scales. For this analysis, the following future scenarios for the Solomon Islands are considered:

- Time horizon: 2070[3]
- RCP scenarios: RCP6.0 and RCP8.5
- Variables: mean rainfall and maximum daily temperatures

The climate change projections summarised in Sections IV-A-1 and IV-A-2 below are applied to the observed daily rainfall record at Honiara to understand future rainfall at the site.

Mean rainfall

Future projections of rainfall change are summarised in Table 4. For the Solomon Islands, there is uncertainty around rainfall projections as GCM outputs specifically for mean rainfall are not consistent in and around the Solomon Islands region (PACCSAP 2013). To consider this uncertainty, a lower bound (LB) (mean change -1 standard deviation) and upper bound (UB) (mean change +1 standard deviation) is calculated and applied to the observed daily rainfall dataset at Honiara.

Table 4: Mean rainfall change (%) for Honiara as per CMIP5 GCM outputs. Lower bound (LB) and upper bound (UB) rainfall scaling factors applied to Honiara rainfall are highlighted in grey.

RCP	Time horizon	CMIP5 GCM Outputs – rainfall change		Rainfall scaling factors applied to Honiara rainfall	
		Mean (%)	Standard deviation (%)	Lower bound (LB) (Mean-1 SD) (%)	Upper bound (UB) (Mean+1 SD) (%)
RCP6.0	2070	2.3	9.0	-6.7	11.3
RCP8.5	2070	1.2	9.5	-8.3	10.7

Maximum daily temperature and rainfall intensity

The relationship between changes in maximum daily air temperature and rainfall intensity is well established (Pall et al. 2007; Berg et al. 2013). The Clausius-Clapeyron (CC) relationship suggests that per 1°C of annual maximum daily temperature change, there is a ~6.5% increase in extreme rainfall (Kharin et al. 2007; Pall et al. 2007). Equation 2 summarises how to calculate future extreme rainfall using the CC relationship.

[Eq. 2]

Where:

ΔT = projected change in maximum daily temperature (see Table 5).

Table 5: Maximum daily temperature change (°C) for Solomon Islands as per CMIP5 GCM outputs. Lower bound (LB) and upper bound (UB) maximum daily temperature changes are highlighted in grey.

RCP	Time horizon	CMIP5 GCM Outputs – Maximum daily temperature change (°C)		Maximum daily temperature change (°C)	
		Maximum daily temperature change (°C)	Standard deviation (°C)	Lower bound (LB) (Mean-1 SD) (°C)	Upper bound (UB) (Mean+1 SD) (°C)
RCP6.0	2070	1.4	0.4	1.0	1.8
RCP8.5	2070	2.2	0.4	1.8	2.6

Recent research (Guerreiro et al. 2018) has identified “Super CC” scaling, where anthropogenic climate change-induced changes to sub-daily extreme rainfall are 1.5-3 times greater than changes expected based on the CC rate alone (see equation 2). The lower limit of this estimate is considered and applied (1.5 times increase), as it is applied to daily rainfall, and not sub-daily rainfall (sub-daily rainfall data was not available). Equation 3 summarises the Super CC calculation applied to the maximum temperature change:

[Eq. 3]

Where:

SCC = Super CC scaling

ΔT = projected change in annual maximum daily temperature

Table 6 summarises the scaling factors that should be applied to extreme rainfall according to future RCP scenario and time horizon.

Table 6: Percentage change (%) of extreme rainfall considering Clausius-Clapeyron (CC) scaling and super Clausius-Clapeyron (super CC) scaling for annual rainfall. Calculations are based on maximum daily temperature change (see Table 5). Grey shaded boxes indicate change factors applied to extreme rainfall according to RCP scenario and time horizon.

RCP	Time horizon	Change in extreme rainfall – Clausius-Clapeyron scaling (% increase)		Change in extreme rainfall – Super Clausius-Clapeyron scaling (%) ^a	
		Lower bound	Upper bound	Lower bound	Upper bound
RCP6.0	2070	6.5	11.7	9.8	17.6
RCP8.5	2070	11.7	16.9	17.6	25.4

^a Assuming a super CC multiplier of 1.5.

Applying climate change scaling factors to observed Honiara rainfall

For each time horizon and RCP scenario, two outputs are generated, a lower (LB) and upper (UB) bound. This is to account for uncertainty in GCM rainfall projections. The following methodology has been applied to the observed daily Honiara rainfall record (1980-present) and does so for each RCP scenario by 2070 to scale for the appropriate climate change factor:

1. Identify extreme rainfall days (>99th percentile) and apply the Super Clausius-Clapeyron (super CC) scaling (see Table 6). Emerging literature (Guerreiro et al. 2018) suggests that super CC scaling should be considered in addition to the Clausius-Clapeyron (CC) relationship, as the rate of extreme rainfall change, particularly in the tropics, has been found to exceed the CC scaling of 6.5% per 1°C of warming.
2. Using the mean rainfall change, scale the non-extreme rainfall so that the annual total change (%) should be the same as that listed in Table 4. For example, for RCP6.0 (LB), mean rainfall should be 6.7% less than the observed annual rainfall. This scaling should be done without changing the extreme rainfall values, as per step 1.

Application of this methodology ensures that the mean rainfall scaling factors are applied to each non-extreme daily rainfall value, whilst the super CC of the extreme rainfall events remain unaltered. Depending on RCP scenario, this methodology stretches the tail ends of the rainfall distribution and can result in wetter wet days and drier dry days.

Figure 1 summarises the annual aggregated rainfall for Honiara considering both UB and LB for RCP6.0 and RCP8.5 for the 2070 time horizon.

Figure 1: Time series of observed annual Honiara rainfall (black line) with upper bound (UB; red line) and lower bound (LB; blue line) climate change scaling factors applied. Grey area represent plausible annual rainfall range for the 2070 time horizon for RCP6.0 (panel a) and RCP8.5 (panel b). Note that 2020 is not a complete year and contains daily rainfall observations between 1/1/2020 and 31/8/2020.

E. FUTURE RAINFALL-TURBIDITY RELATIONSHIP FOR HONIARA

Methodology for calculating turbidity

A summary of how the rainfall-turbidity relationship was calculated for future climate change is summarized below:

1. For each RCP scenario (RCP6.0 and RCP8.5) for the 2070 time horizon, scale observed daily Honiara rainfall (1980-present) for future climate change using the scaling factors (see Section IV-B for more information).
2. Using the established linear relationship between observed Honiara rainfall and turbidity at Kongulai Spring (Section III-B; Equation 1), calculate NTU using the outputs from step 1. Four possible futures are considered: LB/UB for RCP6.0 and RCP8.5 for the 2070 time horizon.
3. Analyze the distribution of NTU for each of the four scenarios as per step 2.

Calculating turbidity under future climate change

Using the methodology as outlined above (Section V-A), Table 7 compares the proportion of rain days where NTU >20 (i.e. shutdown threshold) and where NTU >50 for each climate scenario.

For the 2019-2020 baseline, 35% of rain days had NTU >20. However, compared with projected changes under RCP6.0 by 2070, between 45-50% of rain days are expected to result in NTU >20. This is an increase of up to 15% compared to the 2019-2020 baseline, meaning shutdowns may occur for an additional ~55 rain days, compared to present, accounting for around half of all rain days. For NTU >50, around 13% of rain days exceeded this threshold for the 2019-2020 baseline but could increase to over a quarter of rain days (~26%) under RCP6.0 by 2070. The average turbidity on rain days increases from 38 NTU (which is already well above the 5 NTU (boil water notice) and 20 NTU (shutdown thresholds)) to 43 NTU under RCP6.0 by 2070.

For RCP8.5 conditions by 2070, similar increases in the proportion of rain days where NTU >20 and >50 are observed compared to RCP6.0 conditions. Regardless of future scenario, both suggest that up to 50% of rain days may exceed NTU >20. Given the established rainfall-turbidity relationship, the maximum (extreme) NTU values are also expected to increase, which is potentially problematic from a water treatment perspective.

Table 7: Proportion (%) of rain days where NTU>20 and NTU>50 and mean NTU (rain days only) for RCP6.0 and RCP8.5 by 2070 compared to the baseline (2019-2020; grey shading).

	RCP6.0 - 2070		RCP8.5 - 2070		Baseline (2019-2020)
	LB	UB	LB	UB	
Proportion (%) of rain days where NTU >20	45.1	50.1	44.1	49.6	34.9
Proportion (%) of rain days where NTU >50	21.2	25.7	20.2	25.1	13.1
Mean NTU	37.0	43.3	36.4	43.1	38.1

F. UNCERTAINTIES AND LIMITATIONS

The uncertainties and limitations associated with modelling in this study include:

- Emission scenario uncertainty:** There is large uncertainty about what the emission scenario for the future will be as we don't know what mitigation measures will be taken at national and international levels over the next century. The new CMIP6 models include three additional and new forcing scenarios, including RCP1.9, RCP3.4 and RCP7.0, however, it will likely take many years for these CMIP6 outputs (with new RCP scenarios), and the variables and time horizons considered in this study, to be published for the Pacific Islands Region.
- Country specific GCM projections:** The projections reported in this report were obtained from the Pacific Climate Futures Version 2.1 (Australian Bureau of Meteorology and CSIRO 2017) and are specific to the entire Solomon Islands region and are not specific to the Honiara region.

- Length of observed turbidity record:** The length of the observed turbidity dataset used in this analysis was short (February 2019 – May 2020). As such, the turbidity-rainfall relationship was established over this short time period and is assumed to remain the same in the future.
- Observed rainfall record:** Daily rainfall data from Honiara was used in this analysis. Kongulai Spring is approximately 10km from central Honiara and is elevated at approximately 350m above sea level. Ideally, sub-daily rainfall data collected closer to the Kongulai Spring site would have been used in investigating the relationship between turbidity and rainfall.
- Other factors influencing turbidity:** Other factors (e.g. logging, flash floods, landslides) are also known to influence turbidity and sediment loads. This study does not assume or account for any change in these external factors.

G. CONCLUSIONS AND RECOMMENDATIONS

The main objective of this study is to quantify the relationship between observed rainfall and turbidity at Kongulai Spring and evaluate how this relationship may change under a range of plausible climate scenarios. These climate scenarios include the following:

- RCP scenarios: RCP6.0 and RCP8.5
- Time horizon: 2070 (2060-2079)

A statistically significant relationship (99% level) was found between 24, 48 and 72 hour rainfall at Honiara and maximum daily turbidity at Kongulai Spring. The linear relationship between 48-hour rainfall and turbidity ($r = 0.39$) was calculated between February 2019 and May 2020. This same linear relationship was applied to a longer observed daily rainfall record for Honiara (1980-2020) which has been scaled for future climate change (using the climate scenarios as listed above).

For the February 2019-May 2020 baseline, turbidity exceeded 20 NTU (the threshold for shutdowns) for 35% of rain days. However, for RCP6.0 by 2070, this is expected to increase to 45-50% of rain days. This 15% increase equates to approximately 55 more rain days per year exceeding 20 NTU. Modelling suggests that for RCP6.0 by 2070, half of all rain days will see turbidity exceed 20 NTU, prompting more frequent shutdowns of the current infrastructure. Compared to the baseline (February 2019 – May 2020), mean turbidity increases from 38 NTU up to 43 NTU for RCP6.0. For RCP8.5 conditions, similar increases in the proportion of rain days exceeding NTU >20 and >50 are observed. In addition, the maximum (extreme) NTU values are also expected to increase, which is problematic from a water treatment perspective.

This analysis suggests that the frequency of shutdown days (NTU >20) will continue to increase into the future. Regardless of future warming scenario, each plausible climate future produces more rain days with NTU >20, likely resulting in more frequent and longer shutdowns and supply interruptions if the current infrastructure remains operational and unchanged.

Continued monitoring of turbidity, along with the collection of sub-daily rainfall at Kongulai Spring is recommended to further evaluate the impact of rainfall, including rainfall intensity on turbidity at the site.

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Annex J: Logging in the Solomon Islands and Greater Honiara Area

A. Logging in the Solomon Islands

Around 78% of the Solomon Islands is covered by forests, down from 82% in 1990, with half of these classified as primary forests.[4] Logging remains the largest export for the Solomon Islands, contributing around 65% of the country's export earnings in 2016 and 2017, mainly through the sale of round logs, accounting for 20% of the state revenue.[5] Around 82% of the timber is exported to China.[6]

Many concerns have been voiced in the news and literature about the unsustainable rates at which forests are being harvested. Log exports reached a peak in 2017 of more than 3.4 million cubic meters, a 21% increase from the previous year and in line with a trend that began in 2000. Round log exports were already above 1 million cubic meters by 2005, more than four times the estimated sustainable rate of 250,000 cubic meters per annum.[7]

Global Witness predicts that at current rates of forest harvesting, stocks of natural forests may be completely exhausted by the year 2036. The report also estimates that current forest harvesting rates are at around 19 times what is sustainable. The importance of the logging industry for the economy has raised concerns that this has locked the country into a “race to the bottom” of environmentally-extractive economic growth. Such concerns have motivated some provincial leaders not to issue new business licenses to logging and mining companies.[8]

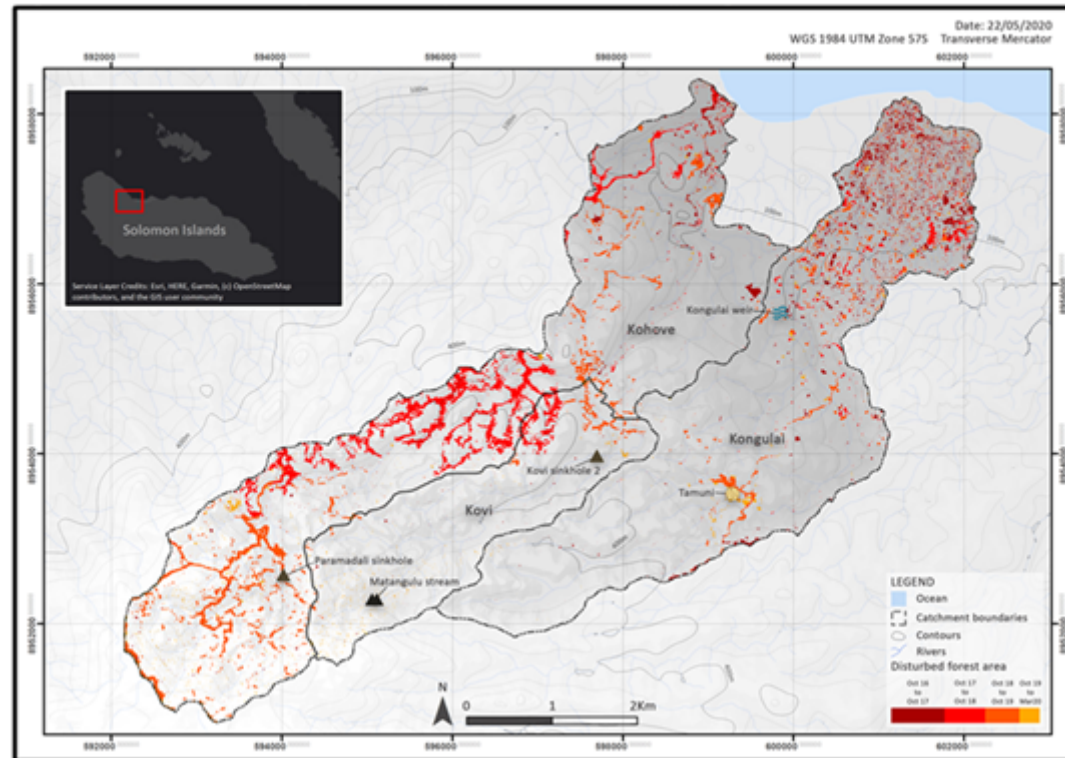
B. Logging in the Greater Honiara Area

Landscapes in the catchments feeding Honiara's water supply have become increasingly degraded through unsustainable land use activities, in particular from commercial logging. Logging activities have increased over the past five years, causing a number of adverse impacts to watersheds, including greater turbidity and sediment loads, higher rates of runoff and landslides during rainstorms, and changes in seasonal flow regulation. This section describes the catchments that feed the rivers flowing through GHA.

Kongulai/Kovi/Kohove. This area, composed of three distinct watersheds, covers about 32 km² and is located to the south and east of Honiara. It is an important water source area for Solomon Water, with sink holes in the Kovi and Kohove watersheds providing important inflow for the Kongulai Spring. Most of these catchment areas fall on customary land, which is owned and managed under ‘informal’ customary decision-making by the locally recognized landowners.

As shown in Figure 1, logging has been most widespread in the upper Kohove and also in pockets in the lower Kongulai. Logging concessions have been granted in these watershed areas, but logging companies have not adhered to the country's Code of Logging Practice (COLP).[9] Remote sensing data (2016-2020) reveals the following: 7.3% of total disturbance was on slopes above 30 degrees (against COLP); 25% of total disturbance was within 25m of streams (against COLP) and 42% was within 50m of streams; and 50% of total disturbance was above 400m elevation (against COLP and specific consent conditions).

Figure 1: Disturbed Areas in Vegetative Cover in Kongulai/Kovi/Kohove (Oct 2016-March 2020)



Lungga. The Lungga River is the longest river in the Solomons, with a length of 50 km. The catchment area is 377 km², nearly twelve times the size of the Kongulai/Kovi/Kohove area (Figure 2). Several logging concessions are in operation in areas along the middle Lungga River, with levels of riparian zone degradation likely similar to the Kongulai/Kovi/Kohove watersheds (although there is currently no remote sensing data to confirm this).

Some of the Lungga catchment area is now ‘Registered land,’ which is a form of perpetual estate where ownership is provided to registered Trustees. Trustees are selected by the customary landowners, but once selected may act on their behalf. The registered land within the catchment was formerly customary land. This is the case in the Komarindi sub-catchment, which is located at the upper area of the Lungga River and covers about a third of the Lungga catchment.

No logging has yet occurred in the Komarindi, since it was previously an informal protected area designated as the Komarindi Conservation Catchment Area (KCCA) and managed under customary estates. Established in the early 1990s and associated with the now abandoned Lungga River hydropower development, it included a community-based ecotourism development program. This program functioned from 1997 to 1999 and was then terminated due to ethnic tensions. Support for the conservation project came principally from the (then) Solomon Islands Department of Forests, Environment and Conservation, the South Pacific Biodiversity Conservation Programme, and the South Pacific Regional Environment Programme.

As a result of the hydropower project and linked KCCA, the government was granted a long-term lease to the land in this catchment area. A group of senior trustees is now lobbying the government to allow logging concessions within the Komarindi, while another group is trying to block this in the courts.

Figure 2: The Lungga River Watershed



Source: Secretariat of the Pacific Community. 2012. Catalogue of Rivers for Pacific Islands.

Shifting cultivation practices. In addition to logging, shifting cultivation practices by communities (away from subsistence agriculture and towards cash-cropping and husbandry) also represent a potentially significant current and future stressor on the watershed areas near Honiara. This is especially true given the proximity of Honiara's fast-growing

markets. Balancing the rural welfare benefits of agricultural growth and development in these areas with the need to mitigate watershed impacts thus could represent another potential important target for management interventions.

Customary land ownership. The customary landowners of the catchment areas are comprised of members of two main tribal groups, the Kakau and Lakuili. There are three recognized tribes within the Kakau landowner group and three under the Lakuili, and each consist of multiple recognized clan groups (approximately 40 clans). The total population of the tribal groups is approximately 2,000 people.

The landowners no longer reside in the middle and upper catchment areas but do utilize the area for gardening, hunting and for logging. Most landowners reside in the coastal per-urban and urban areas of Honiara, including Kakabona and Belaha, and within Barana village in the upper catchment of the Mataniko River.

Landowners have significant influence and rights over the use of the catchment areas, as their land ownership pre-dates urban development in Honiara. Hence, they have reasonable grounds to be compensated for adapting their land use practices (or, conversely, to be rewarded for providing ecosystem services to other residents of Honiara). Therefore, any project that seeks to improve management of the catchment areas must engage with landowners as beneficiaries.

C. Root causes and barriers to improve watershed management

This section describes seven barriers to improve the management of the watershed areas described above. The first five of these barriers were identified by landowners during consultations held in April 2020. These consultations consisted of four participatory workshops, with men and women participating separately, and a number of semi-structured interviews. The landowners who participated have significant understanding of the socio-economic and environmental situation within the catchment, and therefore provided valuable insights into community perceptions and interests.

1) Lack of employment or revenue earning opportunities. As earlier stated, Honiara's poverty levels are higher than the national average, and unemployment in and around the city is high. Thus, while logging is viewed as a major threat to the catchments, people will likely pursue this option unless an alternative is made available. This is true despite the perception that logging is mainly a short-term source of income with a lack of long-term benefits.

The bottom line is that landowners need money and therefore have incentives to agree to logging company offers to log their forest, which are also perceived to be supported by the Department of Forestry. In addition, logging companies can also offer direct employment. An average income for a logging worker was reported to be \$6 SBD per hour (or \$250 SBD per week). It should be noted, however, that this amount is lower than the legal minimum wage of \$8 SBD per hour.

A significant negative perception for implementing catchment protection was the timeframe for the project to start when compared with logging activities. Participants stated that the catchment protection project would need to start quickly because discussions with logging companies are progressing in some parts of the catchment. There are some leaders within the communities who have already signed some documents for logging.

2) Differing opinions on logging. While men and women identified positive and negative outcomes from logging, the overall general perception is negative. Most participants suggested that revenue from logging was short lived and unfairly distributed. Logging is also perceived to bring social issues, such as teenage pregnancies, prostitution, fighting within the communities and tribes, and land disputes.

Landowners also understand that the catchment provides ecosystem goods and services that have significant value but that cannot be adequately measured in terms of money. Two main ecosystems identified were forest and rivers. In addition, custom landowners (both male and female) consider cultural and customary values of catchment areas to be highly important, and catchment areas are also still used for gardening, hunting, and gathering resources (building materials and firewood).

Despite these views, there are also negative perceptions about approaches to better protect catchment areas. Participants perceived that establishing a Protected Area in the catchment would prevent them from accessing land and resources. Hence, this is considered as a barrier to gaining support. There are also opposing views between different landowner groups. For instance, there are court cases between different groups that are for and against logging in some areas, such as in Komarindi.

3) Customary land issues. Another issue complicating efforts to better protect catchment areas is the difficulty in identifying land ownership. Much of the land, including in Kongulai and Kohove, is held under customary tender, governed by customary laws that are not written down and differ across locales. Owners and holders of various interests in the land and its natural resources are not easily identifiable, nor are the boundaries of customary land claims easily delineated, as they are not surveyed and are often disputed. Complicating matters, many landowners no longer reside in the catchment areas.

The clarification of land ownership is crucial to the establishment of a landowning entity that could enter into an agreement for nature-based solutions to catchment management. A 2012 analysis of carbon rights makes it clear that “carbon on customary land is ‘owned’ by customary land ‘owners’ [however] the individuals, groups and clans in which that ‘ownership’ vests is not readily deducible from existing laws.”^[10]

Research into payment for watershed services suggests that projects have a higher risk of failure and are limited when stakeholders hold a perception towards their land tenure rights that do not align with their actual rights.^[11] This can be the case with Registered Land, which is a form of perpetual estate where ownership is provided to a small number of registered Trustees. While land registration may remove land tenure uncertainties, it is also associated with conflict and issues related to unfair distribution of development benefits (see section below). Therefore land registration should be approached with caution.

A catchment protection project will therefore need to incorporate activities that clarify and strengthen land tenure security for participating landowners. This could be achieved by protecting land under the Protected Areas (PA) Act (2010), which involves a process of determining land ownership. Alternatively, land ownership could be clarified through the land recording process under the Customary Lands Records Act or ideally the land recording process applied in conjunction with the PA process. The PA Act and land recording process allow land ownership to be confirmed without alienation (i.e. customary land rights are maintained).

Although land tenure uncertainties present a barrier, the resolution of land ownership issues and clarification of rights may also be seen as a significant beneficial outcome of the project. On Registered Land (such as in the Lungga catchment), extra care must be taken to ensure fair and transparent decision-making and distribution of benefits, as further described below.

4) Unfair distribution of benefits. Establishing registered land concentrates decision-making through a small number of Trustees and was identified by landowners as a significant reason for unfair benefit distribution and reason for conflict in relation to logging activities.

As shared by many landowners, a few at the top benefit from the proceeds of logging concessions and these do not trickle down into the broader landowning tribe. Trustees, all of whom are men, receive the logging royalties and then are entrusted to distribute them. However, most landowners are not involved or even informed about how royalties are expended or distributed.

Women complain that men receive a bigger share, but men also comment that royalties are not fairly distributed. According to one male landowner, the trustees each receive equal amounts, despite differences in number of people represented by each trustee. Thus, the trustee representing more people distributes less per capita than the trustee representing fewer people. Therefore, solutions to incentivize and sustain land use change must include a system for distributing benefits in a way that is fair and transparent.

5) Male dominated society. Consultations with landowners clearly show that men control decision making about land and resource use. However, women landowners perceive that they are more affected by changes that have occurred in the catchments due to logging. For example, they are required to travel further for gardening and collecting clean water. Women landowners are thus supportive of protecting catchment areas. During the consultations, both men and women shared their perception that customary gender roles and responsibilities are a major barrier to effectively protect these areas and share the benefits.

Despite Guadalcanal being a matrilineal society, women's roles are subordinate to men in most areas of decision making and in particular in relation to land. Men hold key roles in running organizations in the communities, including president, chairperson, and treasurer, while women are ordinary members and are less represented. Women can only hold key roles with women organizations, such as women's saving clubs. Further, as stated above, men make decisions about distributing benefits, such as royalties, and women perceive that they do not receive a fair proportion.

At the household level, women reported that men often control the money while women do the shopping and housework. In severe cases, men regularly use up all the money without providing for household needs. As peri-urban communities the proximity to town is seen as an issue. Some men go to the town to sell all their market products but use the money to get drunk.

Because of these gender dynamics, finding a solution to unsustainable land management must involve addressing gender inequalities. By empowering women, the project will seek a more equitable sharing of benefits, which will increase the likelihood of an enduring commitment to forest protection.

6) Lack of enforcement. The Solomon Islands Code of Logging Practice applies to all forest harvesting operations in the country. Such standards are designed to minimise disturbance to the forest ecosystem, ensuring that, for example, the silting up of streams is minimised. However, a 2015/16 study about natural resource extraction on the Solomon Islands found that logging companies typically ignore this code, for instance by logging outside concession areas.[12] This occurs due to fraud and corruption throughout the forestry sector[13] and also because of limited government resources and capacity, which makes it difficult to monitor the companies' behaviour.[14]

Another example is the Solomon Islands Water Authority Act, which contains many key provisions expected from legislation governing a modern water utility. This includes the protection of water catchments. The Act allows for protecting water quality within drinking water catchments by declaring these areas and limiting activities that occur within. However, SW has traditionally been unable to enforce the provisions, mainly due to capacity and willingness issues within SW and Government agencies.

Because legislation is not enforced, there are many cases of companies breaching their license conditions, particularly including environmental and consent compliance but also harvesting more trees than allowed and logging outside concession boundaries. This may mean logging in areas that belong to landowners who did not provide their consent to log, or it may mean logging in environmentally-sensitive areas, as has been clearly shown in Kongulai/Kovi/Kohove (as discussed above). The Solomon Islands also has no laws or policies regulating re-entry logging.

There is thus potential for enforcement to be strengthened through increased monitoring of compliance. This could take the form of landowners monitoring logging activities, for instance around the boundaries of protected areas.

7) Information gaps. Designing an effective catchment protection program will require a better understanding of water resources in the catchments. A number of information gaps currently exist. For instance, the monitoring network is not extensive enough to adequately document environmental changes (seasonal water level or water quality response) in the aquifers. This gap will be addressed by expanding the scope of water monitoring (i.e. parameters), increased monitoring frequency, and increasing the number of surface and groundwater monitoring sites, including drilling of dedicated aquifer monitoring bores.

Another key missing piece is the amount of recharge that enters the aquifers, as recharge is a key input to any understanding about groundwater budgets. Water quality analysis methods or isotopic analysis of water from the existing bore network or any new bores can aid in developing an understanding of recharge rates. In addition, a better understanding of spring flows and water quality responses to rainfall can be used to better understand some groundwater properties, such as connectivity between streams and springs, through-flow, aquifer storage and recharge.

There are also gaps in information about land and forest condition and land use change in the catchment. This will be addressed through activities to establish a project baseline, and is a pre-requisite to enable application of nature-based financing solutions for catchment protection. Information will be gathered through a combination of remote sensing (satellite imagery) and in situ sampling (forest survey). Parameters include forest type, tree species composition, timber-harvest inventory (volume of trees available for commercial harvest), above and below ground biomass, history of disturbance (past logging events.).

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- [1] 2070 centered on a 20-year period (2060-2079). 2070 matches the 50-year design life of the infrastructure.
- [2] Rain days where rainfall >0mm. The linear relationship is calculated between rain days and turbidity because when the linear equation is applied to days where zero rainfall occurred, the minimum turbidity value will be 4.2 NTU. Given the link between rainfall and turbidity, the linear regression is only applied to rain days.
- [3] 2070 centered on a 20-year period (2060-2079). 2070 matches the 50-year design life of the infrastructure.
- [4] FAO. *Forest futures – Sustainable pathways for forests, landscapes and people in the Asia-Pacific region. Asia-Pacific Forest Sector Outlook Study III*, 2019
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<https://theredddesk.org/countries/laws/code-logging-practice>
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- [11] George, A., Pierret, A., Boonsaner, A., Christian, V., & Planchon, O. (2009). Potential and limitations of Payments for Environmental Services (PES) as a means to manage watershed services in mainland Southeast Asia. *International Journal of the Commons*, 3(1).
- [12] Graham Baines, Australian National University, *Solomon Islands is unprepared to manage a minerals-based economy*, 2015.
- [13] Asian Development Bank, *The Political Economy of Economic Reform in the Pacific*, 2011.
- [14] Thomson Reuters Foundation News, *Solomon Islanders battle illegal logging*, 17 October 2013.

Annex K: Outline Terms of Reference – Key Personnel

A. Individual Consultants

Position title	Project Support Specialist (national consultant)
Estimated level of effort	60 months

Scope of work	<p>The specialist will provide all-around support in two main areas – contract administration/ procurement and monitoring and evaluation. In both these areas, the specialist will play a support role.</p> <p>In support of the Contract Manager (position in the PMU under the baseline project) and mainly for Outcome 5 activities, the specialist will:</p> <ul style="list-style-type: none"> (i) assist in the bidding process, including preparing bid documents and invitations to bid (in accordance with ADB procurement guidelines); (ii) help prepare bid evaluation reports for consideration by the bid evaluation committee (in accordance ADB procurement guidelines); (iii) prepare contractor claims and process contract variation orders; and (iv) oversee contract performance monitoring and reporting. <p>In support of the PMU staff in charge of monitoring, the specialist will:</p> <ul style="list-style-type: none"> (i) review project monitoring and progress reports and propose additions/ modifications as necessary; (ii) help prepare monitoring reports to LDCF on an annual basis; and (iii) support the monitoring, evaluation and reporting of broader project activities with climate change financing to ensure an integrated and streamlined approach. <p>The specialist will also undertake other tasks as necessary. These may include making travel arrangements for project consultants, organizing meetings, and assisting with knowledge management activities.</p>
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Main qualifications	<ul style="list-style-type: none"> · The specialist will have academic background and experience related to contract administration and procurement systems and processes. · At least 5 years' of procurement experience. · Knowledge of ADB's procurement guidelines is preferred. · Experience in reviewing and/or writing progress and monitoring reports is advantageous.
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Position title	Safeguards Specialist (national consultant)
Estimated level of effort	18 months

Scope of work	<p>An environmental assessment and review framework (EARF) and resettlement framework (RF) have been prepared for Outcome 5 which will govern this assignment. Following these two documents, the safeguards specialist will support SW and prepare the screening and categorization forms and any subsequent due diligence assessments for environmental and social safeguards.</p> <p>Key tasks will include the following:</p> <ul style="list-style-type: none"> • Deliver the inception report outlining the approach to the assignment and safeguards due diligence work program; • Confirm with Environment and Conservation Department (ECD) what components of Outcome 5 will trigger need for development consent and the requirements of environmental assessment; • For each component (and activity thereunder) to be undertaken at specific sites, prepare the environment, involuntary resettlement, and indigenous peoples screening and categorization forms and the REA checklist and submit to ADB for review and concurrence; • Coordinate with SW and NGO to make sure that participatory and community-driven activities under Outcome 5 are consistent with ADB safeguard requirements, including the grievance redress mechanism (GRM) and land due diligence report (LDDR); • For activities that do not require environmental assessment but require some guidance in terms of environmental and social management guidelines (ESMG), prepare the ESGM to be incorporated into the implementation contracts; • For activities that require environmental assessment, prepare the initial environmental examination (IEE); and • Provide inputs on safeguards due diligence for Outcome 5 for the semi-annual safeguards monitoring reports (SMR) prepared by SW-PMU and submitted to MOFT, ADB and WB.
Main qualifications	<p>The safeguards specialist will have the following qualifications:</p> <ul style="list-style-type: none"> • At least a bachelor's degree in environmental sciences, environmental engineering or related fields, • At least 10 years of relevant working experience in developing environmental assessments, including environmental management plans (EMP). • Experience with natural resources management projects, preferably with international financing institution like ADB, WB, EIB, and IADB. • While the consultant is expected to complete (with guidance from ADB), • experience in implementing ADB social safeguards (e.g. social safeguards screening and land due diligence reports) is preferred but not required.

Position title	Catchment Management/Institutional Expert (international consultant)
Estimated level of effort	24 months
Scope of work	<p>This expert will lead efforts under Outcome 5 (Output 2) to facilitate improved watershed governance by supporting improved interagency, intersectoral and community-inclusive communication, joint decision-making, and information-sharing.</p> <p>Specific tasks will include the following:</p> <ul style="list-style-type: none"> •Lead consultations to raise awareness and build support for improved catchment planning, management and governance; •Coordinate efforts to design an interagency and inter-sectoral group to coordinate activities that affect the catchment areas; •Through a participatory process with a range of stakeholders, facilitate development of two catchment management plans, one for Kongulai, Kovi, and Kohove and the other for Lungga, including integration of climate change adaptation measures; and •Explore options for a catchment management fund to catalyze additional sources of finance for future catchment protection and climate change adaptation activities. •Coordinate with the service provider (under Output 1) and NGO (under Output 3) to provide a bridge between those two outputs by, for instance, helping in the process of selecting the catchment communities to participate in Output 3 and advising on the forest and social impact baseline and monitoring work.
Main qualifications	<ul style="list-style-type: none"> •Masters' (MS, MSc.) level academic degree or equivalent in watershed or natural resource management. A post graduate degree in applied social sciences with a specialization in natural resources management will also be considered; •15 years of minimum work experience in the field of integrated watershed management, natural resources, climate change adaptation, and common property resources management; •Experience in field research, and a documented record of publications in the field of natural resources and integrated watershed management; •Experience in Pacific countries, and particularly in Solomon Islands, would be advantageous.

Position title	Monitoring and Evaluation Specialist (Independent international consultant)
Estimated level of effort	2-3 months
Scope of work	Provide independent monitoring and evaluation of GEF project, specifically to help prepare LDCF Mid Term Review (MTR, Year 2) and Terminal Evaluation Report/Project Completion Report (TER/PCR, towards completion)
Main qualifications	<ul style="list-style-type: none"> · Solid track record in conduct of GEF monitoring and evaluation reports · Good technical understanding of climate change adaptation approaches for water sector

B. Organizations (NGO, private sector, and academic)

Organization	Locally-based NGO
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Scope of work

Focused on Outcome 5 (Output 3), a national NGO will be recruited to coordinate landowner engagement and coordination and implementation of planning and project development activities. The NGO will play a key role in all four Output 3 activity areas listed in the CER as follows:

Social impact and forest baseline and monitoring

- Lead a household survey to help establish a social impact baseline (gender disaggregated) for communities participating in Outcome 5 activities; and
- Building off the work of the watershed mapping/modelling service provider, complete a detailed forest inventory and forest change analysis to describe the baseline conditions in participating communities.
- Monitor indicators on annual basis.

Forest restoration works

- Facilitate employment of landowners or other watershed community members, including a) recruiting, administering, and supervising employment of local people; b) training workers in forest restoration; (c) planning and implementing restoration activities; and (d) ensuring appropriate workplace health and safety standards are met;
- Engage a local service provider to supply appropriate species for replanting; and
- Managing restoration activities on roughly 60 hectares, including repairing erosion hotspots on roads and streams caused by logging tracks and coordinating direct seeding and replanting of riparian areas in proximity to potable water sources.

Forest carbon payment for ecosystem services (PES) subprojects

- Provide key support to the private sector PES subproject developer to develop Project Idea Note (PIN) for subproject, including: a) planning for women's empowerment and participation; b) helping empower landowner participation and education (per the FPIC process); and c) helping establish community engagement focal points;
- Assist in the development of a benefit sharing plan (BSP);
- Help develop a project-scale land use plan to help select areas to be protected and/or restored;
- Work with communities to develop a conservation plan for managing selected areas and exploring options for protecting project areas;
- Help establish landowner participants' business entity that can hold carbon rights, sign PES contracts, receive carbon payments, and hold liabilities;
- Work with communities to appoint a PES sales and registry agent to execute subproject agreements, including PES agreements and emissions reduction (sales) agreements, allowing for due FPIC process;
- Implement monitoring, reporting, and verification regime and conservation management plans;
 - Support landowner participants to establish a monitoring and reporting regime tied to disbursement of PES payments; and
- Provide support and training to assist landowners to undertake community ranger or watershed warden positions.

Livelihoods support

- Develop a mechanism to provide seed funding for the development of new micro-enterprises (e.g. at family scale), targeting watershed landowner

Main qualifications	<ul style="list-style-type: none"> • Registered non-government organisation (NGO) with permanent local presence in Solomon Islands; • Transparent and accountable governance structures and procedures in practice; • Minimum six-years of experience operating in Solomon Islands; • Demonstrated prospects for ongoing viability of the organisation (required to enable the organisation to support a PES program in the long term); • Relevant work history in a relevant field, such as community engagement, community conflict resolution, climate change adaptation, natural resource management, sustainable forest management, biodiversity conservation, and nature-based climate solutions; • Demonstrated capacity (or ability to obtain capacity) to provide technical support to communities with respect to: sustainable forest management; good governance; sustainable enterprise management; monitoring and reporting; and education to enable free, prior and informed consent; and • Respected organisation with a high level of integrity, including demonstrated commitment towards: localisation and delivery of benefits to local indigenous people; safeguarding indigenous land and resource rights, including respect for the principles of free, prior and informed consent; protection and enhancement of biodiversity and cultural values; and environmental safeguards (where relevant).
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Organization	Private sector PES subproject developer
Scope of work	<p>A private sector PES subproject developer will work closely with the NGO to develop a forest carbon PES mechanism for watershed protection that demonstrates environmental, social, economic and cultural integrity. This is a common practice for PES project development, wherein the supplier of PES outcomes (landowner) would usually engage a project developer that would act as the seller to monetise the environmental services they create. A private sector project developer would also be well positioned to raise private sector capital to co-finance project replication beyond the inception project sites.</p> <p>In particular, this entity will provide technical guidance in undertaking two forest carbon PES subprojects and guiding them to the market stage. Later in the project, they will use a grouped subproject approach to develop one additional PES subproject.</p> <p>Specific tasks will be as follows:</p> <ul style="list-style-type: none"> · For each of the PES subprojects, lead the development of a Project Idea Note (PIN) document to allow the subprojects to be registered with a carbon PES standard, including designing a process for free, prior and informed consent (FPIC) and developing a financing plan; ●Formulate a benefit sharing plan (BSP) that targets re-investment of PES finance into sustainable alternative livelihood activities and employment; ●Provide guidance on developing local land use plans, undertaking conservation planning, establishing legal instruments to protect project areas, and forming landowner participants' business entities; ●Apply existing PES accounting methodologies to quantify PES outcomes and develop subproject monitoring plans; · Develop Project Description Document (PDD) suitable for carbon standard validation; ●Design a monitoring, reporting and verification (MRV) system; · Design a landowner community livelihood, education and training plan; and ●Provide support services to the NGO and participating landowner communities to implement the financing plan, including accessing to PES markets, administering PES unit sales, and enabling future private capital investment.

Main qualifications	<ul style="list-style-type: none"> · At least 10 years' experience in PES / nature-based climate solutions, including forest carbon projects; · Demonstrated track record in delivery of PES / nature-based financing initiatives, including bringing projects 'to the market'; ● Have sound experience in managing and establishing projects in the Pacific; ● Be equipped with PES project management systems, methodologies, and tools necessary to rapidly mobilize PES project development and implementation; ● At least 5 years' experience in community engagement and consultation in the Pacific; ● At least 5 years' experience in liaising with national governments in the Pacific; and ● Proven ability to work in a team and facilitate work of other experts in the field.
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Organization	Service provider to develop watershed maps and hydrological models
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Scope of work

A third-party service provider will be identified and recruited to comprehensively map and model Honiara's watersheds, undertake field visits to ground-truth mapping work, and facilitate uptake to relevant government and community stakeholders. The service provider will have four main activities, as follows:

1) Formulate mapping and modeling strategy and collect remote sensing data. Based on previous mapping and hydrological modelling work done for Honiara's watersheds, the service provider will make recommendations on a mapping and modeling strategy and indicators that would accord with program needs. Initial plans include the following:

- Document and map all disturbed areas within the Kongulai, Kovi, Kohove and Lungga River (with priority on the upper Lungga and Komarindi) catchments
- Utilize available satellite imagery and other data sources to identify and map recently logged areas in Kovi, Kohove, Kongulai and Lungga River catchments and topology and land cover type, including forest type, age and structure in Kovi, Kohove, Kongulai and Lungga River catchments;
- Work with SW and possibly Ministry of Forestry to combine this work with other available and relevant data layers for these watersheds, including cadastral, logging concessions and soil type data, to build an overall map of these watersheds; and
- Use these maps to identify high priority areas for both rehabilitation and protection, and propose rehabilitation options for key degraded areas.

2) Collect hydrological data and conduct site visits. The service provider will:

- Install hydrological monitoring equipment in select locations in the targeted watersheds to collect sufficient data to contribute to meaningful modelling and assessment of the water system;
- Conduct maintenance as part of community-partnerships building, which could involve creating several community-based positions to manage hydrological monitoring equipment; and
- Conduct site visits to ground-truth the remote-sensing data that is collected.

3) Develop watershed model. The service provider will:

- Develop a model of the target watersheds as a means to better identify priority areas for restoration or protection (i.e. those that provide important watershed ecosystem services such as flood mitigation).
- Liaise with the NGO to ensure mapping and modelling results can be shared with watershed communities and government stakeholders
- Following the community and government stakeholder consultations, develop a final set of maps and hydrological modelling results.
- Produce a final report that will analyse land-use impacts on hydrological functionality (mainly turbidity and flood risk), examine how these results vary across climate-change impact scenarios, and identify specific areas in the watersheds for project interventions to improve watershed ecosystem services.

4) Create data, mapping, and modelling platform. The service provider will:

- Create a watershed data, mapping, and modelling platform, which will allow for regular updating of land-use data via remote sensing applications.

Main qualifications	<ul style="list-style-type: none">• The third-party service provider should have the requisite scientific capacity for this work.• The preferred choice is a research institute or centre within academia, since such an organization would be incentivized – through the potential research opportunities afforded by such work – to produce high quality outputs beyond a simple pay-for-services contract.• Furthermore, the possibility of obtaining co-financing via research funding is greater with such an organization and would strengthen outputs.• A research institute would also be well-placed to assist in building research linkages and technical capacity with Solomon Islands government agencies, personnel, and academia, which is an important co-benefit envisioned of this work.
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1b. Project Map and Coordinates

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

Figure 9: Map of Guadalcanal Province



1c. Child Project?

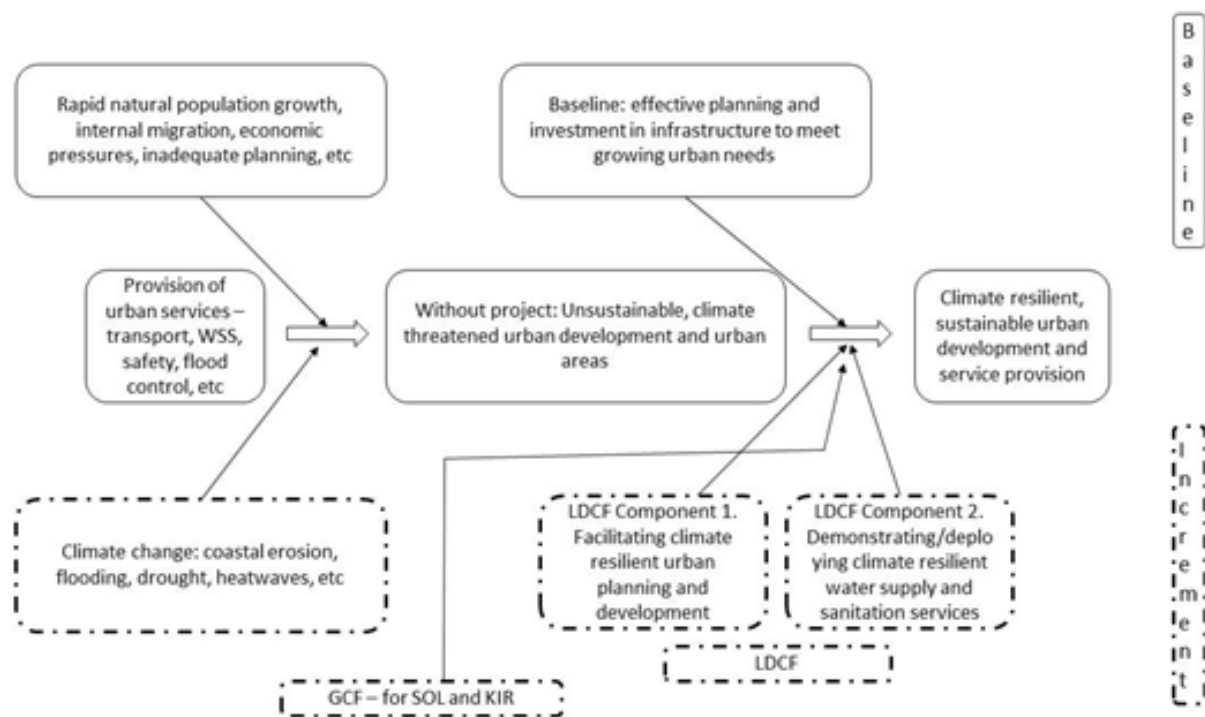
If this is a child project under a program, describe how the components contribute to the overall program impact.

The LDCF project in Honiara clearly contributes to the regional LDCF program (GEF ID 10713 "Climate Resilient Urban Development in the Pacific"), which is intended to help cities in four Pacific countries address specific urban development challenges exacerbated by climate change. As shown in Figure 10, the regional program was intended to support two main components as follows:

Component 1: Facilitating climate resilient urban planning and development – This includes activities to create the enabling framework, to establish the foundation and to build capacity so that there is the desire and the ability to integrate climate resilience and climate proofing into urban development, into urban services and into water supply and sanitation systems. Note, this is basically aligned with the GEF Climate Change Objective 2 (*“Mainstream climate change adaptation and resilience for systemic impact”*).

Component 2: Demonstrating/deploying climate resilient urban services: water supply, sanitation and disaster reduction – This includes activities and investments to achieve climate resilience and/or climate proofing, thereby demonstrating how to achieve this, how it is feasible, and the benefits. This will notably be in WSS, but also in other urban service sub-sectors as prioritized. Infrastructure is central to this component. In Vanuatu this is to be community-based adaptation focusing on disaster risk management. Note, this is basically aligned the GEF Climate Change Objective 1 (*“Reduce vulnerability and increase resilience through innovation and technology transfer for climate change adaptation”*).

Figure 10: General Theory of Change Guiding LDCF Regional Program



Source: GEF-7 Program Framework Document for Climate Resilient Urban Development in the Pacific, submitted April 2019.

In all four countries, baseline finance was secured from the ADB, the Government and other partners. LDCF was intended to provide financial support to complement the business-as-usual ADB and government investments. In each case, ongoing project design discussions were intended to lead to either a modification of the planned baseline activity or to the inclusion of an additional activity, to be supported by LDCF.

As is the case in Honiara, the modified or additional activity will address climate change threats in order to adapt the sector to climate change and decrease community vulnerability. LDCF funds will contribute to the additional costs associated with adapting urban development to climate change and building resilience amongst communities.

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.

Participation fostering locally-informed implementation is a crosscutting element of the project. The project will facilitate a process of local participation using highly engaging techniques (such as Participatory Rural Appraisal, PRA) and consultative techniques as required. In so doing, the project proponents will demonstrate support for Decision 1 from UNFCCC Cancun COP16 with respect to ensuring “the full and effective participation of relevant stakeholders, in particular, indigenous peoples and local communities.”

The project will also help ensure that participation includes an appropriate cross-section of project participants and reflects community diversity, such as clan group, age, gender and role (e.g. leaders, church representatives). This will include people living or reliant on the project site who do not have secure resource user rights relevant to the project and also people living away from their customary land / project site (e.g. in Honiara), but who still have interests or rights to the land and resources.

Engagement with a wide range of stakeholders (see Annex L) will seek to achieve the following objectives, developed in line with the general principles for engagement adopted by the GEF:

- Engagement will be constructive, responsive, accountable and transparent.
- Stakeholder engagement will support fair, balanced, and inclusive participation in project design and execution.
- In order to be effective and meaningful, stakeholder engagement will involve sustained commitment and action, including the appropriate allocation of resources, throughout the design, implementation, monitoring and evaluation of the project.
- Effective stakeholder engagement in the project will be supported by appropriate documentation and easy and timely access to relevant information.

As discussed below, stakeholder engagement will be applied across three main phases of the project:

- a) Design phase – including consultation that feeds into the design and resourcing of the project intervention.
- b) Implementation phase – focusing on how key stakeholder groups will be informed and involved in project implementation.
- c) Monitoring and evaluation (covered in the M&E section) – determining how feedback from stakeholders will be gathered and used to change or improve project implementation, and to ensure stakeholder perspectives are gathered to inform plans for replication or scaling.

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.

Consultations during project design

This section summarizes the meetings held with institutional stakeholders and two rounds of workshops held with landowners. The main findings of these meetings and workshops are provided in Annex M.

Institutional stakeholders. Institutional stakeholders include those with interests in policies, regulation or other activities that intersect with this project. These include key government agencies, proponents of other projects that may influence the project (e.g. projects that have overlapping or compatible objectives), non-government organizations (NGOs), and donors / representatives of organizations providing development assistance.

Face-to-face meetings with institutional stakeholders were conducted during a mission to Honiara in the week 28th January to the 2nd February 2020. These meetings were with the following organizations:

- Solomon Islands Water Authority (SW)
- Ministry of Environment, Climate Change, Disaster Management & Meteorology (MOECDM)
- Ministry of Forestry and Research (MoFR)
- Ministry of Lands, Housing and Survey (MLHS)

- Ministry of Mines, Energy and Rural Electrification (MMERE)
- New Zealand Ministry of Foreign Affairs and Trade (MFAT)
- UN Food and Agriculture Organization (FAO) – Integrated Forest Management Project
- Japan International Cooperation Agency (JICA) – Capacity Development for Sustainable Forest Resource Management
- GIZ - Forest Conservation in Pacific Island Countries
- Live and Learn Environmental Education, Solomon Islands
- Nakau Programme

Landowners. Two rounds of landowner consultations were held to engage with customary landowners from the Kongulai, Kohove and Lungga catchments. The first round was held during the first consultation mission (28th January – 2nd February 2020), which aimed to introduce landowners to the broad concept of the project, including the rationale for why the project was proposed.

The first workshop was organized by SW and included a presentation and question and answer workshop attended by 24 customary landowners from the target catchments. Presentations were delivered by Payment for Ecosystem Services experts Dr Michael Bennett and Mr Robbie Henderson (CEO of the Nakau Programme). The presentations focused on possible alternative land management and livelihood scenarios that are proposed as potential project interventions. Questions and discussion comments were taken from landowner participants and answers provided.

The more extensive second round of landowner engagement, held during 20-23 April 2020, was organized and conducted by SW, with support from Live & Learn Solomon Islands and the Nakau Programme. The consultations used a Participatory Rural Appraisal (PRA) methodology, a strength-based participatory research and education process. In the context of this project, PRA was used to examine community perceptions and knowledge of land use, drivers of land use decisions, livelihoods, local governance, and development aspirations, and also to explore the project concept from environmental, cultural, social and economic perspectives. The feedback from landowners was used to identify key project interventions and project risks at the community level.

Engagement through the PRA approach provided an empowering two-way learning process, whereby participants and researchers learned from each other. The participants were presented with information about the land management and catchment issues that impact upon Honiara's water supply, and also received information about possible solutions. This enabled participants to provide informed feedback regarding the project concept.

The PRA consisted of four participatory workshops, with men and women participating separately (three workshops for men and one workshop for women). In addition, semi-structured interviews were conducted with seven landowners (4 women and 3 men), who were selected for their capacity to provide a good synopsis of community and landowner perspectives. The workshop sessions and interviews were designed to collect qualitative and quantitative data on key research questions and were guided by a PRA facilitation guide designed specifically for this project.

2. Consultations during project implementation

During project implementation, stakeholders will comprise individuals or groups that have an interest in the outcome of the project or are likely to be affected by it. They will include local communities, customary landowners, civil society organizations, government agencies, and private sector entities, comprising women, men, girls and boys.

The project intervention will require changes in land use, and as such, it will involve close engagement with stakeholders involved in policies, regulation and activities that affect current and alternative land use activities. Furthermore, indigenous landowners own the majority of land in the catchment under customary land rights, and are therefore central to the engagement approach.

Institutional stakeholders. The project proponents will engage institutional stakeholders in regular project updates by means of face-to-face meetings and through collaboration on project activity delivery where relevant. Furthermore, project progress reports will be provided to key stakeholders.

The objective of this engagement is to maintain support from Solomon Islands Government (SIG) agencies, private sector and NGOs, identify opportunities for cooperation, and mitigate risks that SIG approves further activities (e.g. logging) that could continue to degrade the catchment areas targeted under the project.

To help facilitate this engagement, the project will join the national Forest Sector Technical Advisory Group (FS-TAG). The FS-TAG is facilitated by JICA, and meets 3-4 times each year to foster networking and cooperation on projects and other matters related to sustainable forest management. Table 7 provides a general work plan for ongoing engagement with institutional stakeholders.

Table 7: General workplan for institutional stakeholder engagement

Activity	Target audience	Frequency
Catchment governance group (Output 2)	<ul style="list-style-type: none"> · SW · SIG Ministries (MoFR, MECDM, MEMERE, MLH&S) · Major SW customers (businesses) · NGOs & civil society groups · Landowner representatives 	3 – 4 meetings annually
Forest Sector – Technical Advisory Group (FS-TAG)	<ul style="list-style-type: none"> · SIG, donor, NGO and industry stakeholders in the forest sector 	3 – 4 meetings annually
Face-to-face briefings targeting non-forest sector stakeholders in Solomon Islands	<ul style="list-style-type: none"> · MECDM · NGOs · Other interested parties 	Bi-annually
Provision of annual progress reports	<ul style="list-style-type: none"> · MoFR · MMERE · MOFT · MECDM · FS-TAG members 	Annually
Development and implementation of a communication plan (stories for local, regional and international mainstream media)	<ul style="list-style-type: none"> · Local, International and regional news readership · Donors · Potential development partners · Private sector · All key stakeholders 	2 stories per year (can be included in SW's "Water stori" stakeholder newsletter, produced 3 times per year)

Landowners. The project will adopt a collaborative style, which will involve partnering with participants in each aspect of decision making, including developing alternatives and identifying preferred solutions. The project will look to landowners for direct advice in formulating solutions and incorporating recommendations into the decisions to the maximum extent possible.

More specifically, the project will employ a model for landowner engagement derived from the Nakau Programme, a regional payment for ecosystem services programme designed specifically for Pacific Islands Small Island Development States (SIDS). Under this model, landowners are referred to as participants, which is taken to mean those people who hold legitimate interests in land selected as the project sites (e.g. as land or resource owners), or who are identified as having secondary rights (e.g. through relationship or other agreement) or have interests that are recognised by the resource owners. Landowners will be engaged through a mandated representative group (refer to Output 3 activities).

While the landowners and communities affected include those holding rights or interests in land or those who will otherwise be affected in specific areas of the Kongulai, Kohove, Kovi, and Lungga catchments, all water users in the GHA will be positively impacted by increased climate resilience through a protected and enhanced watershed, improved water supply, and increased health benefits.

As earlier stated, Outcome 3 will pursue a voluntary and participatory planning process by means of the Project Participation Protocol (PPP). This process will be applied to:

- Enable participants to grant or withhold their FPIC for key aspects of project design, development and implementation, in particular for decisions that create continuing commitments, responsibilities or have potential for future impacts on local livelihoods and land use.
- Enable participants to develop ownership of and meaningful input into project design, implementation, and management.
- Ensure that representatives of participant groups have a mandate from group members, including people who may be disadvantaged based upon gender, age, income or social status.
- Ensure that the process of undertaking community projects is transparent, empowering, and community-building.
- Ensure that costs associated with project development and on-going management are transparently understood and agreed.
- Ensure that the benefits of community projects are equitably and transparently distributed.
- Ensure that project design, development, implementation and monitoring are undertaken with due adherence to necessary safeguards associated with community project development as required by the standard/s applied and as stated in international good practice.

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; Yes

Other (Please explain)

Civil society includes informal and formal groups that exist in the communities, and includes non-government organisations (NGOs). An NGO will play a coordination role in implementing Outcome 5 (Output 3) activities, including coordinating landowner engagement, coordination and implementation of planning and subproject development activities. For forest carbon PES subprojects, the NGO will perform the role of local ‘project coordinator,’ and will receive a portion of the value of PES unit sales to provide ongoing support to communities.

The NGO will also support forest restoration and alternative livelihoods activities (also under Output 3). This may include subcontracting with groups with expertise relevant to the livelihood activities selected (e.g. Kastom Gaden Association, ADRA cocoa program, International Women’s Development Agency). Women’s saving clubs and other women groups (e.g. church groups) could also be engaged in the development of livelihood activities and benefit sharing plans for distribution of PES benefits.

A private sector subproject developer with expertise in PES will work closely with this national NGO to provide technical support, training and capacity building. In this way, the NGO will be a service provider but also a beneficiary of capacity building that will support project sustainability and opportunities for replication.

Annex L: Project Stakeholders Engagement Matrix

Stakeholder Name/Project	Organisation type	Roles and objectives	Linkage/opportunities
Institutional Stakeholders			

Ministry of Forestry and Research (MOFR)	Government agency	Responsible for regulation of timber harvesting. Focus increasingly shifting to sustainable use as over exploitation has led to decline in the logging sector. MOFR also responsible for REDD+ (see below).	<ul style="list-style-type: none"> · Lead agency that determines logging licensing, regulation & enforcement. Could assist to remove logging pressure from project sites. · Support from MOFR is required for signing off on Protected Area declarations. Have signaled support for REDD+ initiatives. · Gateway to access data on logging, timber inventory, mapping
Ministry of Forestry and Research MOFR (REDD+ Unit)	Work unit within Government agency	Development of national REDD+ program. Funding provided by SIG (for personnel) & operational work supported by SPC/GIZ, UNDP- CB2 and GEF-FAO. Currently activities focused on Institutional Strengthening, Stakeholder awareness and Engagement, Forest Cover/Land-use change assessment, Preparation for the submission of a National Forest Reference Level (FRL), and REDD+ pilot activities. These components provide key outcomes of the REDD+ program in the SI REDD+ Readiness Roadmap. Currently, SI REDD+ program is still in an initial stage, focused on the phase 1 of REDD+ readiness.	<ul style="list-style-type: none"> · SIG REDD+ lead. National REDD+ policies could impact on project scale activities. · Have signaled support for collaboration with voluntary market REDD+ projects, such as Nakau through MFAT. Can potentially provide access to relevant data or technical capabilities from MOFR (e.g. forest inventory / monitoring) · Potential for collaboration on pilot activities (REDD+ unit are still in the process of site selection) · Provide opportunity for the MFAT projects to have a positive influence on national policy / approach to REDD+

Ministry of Environment, Climate Change, Disaster Management & Meteorology (MECDM)	Government agency	<p>Responsibilities include sustainable environment management, climate change adaptation and mitigation, disaster risk management.</p> <p>Lead agency for Protected Areas implementation & regulation under the <i>Protected Areas Act, 2010 & Protected Areas Regulations, 2012</i>.</p> <p>Key agency for determining implementation of GEF 6 and design of GEF 7 (focus to shift to Terrestrial Areas conservation).</p>	<ul style="list-style-type: none"> · Lead agency for Protected Areas / PA Act 2010. · Lead SIG agency for GEF implementation · PS has signalled support for the GEF project · Support for biodiversity assessment or data. · PS expect to be informed of project development, and wants to receive drafts · PS supports interventions in the catchments that do not interfere with customary land rights
MECDM Nationally Climate Change Section	Work unit within Government agency	Responsible for developing Solomon Islands Nationally Determined Contribution (NDC)	<ul style="list-style-type: none"> · Design of the NDC will impact options for design of carbon financed catchment management activities. There is a need to engage with MECDM on policy to work towards alignment and harmonization of approaches · Important stakeholder for nesting project scale carbon financed activities in national program · Interest in project outcomes for climate change adaptation
MFAT - Ministry of Foreign Affairs and Trade NZ	Donor / international development assistance	Long term objective to help Solomon Islands' government achieve a stable, resilient and socially cohesive society; an economy that enables prosperity and more equitable distribution of benefits; and deliver for all citizens and engage constructively in the region.	<ul style="list-style-type: none"> · Funding the <i>Carbon Financed Forest Conservation Project</i> implemented by Live & Learn (NGO) to develop projects under the Nakau Programme. This project could assist with development of an enabling policy and financing environment that could benefit the GEF project

Solomon Islands Water Authority (SW)	State owned enterprise	Aims to provide reliable and safe water supply and sewerage services within particular areas of operations (e.g. urban areas) in the Solomon Islands	<ul style="list-style-type: none"> · Poor water quality impacts service provision, increases costs and reduces profitability · Poor water quality is driving large investments in water treatment infrastructure · Beneficiary of improved catchment management · There may be a strong economic business case for investment in 'green' / ecological infrastructure (i.e. catchment management) · Interested in solutions to water quality and catchment issues that can be replicated
GIZ; currently implementing the project <i>REDD+ Forest Conservation in Pacific Island Countries Phase 2</i>	Donor / development assistance	Main work is to support the SIG REDD+ Unit (see above). Focus includes pilot activities.	<ul style="list-style-type: none"> · Trusted organisation with strong link with SIG. · Has signaled support for piloting forest carbon projects · The GIZ project has provided funding support to the Nakau Programme for the past 5 years through small technical assistance grants. · Potential support for GIS / data access; technical support for forest inventory work.

<p>FAO/GEF</p> <p>Project: Integrated Forest Management Project (IFMP)</p>	<p>International development agency / GEF project</p>	<p>Aims to support biodiversity conservation through expansion, enhanced management and financial sustainability of the country's developing protected area network; sustainable and integrated landscape management; improved forest and natural resource management by local communities (e.g. including gender dimensions of non-timber forest product harvesting), and; the restoration and enhancement of carbon stocks in forest and non-forest lands.</p>	<ul style="list-style-type: none"> · Personnel have signalled willingness to support the GEF project · IFMP personnel have close ties to SIG; can assist with facilitating collaboration and support. · IFMP objectives are closely aligned and there is significant potential for collaboration. Specific opportunities include: PA establishment, Biodiversity surveys, Sustainable Financing (forest carbon), and Sustainable land use planning and livelihood
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<p>JICA/SFRM</p> <p>Project Title: Capacity Development for sustainable Forest Resource Management in Solomon Islands.</p>	<p>Donor / international development assistance (Japan)</p>	<p>Project targets capacity building and support for MoFR Officers. Implements pilot activities to promote sustainable forest management. Activities include:</p> <ul style="list-style-type: none"> · Supporting good governance and collaboration in the forest sector · Forest status baseline survey by Drone · Participatory Land Use Assessment and Planning · Participatory Forest Inventory (NFI Pilot) · Training for participatory Activity Planning · Participatory Value Chain Analysis 	<ul style="list-style-type: none"> · Facilitates Forest Sector – Technical Working Group (FS TWG). Key opportunity for coordination / generating support for the GEF project · Has technical expertise that crosses over with GEF project needs (e.g. GIS monitoring / participatory land use assessment) · Could potentially provide resources, data and other relevant information
<p>SPREP; Pacific Ecosystems Based Adaptation to Climate Change Project (PEBACC). Funded under International Climate Initiative (IKI).</p>	<p>Regional organisation (environmental management & policy)</p>	<p>SPREP was involved in establishment of the 5,000 Ha Barana Heritage and Nature Park, involving the Barana village community in the upper catchment of the Mataniko River</p>	<ul style="list-style-type: none"> · SPREP are a trusted SIG partner and respected regionally. SPREP support for the project is useful for enhancing its reputation. · Potential to assist with ecosystem service valuations · Potential for collaboration on alternative livelihood options for people living in the Honiara catchment (e.g. eco-tourism), which could take lessons learned from the Barana Heritage and Nature Park example.

Stakeholder Name/Project	Organisation type	Roles and objectives	Linkage/opportunities
Community Stakeholders			
Catchment landowners	Includes registered land owners (trustees), and other recognized landowners under custom	Most of the catchment areas fall within customary land, or registered land that is perpetual estate over customary land. The landowners have a central role in decisions about land use. Land use and rights is central to the social, cultural and economic wellbeing of landowners, however most landowners reside away from their customary land in urban or peri-urban areas of Honiara. (See 5.1 below for more information about catchment landowners and communities).	<ul style="list-style-type: none"> · Hold rights to make decisions regarding land use · Have the power to decide to move away from logging to more sustainable alternatives · Decisions by landowners to undertake logging provides them with benefits, but causes downstream impacts. · May suffer opportunity costs from giving up logging activities · Have an interest in sustainable use and economic development of their land · Value catchment forest for custom / cultural purposes
Galego Resources Ltd (GRL) Komarindi Resources Ltd (KRL) Central Resources Ltd (CRL)	Landowner companies	Landowner companies are established to undertake business activities on registered land (e.g. GRL, KRL) or customary land (e.g. CRL). These are primarily involved in logging. The directors of the companies consist of some of the Trustees, but also include developers who are not landowners.	<ul style="list-style-type: none"> · Have interests in logging, which may be conflicting with the objectives for sustainable catchment management · There may be opportunities to redirect the interests of the companies to other ways to create value from forests (e.g. generate income through conservation & PES rather than logging).

<p>Major SW customers</p> <ul style="list-style-type: none"> - Sol Tuna Ltd - Solomon Breweries Ltd - Solomon Islands National University Solomon Islands Airport Corp. 	Private Sector	<ul style="list-style-type: none"> - Profit driven / commercial focus - Require reliable water supply for their operation 	<ul style="list-style-type: none"> · Potential source of ‘down stream’ private sector finance to improve upstream water shed management and water quality
<p>Solomon Islands Community Conservation Partnership - SICCP</p>	Local NGO	<p>SICCP’s vision is to develop and strengthen local capacity to manage conservation networks, enhance policy roles, and expand support and empowerment of community-driven conservation actions in the Solomon Islands</p>	<ul style="list-style-type: none"> · Objectives align with the GEF project objectives, No local or specific opportunities to collaborate identified to date
<p>Ecological Solutions Solomon Islands (ESSI)</p>	Local NGO	<p>Environmental organization made up of a team of local environment experts supporting grassroots conservation and management initiatives. Provider of ecological and scientific services. Main activities include: Environmental audits and professional environmental assessment services; Filling on site environmental management roles.</p>	<ul style="list-style-type: none"> · Have capacity to conduct biodiversity survey and scientific research · Potential provider of baseline data

Live & Learn Solomon Islands (LLSI)	Regional & local NGO	Operates environmental management and sustainable development projects, including disaster risk reduction, climate change mitigation and adaptation, gender and women's empowerment. Has a strong focus on good governance, and livelihoods at grassroots levels.	<ul style="list-style-type: none"> · Local partner in MFAT <i>carbon financed forest conservation</i> project · Has expertise in PES schemes · Potential provider of services to engage landowner participation in the GEF project
VSA	NZ Government volunteer program	VSA provides volunteer support for projects. Australian or New Zealand volunteers available. Volunteers should be based in Honiara.	<ul style="list-style-type: none"> · Could increase capacity of GEF project partners through volunteer personnel who provide technical support / mentoring

Annex M: Project Design Consultations

A. Catchment landowners and communities

Most of the Kongulai and Kohove catchment areas fall on customary land, which is owned and managed under ‘informal’ customary decision-making by the locally recognized landowners. Much of the Lungga catchment area is now ‘Registered land,’ which is a form of perpetual estate where ownership is provided to registered Trustees. The Trustees are selected by the customary landowners, but once selected may act on their behalf. The registered land within the Lungga catchment was formerly customary land, and includes land that was registered for a proposed hydroelectricity scheme.

The customary landowners of Lungga, Kongulai and Kohove catchment areas comprise members of two main tribal groups, the Kakau and Lakuili. There are 3 recognised tribes within the Kakau landowner group and 3 under the Lakuili, and each consist of multiple recognized clan groups (approximately 40 clans). The total population of the tribal groups (combined) is approximately 2,000 people.

The landowners no longer reside in the middle and upper catchment areas, but do utilize the area for gardening, hunting and for logging. Most landowners reside in the coastal per-urban and urban areas of Honiara, including Kakabona and Belaha, and within Barana village in the upper catchment of the Mataniko River.

B. Engagement methodology

Engagement in the project design phase focused on the following stakeholder groups:

- (i) Key government agencies
- (ii) Proponents of other projects that may influence the project (e.g. projects that have overlapping or compatible objectives)
- (iii) NGOs
- (iv) Donors / representatives of organizations providing development assistance

- (v) Customary landowners from the Kongulai, Kohove and Lungga catchments

1. Institutional stakeholders

Face-to-face consultation meetings were conducted with each stakeholder group representing the ‘institutional stakeholders’ (as listed in points i – iv, above). The meetings were conducted during the mission to Honiara during the week 28th January to the 2nd February 2020. This consultation exercise enabled documentation of the general project baseline, and formulation of an initial draft design concept for the project (i.e. the draft project design ‘alternative’). A summary of the discussions from these consultation meetings is provided in the table below.

Those who attended all or most of the meetings with institutional stakeholders were as follows:

- Ian Gooden (IG), CEO of Solomon Water
- Jeffrey Bowyer (JB), Climate Change Specialist, ADB consultant
- Michael Bennett (MB), Forest Management Specialist. ADB consultant
- Robbie Henderson, CEO of Nakau Programme (funded by SW)

Organization and People Met (internal meetings not listed)	Summary of Discussion
Tuesday, 28 January	

Ministry of Environment, Climate Change, Disaster Management & Meteorology

-Dr. Melchior Mataki, Permanent Secretary

-Participants: IG, JB, MB, and RH

-JB reminded Dr. Mataki about the GEF regional proposal and described plans to develop child proposal

-IG explained that project will work in all three catchment areas in Greater Honiara Area (Lungga, Kohove, and Kongulai)

-Dr. Mataki offered his support for an approach that balances development and conservation and combines regulation (protected areas) and payment for ecosystem services (PES)

-He stressed the need for landowners to consent to forest protection measures in the catchments, and to properly engage with landowners from the beginning. He suggested partnering with the Ministry of Culture to assist with this

He does not want to see “declarations” from government or forced agreements to protect forest, would prefer proper mapping of landownership and landowner consent

-He sees potential in applying the Protected Areas Act and the Nakau Programme in terms of forest carbon

-He cited SPREP as a good model for community engagement

-IG mentioned SW’s community group, and RH revealed that the Nakau Programme has anthropologist

-Dr. Mataki highlighted that communities on urban fringes have access to money and require money for living expenses, hence the interest in money is significant, which introduces challenges for working with these groups

-He requested a copy of the regional proposal and asked to be updated on progress. He would like to be provided with an initial copy of the concept and kept informed throughout proposal development. Correspondence can be directed to Mr Channel with PS Dr Mataki in CC”

SW with

Live and Learn

-Bill Apusae (from Live and Learn)

-Participants: IG, JB, MB, RH and Bill Apusae

-The team reconvened for a presentation by RH about the Nakau Programme’s approach

-RH described Nakau Programme carbon credit schemes in Fiji, Vanuatu, and Solomon Islands

-He also explained key requirements for carbon farming projects, including additionality, clear land ownership and carbon rights, free, prior & informed consent (FPIC), land use planning, and benefits sharing

-RH also outlined the process of developing a carbon project, from initial concept to carbon credit sales; this process can take two years or more from start to finish

-Mr. Apusae from Live and Learn also shared their activities in Solomon Islands. Live and Learn works closely with the Nakau Programme.

Wednesday, 29 January

Ministry of Forestry and Research

- Fred Pitisopa, Supervising Commissioner of Forests
- Terence Titiulu, Deputy Commissioner (Planning)
- Samuel Pitakaka Vazu, Undersecretary (Technical)
- Wilfred Atomea, Undersecretary (Administration)

Participants: JB, MB, RH, and Ray Andresen (SW)

- JB started with a brief explanation about the GEF project, and Ray followed with a description of current problems in Kongulai Spring (frequent shutdowns) and the need for additional treatment because of siltation
- MB and RH shared their thoughts on various options, such as forest carbon financing and PES
- Mr. Pitisopa highlighted the need for proper mapping of catchments
- Mr. Vazu commented that the government is not stopping anyone from applying for logging license
- RH requested for locations of forest concessions and also data on forest cover
- Mr. Titiulu (I think?) described standard logging agreement – 60% to contractor, 25% to government, and 15% to landowners (of Free On Board price) – but specific percentages depend on negotiations
- RH commented that it's important to consider opportunity cost of government (not just landowners) if there is attempt to shift from logging to ecosystem services
- There is lack of processing of logs in the country; country is still well short of goal of 8% local processing of round logs that are cut; high price of electricity is one barrier
- Mr. Pitisopa said that landowners are the key decision makers who make the decision whether to log or not, hence they need to be convinced about alternatives
- It is technically possible to reverse logging concession, if landowner trustees agreed to this action

Ministry of Lands, Housing and Survey

-Alan McNeil, Commissioner of Lands

Participants: IG, JB, MB, and RH

-Following a brief description of the GEF project, IG stressed that the project entails identifying landowners in the catchment areas and asked Mr. McNeil about the best way to go about that

-Mr. McNeil explained that the first step would be to consult cadastral maps (available at Ministry of Lands on GIS) to see what land is registered, un-registered, and customary; if registered, names should be listed

-He added that once money is involved, establishing land ownership can be challenging, even on registered land. The trustees of registered land is recorded, but it may be disputed (e.g through the high court)

-For un-registered land, the Customary Land Records Act allows for boundaries to be identified (as part land recording, not registration)

-Mr. McNeil further explained that land recording can take 6 months; the process includes application by landowners, public notice, hearings, reporting, and certificate of completion

-Mr McNeil was not familiar with the land registration process under the Protected Areas Act, or if it could compliment the process of land recording

- land recording is usually undertaken by engaging a consultant to undertake landowner consultations. Under the Act the consultant needs to be a lawyer. Usually a consultant would work with local experts

-Driven by logging interests, this process was recently completed in Isabel and West Guadalcanal

-At the Ministry of Lands, there is a national recorder (Mary Tegavota) that coordinates the process; there are also external recording officers for each area. The latter are usually legal practitioners with assistants

-There are invariably disputes to establish primary and secondary rights

-GPS coordinates are used to establish broad areas, usually at a sub-tribe level

-Mr. McNeil noted that Lungga and Kongulai catchments are mostly registered, while Kohove is largely unregistered.

-In the Lungga catchment, the Koramindi area has been registered over the past couple years because of logging, but Alan noted that the area should never have been registered in the first place

-A maximum of five names can appear on title (joint owners or trustees), but there can be bigger groups behind the scenes

-IG clarified that the highest priority in the Lungga catchment is the buffer zones near the river

-Alan explained that timber companies do not require land to be registered and talked about felling license versus grant-of-profit license (cannot do both on registered land)

-He also noted that the Millennium Challenge Corporation is interested in customary land recording

-RH asked if the Landowner Advocacy and Legal Support Unit (LALSU), a part of the Public Solicitor's Office was available to assist and advice landowners. Mr. McNeil was not sure

<p>Ministry of Mines, Energy and Rural Electrification -Dr Christopher Vehe, Permanent Secretary</p>	<ul style="list-style-type: none"> -Participants: JB and Ray Andresen (SW) -As SW is under MMERE, this meeting was intended to inform the PS about the GEF project -JB gave a brief overview of the project, and Dr. Vehe expressed interest in staying informed -Dr. Vehe noted that GEF tends to take a long time to approve projects and that landowners can be skeptical, but otherwise expressed his support -He suggested to look at other recently approved GEF projects and also to ensure that the project is consistent with national priorities (as documented in the NDCs, SDGs, and NDSS) -He also asked for the TORs of the consultants (which SW subsequently provided) and pledged to send someone from MMERE to the stakeholder consultation (which came to pass)
<p>New Zealand Ministry of Foreign Affairs and Trade (MFAT) -Anabel Lusk, Second Secretary (Development)</p>	<ul style="list-style-type: none"> -Participants: IG, JB, and RH -JB introduced the GEF project, and IG talked about logging in the catchments, particularly in the Kohove -Ms. Lusk explained MFAT's funding of the carbon trading schemes in three locations, with Live and Learn International as the main contractor and Nakau and EKos as the subcontractors -She shared her view that there is a good opportunity for collaboration (e.g. shared trainings, information sharing) between the projects and also with the government's REDD+ unit -She also suggested regular meetings between the projects, building off the thrice-yearly meetings of the Forest Sector Technical Working Group, FS-TWG (led by JICA) -She suggested their would be merit informing a sub-group of the FS-TWG focused on forest conservation, REDD+ and PES financing. Her observation of the FS-TWG is that it's a good forum for sharing project status updates, but usually doesn't provide time for collaboration on specific issues or activities -Eventually, the goal should be to create a model that could be self-sustaining without donor support, possibly by partnering with countries or industries (e.g. aviation sector) that are seeking to offset their emissions -RH noted that demand for carbon credits are not mature enough to be confident in trends -Ms. Lusk mentioned opportunities in eco-tourism, and there was also discussion about non-timber forest products, as well as forest restoration -She also suggested possible linkages to "Climate Resilient Honiara" involving UN-Habitat, RMIT University, and Ministry of Lands -RH discussed potential pre-payment activities, like bee-keeping and WASH

<p>UN Food and Agriculture Organization (FAO)</p> <ul style="list-style-type: none"> -Raushan Kumar, Technical advisor -Douglas Yee, 	<p>Participants: IG, JB, MB, RH, and SW Team</p> <ul style="list-style-type: none"> -Mr. Kumar gave an overview of FAO's Integrated Forest Management Project (IFMP), funded until July 2021 -He reviewed the project's five objectives – protected areas management, sustainable lands management, REDD+, forest restoration, and biodiversity -The team noted that there is potential to learn from their activities, especially related to alternative livelihood (in protected areas) and forest restoration (near Tina River) -The project is conducting an assessment of forest cover and land use changes over time (1990, 2020, 2017, 2020), with landset satellite resolution of 28.5; results will be available in Sept/Oct - Component 4 of the IFMP targets restoration of 80,000 Ha of native forest _ discussion was held on the need to harmonize a project scale forest carbon financing activities with national scale REDD+ schemes (that are in development)
<p>Friday, 31 January</p>	
<p>Japan International Cooperation Agency (JICA)</p> <ul style="list-style-type: none"> -Dr Nishikawak Tatjusi, Chief Advisor -Eisho Sato, Community-based Forest Management Expert -Masamichi Haraguchi, Forest Information Specialist 	<ul style="list-style-type: none"> -Participants: IG, JB, MB, and RH -Dr. Tatjusi described the Project on Capacity Development for Sustainable Forest Resource Management (SFRM), including forest information tools and pilot activities -The \$4 million project started in Sept 2017 and has a duration of 5 years -Discussion centered on the Forest Working Group, which is made up various agencies engaged in supporting sustainable forest management in Solomon Islands -JICA had interest in trialing forest cover monitoring using drones in Kongulai and Kohove (as a training exercise), however this was not supported by landowners and did not go ahead
<p>GIZ</p> <ul style="list-style-type: none"> -Manuel Haas, Forestry and REDD+ Technical Adviser 	<ul style="list-style-type: none"> -Participants: IG, JB, MB, and RH -Mr. Haas discussed activities under GIZ's Forest Conservation in Pacific Island Countries, which focuses on REDD+ in the voluntary market (jurisdictional-level REDD) -The project is finalizing three project sites; criteria includes community attitudes towards conservation and landowner issues. The REDD+ unit are interested in using the Plan Vivo Standard. -Mr. Haas mentioned Hansen Forest Loss, which has a new set of data through 2018; IG mentioned recent data from University of Queensland on forest loss around Honiara -There was discussion on options for non-timber forest products and alternative livelihoods

Solomon Water Operations -Scravin Tongi, Chief Operation Officer -Mark Waite, Strategic Projects Management Advisor (PMU) -Ray Andresen, Strategy Manager	-Participants: IG, JB, MB, and RH -Led by MB, the team discussed the data/information needed to help establish a justification for a direct PES scheme between upstream custodians of watershed services and downstream water users -SW will provide information on capital and operational costs, a recently-completed willingness to pay survey, and their rate schedule -MB asked about other downstream water uses, such as SolBrew
Ministry of Culture and Tourism -Andrew Nihopara, Permanent Secretary -Dennis Marita, Director of Culture	-Participants: IG, JB, and MB -Mr. Marita explained that Ministry does not typically deal with land issues, but focuses more on culture and traditional relations (land as a cross-cutting issue) -However, there is potential to work with the Ministry (along with the Ministry of Traditional Governance) to help identify and work with landowners on customary lands -It was noted that most of the original landowners in the upper catchment areas are now landless -Mr. Nihopara discussed distrust of acquisition process, which has not involved proper consultations -Millennium Challenge Corporation is looking at root causes of land issues (with dual focus on land reform and governance) -Recording of lands is key part of Protected Areas Act and Customary Land Recording Act -Mr. Marita noted that villages with good leadership structures tend to be easier to work with -Mr. Nihopara described efforts to develop WWII historical trail above Honiara, but only 3 of the 6 villages were willing -There is potential to help support model communities in catchment areas, potentially to include eco-tourism

2. Landowner engagement

1. First landowner workshop

A landowner workshop was held during the first consultation mission (28th January – 2nd February 2020), which aimed to introduce landowners to the broad concept of the project, including the rationale for why the project was proposed.

The workshop included a presentation and question and answer workshop attended by 24 customary landowners from the target catchments. Presentations were delivered by Payment for Ecosystem Services expert Dr Michael Bennett and Mr Robbie Henderson (CEO of the Nakau Programme). The presentations focused on possible alternative land management and livelihood scenarios that are proposed as potential project interventions. Questions and discussion comments were taken from landowner participants and answers provided.

The main findings were as follows:

- There is resistance to logging by some landowners in the three upper catchment areas of GHA (Kongulai, Kohove, and Lungga), but lack of economic opportunities makes it difficult to slow the current unsustainable rate of deforestation. Some landowners support logging, but mainly because it provides one of few opportunities to generate income.
- The frequent shutdown of the Kongulai Spring (40% of Honiara's water supply) due to increased sedimentation is having significant impacts on the reliability of the city's water supply and creating additional costs and revenue losses to SW. The shutdowns are also likely to have financial and potentially health impacts on customers when potable water is not accessible.
- When the Lungga River eventually becomes the city's main source of water, sedimentation will be an issue there too unless logging is better managed in the upper catchment.
- There is a clear need to improve the management of GHA's catchment areas, but a simple ban on logging is difficult to enforce and also leaves landowners with little means of livelihood.
- Landowners indicated support of alternative income generating activities to logging (such as PES), however to act as a sufficient incentive to give up logging the benefits of alternative activities would need to be realised in the near term as well as longer term. If required to wait the landowners would likely pursue logging, because money is sought to provide for short term needs.
- Given the above, there is potential for an innovative approach to catchment management that could combine protective measures, payment for ecosystem services (PES), community engagement, and livelihood activities. PES activities could include carbon trading, catchment services, and potentially biodiversity offsets. A project would need to provide a flow of benefits at an early stage and not just at the end.
- Over the next four months, a team of consultants funded by ADB and SW will develop a proposal to the Global Environment Facility (GEF) that outlines this approach. The proposal will discuss how to address current barriers, including land tenure issues.

2. Second round of landowner workshops

The second phase of landowner engagement for project design was conducted during the period April – June 2020. The workshops were organised and conducted by Solomon Water with support from Live & Learn Solomon Islands and the Nakau Programme. Participation in the workshops and interviews was voluntary, and men and women participated separately.

These workshops used Participatory Rural Appraisal (PRA)[\[1\]](#) methodology. PRA is a strength-based participatory research and education process. In the context of this project it was used to examine community perceptions and knowledge of land use, drivers of land use decisions, livelihoods, local governance, development aspirations and the project concept from environmental, cultural, social and economic perspectives. This was used to identify key project interventions and project risks at the community level.

Engagement through the PRA approach provided an empowering 2-way learning process, whereby participants and researchers learned from each other. The participants were presented with information about the land management and catchment issues that impact upon Honiara's water supply, and also received information about possible solutions, including payment for ecosystem services (PES). This enabled participants to provide informed feedback regarding the project concept.

The PRA consisted of four of participatory workshops and semi-structured interviews with key people selected for their capacity to provide a good synopsis of community and landowner perspectives. The workshop sessions and interviews were designed to collect qualitative and quantitative data on key research questions, and were guided by a PRA facilitation guide designed specifically for this project.

The Solomon Water engagement team selected the participants from the proposed project area. Participation was organized to ensure equitable representation of community diversity such as clan group, age, gender and role (e.g. leaders, church representatives). Groups identified as being disadvantaged in decision making, such as women and youth, were provided opportunities to express their views separately from men and community leaders. Fu

The key findings were as follows:

- Custom landowners (male and female) consider cultural and customary values of catchment areas (including forests and rivers) to be highly important. The tangible cultural values include provision of resources used for custom purposes, such as making traditional dress. *Tabu* places such as burial sites and sites used for sacrifices by ancestors are still considered highly important.

- Landowners perceive the catchment area to have changed significantly. Major changes were considered to be the introduction of logging, use of the catchment area for the Honiara city water source, and emigration of people out of the catchment area towards the coastal and peri-urban areas of Honiara. Changing attitudes of younger generations were also perceived to be a driver of change. The catchment areas are still used today for gathering resources (e.g. building materials and firewood), and hunting.
- While men and women identified positive and negative outcomes from logging, the overall general perception was negative. Most participants suggested that revenue from logging was short lived and unfairly distributed. Logging is perceived to bring social issues such as teenage pregnancies, fighting within the communities and tribes, and land disputes.
- Some women reported receiving royalties, but said that most of the royalties went to men, as distributed by Trustees (all male). The prevailing view is that royalty distribution is unfair and men receive a bigger share than women.
- The women also stated that damage to the environment is a major concern arising from commercial logging. They explained that women are predominantly involved in gardening and looking for food in the bush, and reported that since logging came and destroyed the natural environment women have to walk further to make gardens or look for food. They also have to walk longer distances to get water since logging has also affected the water supply.
- A significant negative perception for implementing catchment protection was the timeframe for the project to start when compared with logging activities. Male participants stated that the catchment protection project would need to start quickly because discussions with logging companies are progressing in some parts of the catchment.
- Participants perceived that establishing a Protected Area in the catchment would prevent them from accessing land and resources (e.g. for firewood, building materials or hunting). Hence this was considered as a barrier to gaining support.
- Men and women said that Payment for Ecosystem Services (PES) is a new concept that requires more consultation and training with the communities. At the moment there is not enough information about the proposed project.
- “Money” was generally ranked as the most important benefit sought by men, and women ranked it as relatively important. This was related to the importance of money in the life of people who live in an urban or per-urban environment, where most goods and services are purchased.
- Education, employment and setting up businesses were also generally perceived to be important benefits sought from development projects, especially because they enable people to have better livelihood opportunities, or allow people to earn money.
- Women highlighted that despite Guadalcanal being a matrilineal society, men always dominate in any decision making about land issues or land development. Participants reported that gender roles and responsibilities are strongly determined by culture.
- Women have the capabilities to do various positions such as project manager/coordinator, treasures, chairperson, secretary, trainers, rangers etc. However presently women only occupy these positions in organisations that do not involve men.
- Barriers identified (by women and men) to women’s increased participation were similar. The main barrier is perceived to be cultural, where women’s roles are subordinate to men in most areas of decision making and in particular in relation to land.
- Lack of capacity and skills for participation in the project was a barrier identified by men and women.
- Logging companies were perceived to be a major barrier to change. People want and need money and therefore had incentives to agree to logging company offers to log their forest, which were also reported to be supported by the Department of Forestry.

- Participants reported that since the catchment covers peri-urban areas there are some illegal settlers settling in some parts or near the catchment areas. This is an external barrier that could cause risks to a catchment project.
- From the discussions and general observations, the timeframe for developing a catchment protection project is a key issue. Logging is currently the major threat to the catchments and people will likely pursue this option unless an alternative is available very soon.

Recommendations from landowner consultations were as follows:

- Landowner benefits should be delivered as early as possible in the project implementation period, or if possible prior to commencement of the project through related catchment management co-financing. This is required to provide a viable and timely incentive to cease logging activities. Opportunities to provide benefits by engaging landowners in restoration works should be considered a high priority.
- Benefits to landowners should include (but not be limited to) some form of financial remuneration, such as through employment, or clan or family payments. This recognizes the importance of money to the lives of catchment communities and the need to cover their ‘opportunity costs’ of foregoing income from logging. However such forms of benefit sharing should be supported by investments in good governance and planning (see below).
- Distribution of benefits to landowners should also include non-financial benefits, such as investments into education and new enterprise development. The non-financial benefits should be determined through community-led planning processes.
- To ensure good planning and fair distribution of project benefits (e.g. PES payments), the project must invest in supporting good governance and benefit sharing arrangements at community level. The project should not repeat mistakes from the logging experience, where unfair distribution of royalties and poor governance has led to conflict and other issues.
- Careful consideration should be given to establishment of projects on Registered Land, as this presents significant risk to fair and transparent governance and sharing of benefits. Other instruments such as Land Recording or the Protected Areas Act (i.e. not requiring alienation of land) are likely to be more appropriate. Establishment of Registered Land concentrates decision-making through a small number of Trustees and was identified by landowners as a significant reason for unfair benefit distribution and reason for conflict in relation to logging activities. However projects on Registered Land may be more appropriate if it were possible to establish another layer of governance that is conducive to fairness and transparency. The latter may be required if the project seeks to shift the activities of existing landowner companies (operating on Registered Land) from logging to PES.
- Education and consultation is required to correct landowner misconceptions that Protected Areas will lock them away from access to land or resources (e.g. firewood collection). The Protected Areas Act makes specific provisions for local and customary access and use of resources from Protected Areas on customary land.
- An equal number of male and female representatives (mandated by landowner communities) should be represented in catchment level governance arrangements (e.g. under the proposed Water Fund model). This acknowledges the key role of landowners as decision makers and beneficiaries.
- The project should include dedicated investments into women’s empowerment and participation. While inclusion of women should be a ‘cross-cutting’ aspect of the project, it is recommended that it is also a specific activity focus requiring dedicated personnel. Women in the catchment face complex and challenging cultural and other barriers to participation, and are arguably the most impacted by poor land use and governance. Conversely, consultation results indicate that women could play positive roles in various aspects of the project.

- While equal participation of women should be mandated under the project, it is recommended that a bottom-up participatory approach to women's empowerment be pursued. The project must mitigate the risks of causing unintended negative consequences (e.g. domestic violence) and recognise that a culturally sensitive approach is needed.
- Further investment in landowner community consultation is required prior to and through the implementation of the project. This should aim to build landowner awareness and understanding of alternative land use and livelihood opportunities (e.g. PES), increase capacity for participation, and build trust between landowners and institutional stakeholders (including SW).
- The project should incorporate activities that provide opportunities to involve elders (men and women) in the practice and sharing of customary traditions on their land. This will contribute to maintenance of cultural values that are reported to be declining in younger generations.
- Solomon Islands Government needs to adopt a unified and coordinated position towards catchment protection, as landowners may be confused by conflicting approaches.

[1] Narayanasamy, N. (2009) Participatory Rural Appraisal; Principles, Methods and Application. Sage Publications, Los Angeles.

3. Gender Equality and Women's Empowerment

Provide the gender analysis or equivalent socio-economic assesment.

1. Baseline investment and GEF Outcome 1

This section describes the gender elements of the infrastructure to be constructed under the project, including the baseline project and LDCF-funded turbidity removal. The baseline Urban Water Supply and Sanitation Sector Project (UWSSSP) is classified as *effective gender mainstreaming*, meaning that project outputs are designed to directly improve women's access to social services, economic and financial resources and opportunities, basic rural and urban infrastructure, and/or enhancing voices and rights, which contribute to gender equality and women's empowerment.

For the baseline project, a full gender assessment (GA) and Gender Action Plan (GAP) were finalized in November 2018. These documents provide a back-drop for the more specific gender analysis and actions developed for the work in the catchment areas. The main focus is on women's empowerment, but the approach is also applicable to ensuring engagement of marginalized groups, including youth and people with disabilities.

The GA finds that gender relations in Solomon Islands are strongly male-dominated.^[1] Some aspects of customary laws reduce the status of women, perpetuate inequalities in decision-making, economic resources, and access to health care and education (among others), and also restrict the rights and freedom of girls and women. The roles of women are primarily focused on reproduction and family-oriented production. Further, violence against women remains a major concern.

The lack of inclusion of women in different sectors is reflected in the paucity of gender disaggregated data and information. Even though there are plans, policies and strategies available in the Solomon Islands for gender inclusion at organizational levels, they are poorly applied at the ground level.

Related more specifically to the water sector, the GA found that unsafe and insecure water and sanitation services significantly affect women's time poverty (time collecting and preparing water as well as caring for sick family members as a result of waterborne diseases). Other issues highlighted by women and girls include barriers in connecting to services (such as connection fees and documentation needed), menstrual hygiene, limited income-generation opportunities for women, and limited participation in decision making.

For the baseline project, specific gender design features include: (i) supporting women's employment; (ii) supporting women's decision making by setting up water user groups; (iii) addressing barriers to connecting to services by providing gender-sensitive water, sanitation, and hygiene-awareness and behaviour campaigns and training for households on willingness to pay for services, including discussion in the household on women's role in water collection and preparation; and (iv) providing menstrual hygiene training and products.

The GAP also puts an emphasis on developing a congenial environment whereby women get support from men in the house and the community to access all resources, available infrastructures, administrative and judiciary support in line with the Government policies and provisions for gender mainstreaming. SW will become a conduit for empowering and mainstreaming women in the society.

2. GEF Outcome 5

A gender analysis was conducted specifically for Outcome 5, and the baseline GAP was also updated to include Outcome 5, including gender-specific targets (see Annex N). The analysis found that women interact with forest resources and the land around them in different ways to men. Often this interaction with the forest resource is deeply embedded in custom and tradition, sometimes it is simply that those who are most impacted by changes to resource management practices are the marginalised whose role it is to garden and provide for the family.

The incorporation of gender-based indicators for project monitoring and evaluation will support the development of the project in a way that provides opportunities for greater gender equity and avoids negative impacts on marginalised community members. At a basic level, the project will seek 50% engagement of marginalised people in project consultations and education workshops (gender and age disaggregated attendance sheets will provide the evidence of participation).

However, attendance alone is not enough. Without a concerted focus to empower women and other marginalized groups to speak at public forums and participate in decision-making, project designs may not benefit marginalized community members and may even negatively impact this vulnerable cohort. Under the project, women must therefore be appropriately engaged in planning and decision making on the rules around any land management changes in the project to ensure it will not lead to unfair penalties and restrictions.

To help achieve this, the project will support a high level of engagement and participation of marginalized people in education programs, land use and community planning work, and the design of long-term governance systems. Throughout various stages of the project, gender actions will aim to mitigate risks to women and create equal opportunity and empowerment. In addition, community development experience has shown that engaging women in financial management at the community level is an effective way to increase transparency and accountability in community enterprise. Strong participation of women in project governance and financial management is hence a crucial aspect of managing project impacts.

The project also recognises that creating a role in decision-making and sharing ideas can also, in itself, lead to negative consequences, such as placing those that speak at an increased risk of domestic violence. The project must therefore commit to mainstreaming gender in a way that reduces the risk of negative impacts. Finding alternative ways for marginalised community members to be effectively engaged in the project therefore needs to be done sensitively. Depending on the demographics determined through the social impact baseline, one option will be to run separate workshops for women and female youth at each location where consultations are run. These workshops can be conducted at a time when the women are not needed for household chores or may need to be shortened to enable women's participation.

Another key opportunity to address gender inequalities within the catchment communities is through targeted livelihood opportunities. Finding livelihood opportunities for women requires consideration of the specific challenges women face in time availability and their diminished opportunities for decision making over land. Seasonal livelihood opportunities such as the collection of wild seasonal crops, micro-enterprise opportunities that can occur at home, or periodic employment are often more attractive to women whose domestic responsibilities prevent them from full time employment.

Women's associations and empowering women through collectives and cooperatives can help to avoid an increase in domestic violence. Collectives and cooperatives can also be a good way to engage people with disabilities who may otherwise be excluded from the project.

[1] Dey,R., 2018, *Gender Action Plan_Final*, Urban Water Supply & Sanitation Sector Project

Annex N: Gender Action Plan

Project Outputs	Gender Targets and Activities	Timeline	Responsibility
Outcome 1 <i>Continuous, safe, and climate resilient urban water supply ensured</i>	By 2026, 14,000 households (including informal settlements in greater Honiara area [GHAS]) will have access ^[1] to SW services in project areas, including all of female-headed households (2019 baseline: 8000 households, approx. 12% of households are female-headed households)	2028	SW HAEP Team
	Households, including female headed households, will be supported to provide necessary documentation for connection applications. This includes piloting applications that do not require land documentation.	2019 - 2027	SW
	Vulnerability assessment to be carried out and all vulnerable household identified in project areas will be provided with opportunity to access safe water through subsidies and/or installment options.	2021	SW HAEP Team
	All trainings on WASH, O&M, WATSAN awareness will include at least 50% women	2020 - 2026	SW HAEP Team
	Households with low literacy will be proactively supported to make connection applications through targeted support from SW	2019 - 2027	SW
	Water user groups, with 50% membership of women, established in project HAEP target areas in GHA and Auki, Gizo, Munda Noro, and Tulagi. (number of user groups TBC during project inception)	2021-2026	SW HAEP Team
	Contractors engage at least 20% women ^[2] . (Baseline:0) Orientation and guidance to contractors on labor standards, gender equality in wages, gender (including gender-based violence) and HIV training provided to all contractors at commencement of work and during implementation as required. (Baseline:0) Separate toilet/sanitation facilities for men and women workers. (Baseline: 0)	2020 - 2026	SW Contractors

Outcome 2 <i>Effective, efficient, safe and climate resilient urban sanitation services provided</i>	3,000[3] women and girls attend menstrual hygiene management training (Baseline 2019: 0). Menstrual hygiene products to be provided to women and girls attending training. (Baseline 2019: 0)	2021- 2026	SW HAEP Team
	Provide pilot sanitation facilities, including menstrual hygiene facilities, in at least 1 community or school.	2021- 2026	SW HAEP Team
	Contractors engage at least 20% women[4]. (Baseline:0) Orientation and guidance to contractors on labor standards, gender equality in wages, gender (including gender based violence) and HIV training provided to all contractors at commencement of work and during implementation as required. (Baseline:0) Separate toilet/sanitation facilities for men and women workers. (Baseline: 0)	2021-2026	SW Contractors
Outcome 3 <i>Awareness and behaviors of hygiene and water conservation in GHA enhanced and sustained</i>	By 2025, 10,000[5] people are reached directly by WASH programs which use gender sensitive materials (approx. 50% will be women based on population profile) [(2019 baseline: 0%).		SW HAEP Team
	All new WUGs in HAEP target areas (with 50% women's participation) receive training in maintenance of water and sanitation facilities	2021-2026	SW HAEP Team
	1,600 households[6] are provided with training to facilitate improved willingness to pay for water (i.e. benefits of water and sanitation services for the household)	2021-2026	SW HAEP Team
	Effective gender-sensitive audio and visual materials developed to raise awareness at the HH level of proper water usage & environmental management issues, & implemented through appropriate channels e.g. mobile phone applications, posters, billing mail and public discussion materials etc. Distributed to village heads and community leaders in HAEP target areas. Locations of posters will be on strategic places frequented by women. Target: all HHs in urban and peri-urban areas including all female-headed households	2021-2026	SW HAEP Team
	Monthly WASH awareness-raising seminars and activities delivered under the HAEP program through the community partnerships including women's groups, youth groups and schools. (Baseline = 0)	2021-2026	SW HAEP Team

	At least bi-annual M&E and Learning surveys to allow feedback mechanisms from community members on HAEP program. 50% of those consulted are women (Baseline =0)	2021-2026	SW HAEP Team
Outcome 4	100% of SW staff (140 staff) attend gender training. Training to be conducted at least twice over project duration.	2020 - 2027	SW
<i>SW is financially and technical sustainable</i>	SW board includes at least 2 women at all times (Baseline: 2 out of 7 members are currently women)	2019 - 2027	SW
Outcome 5	Training and capacity building to community stakeholders on watershed maps and hydrological models with at least 30% ^[7] participation of women (baseline: 0)	2021 - 2027	SW
<i>Management of Honiaria's watershed area strengthened and made resilient to climate change</i>	Service provider to develop watershed maps and hydrological models to provide at least one internship opportunity for a woman (technical student/woman working in key ministry) to support all activities in developing watershed maps and hydrological models (e.g. site visits, collect hydrological data, mapping and modelling) (baseline: NA)	2021 - 2027	SW
	Complete a gender-responsive social impact baseline for participating communities (e.g. sex disaggregated data, specific questions on household decision-making, entry points for women) (Baseline: no social impact baseline)	2021 - 2027	SW
	Provide education and training opportunities ^[8] to participating communities, with at least 50% opportunities to women (Baseline: 0%)	2021 - 2027	SW
	Provide training and alternative employment in restoration and replanting to participating communities, with at least xx% ^[9] of employment for women. (Baseline: 0%)	2021 - 2027	SW
	Develop PES sub-projects with specific targets for women landowners and activities relating to women's engagement and decision-making in the household (e.g. if their husband is the landowner) (Baseline: no PES subprojects and no gender targets in PES subprojects)	2021 - 2027	SW
	PES representative group includes at least 50% women (Baseline: NA)	2021 - 2027	SW
	At least xx% ^[10] of supported micro-enterprises are women-owned ^[11] (Baseline: 0%)	2021 - 2027	SW
	Community catchment governance and coordination mechanisms/arrangements include at least 50% women (Baseline: NA)	2021 - 2027	SW
Cross-cutting <i>Project is</i>	Gender Action Plan (GAP) training provided to SW staff and other stakeholders involved in project design and implementation (estimated participants = 20 staff)	2020 - 2027	SW supported by consultants and ADB.

<i>implemented and monitored efficiently and effectively</i>	All zonal consultation meetings are scheduled at times and places that are convenient for women	2021-2026	SW HAEP Team
	GAP implementation monitored with semi annual GAP reports including sex-disaggregated data	2020-2027	SW HAEP Team
	During capacity building, overall project's gender sensitive grievance redress mechanism (GRM) developed and publicized to ensure all project beneficiaries know the GRM procedure. Sex-disaggregated data will be prepared to identify the sex of complainants, the nature of their complaint and the resolution of the complaint. The SW Safeguards Specialist will review the register and interview women to corroborate equal treatment for male and female complainants.	2021-2026	SW HAEP Team
	Women's time poverty decreased as a result of project (measure through baseline and endline surveys)	2028	SW HAEP Team
	Using a variety of social science techniques, qualitative data is collected over the life of the project in 4 – 6 project areas to measure positive impacts on women's daily lives resulting from improved access to safe water. These would include baseline, mid and end of project surveys. (Baseline = N/A)	2021-2026	M&E surveys SW HAEP Team

[1] Access will be universal in project areas but connection is voluntary.

[2] Similar projects in Solomon Islands (not ADB funded) have not included any women construction workers. Construction is not a highly desirable job for women so focus will be on ancillary roles available – therefore 20% target is ambitious but realistic.

[3] Estimated based on number of women and girls of reproductive age living in informal settlements (where the majority of the work will be focusing)

[4] Similar projects in Solomon Islands (not ADB funded) have not included any women construction workers. Construction is not a highly desirable job for women so focus will be on ancillary roles available – therefore 20% target is ambitious but realistic.

[5] Approx. 10% of population of greater GHA, mainly focusing in informal settlements.

[6] Approx. 30% of new targeting households will be provided training (i.e. 5700 additional households are targeted for the overall project and this action will target 30% of these additional households with willingness to pay training 30% of 5700 is approx. 1600 households). Focus will mainly be in informal settlements.

[7] Women's high levels of time poverty may limit willingness to be involved in training and capacity building

[8] Specific opportunities to be developed and confirmed but could include school fee support, technical and vocational training, scholarships etc.

[9] To be determined using analysis from the the social impact baseline

[10] Target will be set during implementation after baseline and assessments have been completed

[11] Where a woman is the sole owner or co-owner (at least 50% ownership)

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

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.

Forest carbon PES finance development under Outcome 5 (Output 3) will involve direct contracting with private sector buyers of forest carbon credits. PES finance raised from the private sector is used to cover project implementation costs and to compensate landowners for opportunity costs, and will continue beyond the grant-funded period. Carbon credits buyers include companies voluntarily seeking emissions reduction/offsetting targets for carbon neutrality to enhance their reputation or to mitigate reputational or business risk.

Private sector buyers may also include companies that are required to offset emissions due to compliance requirements (e.g. airlines), or those who are taking preparatory steps for future compliance. In practice the projects will likely deal with carbon offset resellers (wholesale) who source offsets from projects and supply these to their business customers (retail).

Furthermore, a private sector PES subproject developer will be engaged to co-execute Output 3, including the forest carbon activities. This is a common practice for PES project development where the supplier of PES outcomes (landowner) would usually engage a project developer that would act as the seller to monetise the environmental services they create. Furthermore, a private sector project developer is well positioned to raise private sector capital to co-finance project replication beyond the inception project sites. The inception projects will play a role in providing a proof of concept, and will serve to de-risk investment for project expansion. Companies that have offset targets or obligations commonly invest in carbon PES project development to secure a supply of credits at known prices, hence reducing uncertainty.

Apart from this, Outcome 5 (Output 2) will explore creation of a catchment management fund that could raise funds from local private sector sources to finance livelihood and PES activities in the catchment. Activities will involve assessing feasibility of the approach such as determining willingness to pay. If adopted, this approach would see key private sector beneficiaries of watershed ecosystem services (e.g. water bottling companies) contribute to a fund for catchment management, and in return for mitigating their business risk associated with water supply and climate risk. Candidate companies include major bottling companies such as Solomon Breweries Ltd. (SolBrew), Szetu Enterprises Ltd. and Blue Water, as well as other enterprises that benefit from

stable and sustainable water supplies and improved climate resiliency, such as major hotels and tourism operators.^[1]

[1] Szetu Enterprises Ltd. and the bottlers of Blue Water were both consulted as part of baseline project development. Pita, Sally, Michael McCandless, Sonia Chirgwin and Lulu Zuniga Carmin. 2019. *Solomon Islands Urban Water Supply & Sanitation Sector Project: Resettlement Plan*.

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):

A significant risk to the project is COVID-19. To address this risk, the project will follow COVID-19 related health and safety measures for the implementation of contracts, which were issued by ADB in July 2020. Bidding documents under the project must include a COVID-19 Health and Safety Management Plan, which must be approved prior to the mobilization of site work.

For their own health and safety, consultants should follow the regulations and guidance on COVID-19 health and safety prevention and controls issued by the government. In addition, Solomon Water must, where possible, replace field inputs requiring travel and attendance of meetings with video and teleconferencing. Consultants who are required to visit the project site should be briefed on the approved site specific health and safety management plan (which should be updated to include COVID-19 specific elements) prior to entering the site and comply with the provisions of it.

Table 8 below shows other risks to the project (social, financial, and environmental).

Table 8: Risks to Project

Risk	Outcome	Mitigation Measures
Social Risks		
‘Elite capture’ of decision making or benefit sharing by landowner participants who are educated or have ‘power.’	<ul style="list-style-type: none"> ● Failure to deliver benefits fairly to those who are already disadvantaged (e.g. women may not receive a fair share of benefits) ● Disenfranchised individuals may disrupt project. E.g. landowners who are not benefiting may pursue logging. ● Disruption of traditional governance and power relationships. 	<ul style="list-style-type: none"> ● Nakau PES system is designed to mitigate elite capture risk. Projects must describe and recognise existing governance structure and systems. ● Activities to include anthropological assessment. ● Selection of a representative landowner group (e.g. association) triggers FPIC process requiring broad landowner mandate. The Nakau benefit distribution system requires fairness and transparency, and is monitored & audited

Landowner participants misuse or mismanage funds	<ul style="list-style-type: none"> ● Conflict & erosion of trust in the landowner group over use of funds ● The landowner group could collapse, or have insufficient funds to carry out activities ● Mismanagement of funds can lead to dependency or spending with negative outcomes (alcohol and drugs) 	<ul style="list-style-type: none"> ● Project to include Nakau (or similar) PES system for fair & transparent benefit sharing and financial discipline (including reporting). ● Provide financial literacy education to participants. ● Undertake social impact monitoring to track impact of money on social outcomes
Failure to consider broad community development needs, including food security, land for housing and short-term needs for income.	<ul style="list-style-type: none"> ● Landowners access to resources for building and land for farming is constrained. ● Dependency on PES income that is insufficient to provide for all community needs. ● Landowners forced to break project rules in order to meet immediate needs (food or income) 	<ul style="list-style-type: none"> ● Project to include participatory land use and community development planning to ensure PES is developed in the context of other needs. ● PES methodologies allow for continued customary use of forests (e.g. harvesting of fuel wood and timber for local building).
Community expectations are not met (for example delays in generating income, income less than expected).	<ul style="list-style-type: none"> ● Landowners disillusioned and more likely to support logging. 	<ul style="list-style-type: none"> ● Involve landowners in paid work to restore degraded land and undertake monitoring from an early stage (benefits provided as early as possible). ● Effective & ongoing engagement and education to ensure realistic expectations ● Communication plan to include strategy & messaging in relation to expectations.
Project diminishes landowners land and resource rights (e.g. land registration)	<ul style="list-style-type: none"> ● Loss of land security and access, leading to long-term reduction in resilience and increased vulnerability 	<ul style="list-style-type: none"> ● Employ PES methodology / standards such as Nakau that provides a framework for safeguarding for indigenous landowner rights. ● Record land & resources rights under the Customary Land Recording Act and The Protected Areas Act ● Project agreements (project duration) limited to 30 years to ensure future generations have a say in their development aspirations.
Lack of support from central government, and/or MoFR	<ul style="list-style-type: none"> ● Barriers or delays in achieving the outcomes (e.g. Protected Area declaration). ● Legal and illegal logging may continue in the catchments ● Government policies (e.g. NDCs) might inhibit project outcomes. 	<ul style="list-style-type: none"> ● Actively engage the relevant SIG ministries. Formalise the government support through a partnership arrangements / MOU
Insufficient local capacity (e.g. within SW or NGOs) to deliver project during and/or beyond GEF funding period	<ul style="list-style-type: none"> ● Unable to achieve expected outcomes. ● Project unsustainable after funding period. 	<ul style="list-style-type: none"> ● Capacity building activities (PES education & participatory planning) support and technical backstopping for local partners ● Engage local and regional partners (e.g. Nakau) with proven PES project experience
Financial Risks		

Failure of project proponents to raise finance locally to pay for PES outcomes. E.g. PES related tariffs unpalatable, unwillingness or inability of customers to pay.	<ul style="list-style-type: none"> ● Limited revenue is generated and retaining forests is not financially viable for communities. ● Loss of incentive to retain / restore catchments 	<ul style="list-style-type: none"> ● Analytical study to describe business case for PES investment (e.g. demonstrate savings) ● Diversify PES income streams (include international carbon financing) ● Implement activities & partner with other initiatives to diversify income-generating opportunities beyond PES
Inability to access carbon markets, insufficient demand for carbon offsets, or price inadequate.	<ul style="list-style-type: none"> ● Limited revenue is generated and retaining forests is not financially viable for communities. 	<ul style="list-style-type: none"> ● Implement carbon-financing plan (including sales and marketing). Scope to include access to private & public sector markets and financing ● Diversify PES income streams (include local / direct PES financing) ● Implement activities & partner with other initiatives to diversify income-generating opportunities beyond PES
Environmental Risks		
Plant species selected for land restoration become invasive (weeds)	<ul style="list-style-type: none"> ● Spread of invasive weeds 	<ul style="list-style-type: none"> ● Plant selection & restoration plans developed in consultation with MECDM and MOFR
Continued erosion, land degradation and stream damage due to lag times in commencing land restoration works	<ul style="list-style-type: none"> ● Continued impacts from poor water quality, including disruption of public water supply and associated costs 	<ul style="list-style-type: none"> ● Investment in rapid assessment of urgent restoration works requirements ● Project will increase effort and investment in land restoration works from commencement (targeting priority areas) ● Land restoration works not entirely dependent on the project (will commence prior to project)
Increased rainfall and flooding, impacts exacerbated by restoration works	<ul style="list-style-type: none"> ● Increased downstream impacts of flooding ● Increased land degradation 	<ul style="list-style-type: none"> ● Planning of restoration works to consider rainfall and flood risk ● Best practice soil conservation / erosion control practices to be applied (e.g. in earthworks to repair streams or tracks)

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.

Figure 11 below summarizes the institutional arrangements for the project, including the baseline and LDCF-funded activities. The main elements are as follows:

- The Solomon Islands Water Authority is the GEF executing entity (and will serve the same role for the ADB baseline investment)
- A project steering committee (PSC), established during the design phase, will provide project oversight, guidance, and direction.
- A project management unit (PMU) within SW is comprised of SW personnel and specialist consultants. The PMU reports directly to the SW Chief Executive Officer.

Solomon Islands Water Authority. Created under the Solomon Islands Water Authority Act 1992, SW is a state-owned enterprise with a mandate “to *provide for the proper management and development of urban water resources and sewerage services in Solomon Islands.*” SW’s mission is to deliver “reliable and safe water supply and sewerage services” to the urban centres. It currently operates in Auki, Honiara, Noro, Tulagi and is expanding to Gizo and Munda.

SW is established under the supervision of the Ministry of Mines, Energy and Rural Electrification (MMERE). In addition, the Water Resources Division (WRD) under MMERE is responsible for water resources assessment and management.

The key roles of SW will be to:

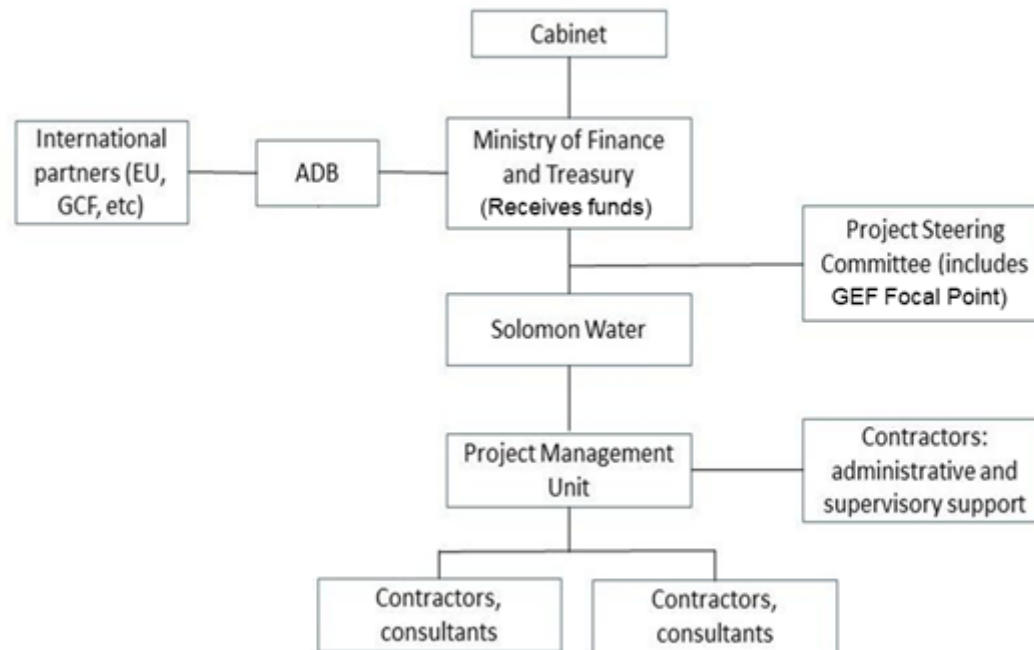
- Act as a secretariat to the PSC;
- Ensure the effective operations and maintenance of the project facilities and all infrastructure provided under the project;
- Provide technical advice on the project scope, facility designs, procurement or others;
- Prepare all draft financial reports and support financial management;
- Ensure that PMU is fully staffed and functional during the entire period of implementation;
- Review consultant reports and ensure the outputs are suitable to the project objectives and the government policies and regulations;
- Administer all consultant and works contracts (instructing the supervision consultant, approving variations, suspending and terminating contracts); and
- Ensure compliance with grant covenants, ADB’s guidelines, procedures, and policies, as the main user of the project.

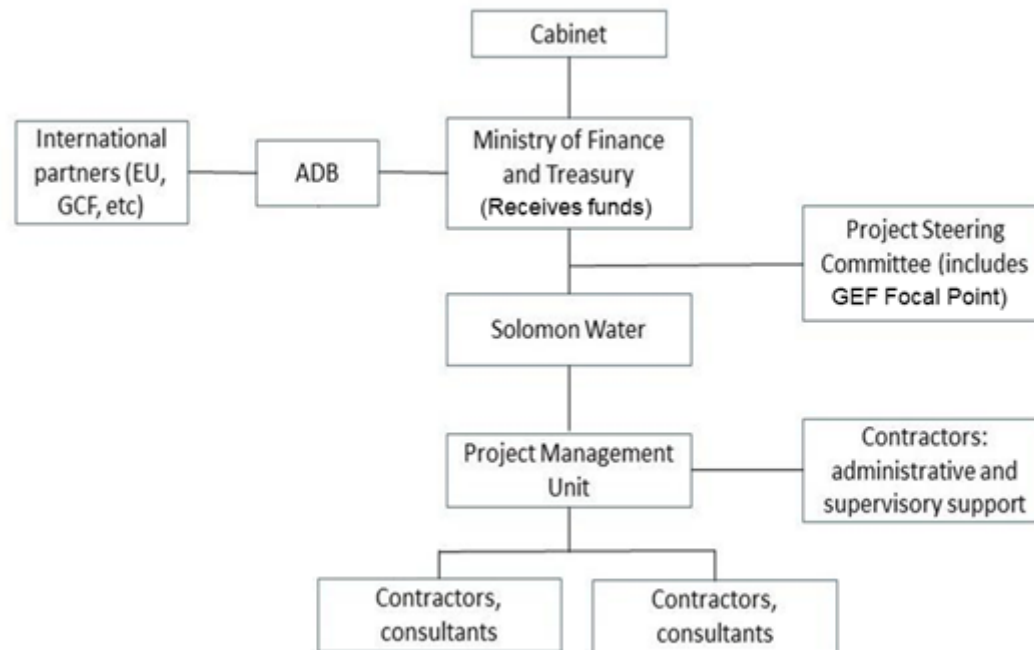
Project steering committee. Established during project development phase, the PSC will meet at critical junctures when major decisions (pertaining to both the baseline and GEF/LDCF components) are required . The PSC is chaired by a Board member of SW and its composition is as follows (as agreed, this may be expanded to include representation from other stakeholders, if needed, to strengthen coordination and implementation):

- Permanent Secretary of the Ministry of Finance and Treasury
- Permanent Secretary of the Ministry of Mines, Energy and Rural Electrification
- Permanent Secretary of the Ministry of Development Planning and Aid Coordination
- Permanent Secretary of the Ministry of Environment, Climate Change, Disaster Management and Meteorology
- Director for RWASH, Ministry of Health and Medical Services
- Clerk to the Honiara City Council
- Provincial Secretary for Guadalcanal Province
- Permanent Secretary for the Ministry of Lands, Housing and Survey
- Permanent Secretary for Ministry of Forestry and Research

- Board member of Solomon Water (Chairperson)
- General Manager of Solomon Water (GM SW) (Non-voting)

Figure 11: Institutional Arrangements for Project





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Project management unit. The PMU is part of SW and is responsible for: (i) overall day-to-day project management; (ii) design and delivery of the project components; (iii) community liaison; (iv) implementation of the project's resettlement and environmental safeguards; (v) project financial management; and (vi) project monitoring (including contract administration and construction oversight) and reporting. To help manage the baseline and GEF/LDCF projects, the PMU will be headed by a Project Director (to be funded under the baseline).

PMU support provided under baseline project. In addition to the Project Director, the PMU will be staffed by suitably qualified and experienced technical and administrative staff.[\[1\]](#) For the baseline project these will include the following:

- Contracts Engineer
- Environmental Specialist
- Social Safeguards Specialist
- Project monitoring and evaluation
- WASH Specialist
- Project monitoring and evaluation

In addition, contracts will be awarded for: project contract administration and supervision services, a hygiene awareness program; and data management, including supervisory control and data acquisition (SCADA). As needed, intermittent consultants (individuals and firms) can also be recruited to assist the PMU to design, manage, supervise and monitor other various aspects of the project.

PMU support provided under GEF/LDCF. To help manage the GEF/LDCF project, three additional staff will be added to the PMU (see TORs in Annex K):

- Full-time Project Support Specialist (national consultant) will help SW as needed with various aspects (e.g. contracts and administration of Outcome 5, project monitoring). This consultant will be funded through PMCs on a full-time basis.
- Safeguards Specialist (environmental and social) will provide 18 months of support to undertake the safeguards due diligence for site-specific components and activities.
- Catchment Management/Institutional Expert (international consultant) will focus primarily on Outcome 5 (Output 2). This person will initially be full-time and will then provide part-time targeted assistance after the second year of the project.

As mentioned previously, Output 2 will also include the formation of a Catchment Management Group. The exact composition of this group will be determined via its process of establishment. However, it is envisioned that it will include representatives of many of the same government agencies as those on the steering committee. It could also include further representation from donors, private sector and civil society organisations with activities in the catchments. This will serve to more closely integrate traditional water supply and sanitation infrastructure investments within Honiara with upstream nature-based investments in an overall planning framework.

It will also include key representatives of the upper watershed and Honiara communities. Candidate organizations include the landowner focal point groups (established under Output 3), relevant tribal leadership / governance groups for lands in the target watersheds (e.g. the Tandai house of chiefs), as well as other appropriate community groups and women's organizations, with an eye towards ensuring that governance and decision-making for catchment management and planning is inclusive, broad-based and transparent.

2. Coordination with other donor projects

This section provides information on past and current projects in Solomon Islands, particularly in Honiara. During consultations, the project design team met with proponents of many of the projects that have overlapping or compatible objectives.

Asian Development Bank. The project will build off of ADB's previous and ongoing projects in Solomon Islands. ADB has been supporting Solomon Islands since 1973 and has committed \$174.4 million in loans, \$219.0 million in grants, and \$32.3 million in technical assistance. Three current projects are particularly relevant to this project:

- In 2018, ADB supported the development of the Greater Honiara Urban Development Strategy and Action Plan (GHUDSAP), with the SIG's Ministry of Lands, Housing, and Surveys (MLHS). The GHUDSAP seeks to address the challenges that have come to the fore in light of the rapid urban growth in the Greater Honiara Area. It identified the urgent need for investments in the areas of climate resiliency and water supply.
- ADB is working with development partners (World Bank, Green Climate Fund, Govt of Australia) to support the Tina River Hydropower Project, which will generate electricity from renewable sources and provide more affordable and reliable energy to Honiara. This project can offer valuable lessons in customary land.
- In 2019, ADB signed a \$6 million grant agreement with Solomon Islands as part of the second phase of its regional program on disaster resilience in the Pacific. The grant will help improve the country's resilience to disasters triggered by natural hazards. It will support policy actions in disaster risk management and provide a source of contingent financing for timely disaster response, early recovery, and reconstruction activities.

ADB also supports Solomon Islands through the Pacific Region Infrastructure Facility, which provides technical assistance, research, and knowledge products on key infrastructure issues to Pacific island countries and acts as a coordination facility for development partners in the region. In 2019, the facility supported Solomon Islands in the development of a draft national infrastructure pipeline.

United Nations Development Programme. In 2014, SIG embarked on the four-year *Solomon Islands Water Sector Adaptation Project* (SIWSAP) to improve the resilience of water resources. The project was implemented in partnership with UNDP, with financial support by GEF's Least Developed Country Fund. The project objective was to improve the resilience of water resources to the impacts of climate change and improve health, sanitation and quality of life, so that livelihoods can be enhanced and sustained in the targeted vulnerable areas.

SIWSAP worked with partners to achieve this objective by: a) Formulating, integrating, and mainstreaming water sector climate change adaptation response plans in the water-related sectors as well as broader policy and development frameworks; b) Increasing the reliability and improving the quality of water supply in targeted areas; c) Investing in cost-effective

and adaptive water management interventions and technology transfer; and d) Improving governance and knowledge management for climate change adaptation in the water sector at the local and national levels. The SIWSAP also included pilot projects covering three townships (including Gizo) and three rural areas across Solomon Islands, which included the development of community-based Water Sector Climate Change Adaptation (WS-CCA) Plans.

UN-Habitat. In 2018, UN-Habitat launched the *Enhancing urban resilience to climate change impacts and natural disasters: Honiara* project. Supported by the Adaptation Fund, the project works with vulnerable urban communities in Honiara to implement climate adaptation actions and to undertake capacity strengthening initiatives across multiple urban scales – community, ward and city-wide (including issues that cross the city-province boundary) – in order to strengthen the climate resilience of the city. The project builds on a knowledge platform that has already been established, most notably by a climate vulnerability assessment for the city (UN-Habitat, 2014)[2] and the subsequent Honiara Urban Resilience and Climate Adaptation Plan (HURCAP), which was launched by UN-Habitat and local and national government stakeholders in late 2016.[3] The HURCAP identifies water catchment planning (including sustainable use of groundwater resources) as a key strategy in the water and sanitation sector.

UN Food and Agriculture Organization. Under the Integrated Forest Management Project (IFMP), the FAO is currently supporting biodiversity conservation through: expansion, enhanced management and financial sustainability of the country's developing protected area (PA) network; sustainable and integrated landscape management; improved forest and natural resource management by local communities (e.g. including gender dimensions of non-timber forest product harvesting), and; the restoration and enhancement of carbon stocks in forest and non-forest lands. Proponents of the FAO project have signalled a willingness to support the GEF project. IFMP objectives are closely aligned and there is significant potential for collaboration. Specific opportunities include: PA establishment; biodiversity surveys; sustainable Financing (forest carbon); and sustainable land use planning and livelihoods.

New Zealand Ministry of Foreign Affairs and Trade (MFAT). MFAT's long-term objectives are to help the SIG: achieve a stable, resilient and socially cohesive society; grow the economy to enable prosperity and more equitable distribution of benefits; and deliver for all citizens and engage constructively in the region. MFAT is supporting the *Carbon Financed Forest Conservation Project* implemented by Live & Learn (NGO) to develop projects under the Nakau Programme. This project could assist with development of an enabling policy and financing environment that could benefit the GEF project

GIZ. Under the project *REDD+ Forest Conservation in Pacific Island Countries Phase 2*, GIZ is supporting the MoFR REDD+ Unit. The project is piloting forest carbon projects, including funding support to the Nakau Programme for the past 5 years through small technical assistance grants. Collaboration with the GEF project could include support for GIS / data access and technical support for forest inventory work.

Japan International Cooperation Agency. Under the *Capacity Development for Sustainable Forest Resource Management* project, JICA is implements pilot activities to promote sustainable forest management. Activities include: supporting good governance and collaboration in the forest sector; forest status baseline survey by drones; participatory land use assessment and planning; participatory forest inventory (NFI Pilot); training for participatory activity planning; and participatory value chain analysis.

Secretariat of the Pacific Regional Environment Programme. Under the *Pacific Ecosystems Based Adaptation to Climate Change Project* (PEBACC), SPREP helped establish the 5,000 Ha Barana Heritage and Nature Park, involving the Barana village community in the upper catchment of the Mataniko River. There is potential for collaboration on alternative livelihood options for people living in the Honiara catchment (e.g. eco-tourism), which could take lessons learned from the Barana Heritage and Nature Park.

[1] Consultants will cover a range of activities. For further details, refer to consultant TORs in the Project Administration Manual disclosed at <https://www.adb.org/sites/default/files/project-documents/51271/51271-001-pam-en.pdf>

[2] <http://unhabitat.org/books/honiara-solomon-islands-climate-change-vulnerability-assessment/>

[3] <https://reliefweb.int/report/solomon-islands/honiara-urban-resilience-climate-action-plan>

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.

1. Development strategy and policies

The project is guided by high level development policy and plans, notably the National Development Strategy (NDS) 2016-2035, the SIG's overarching development planning framework. This strategy contains five long-term NDS objectives, including Objective 4: *Resilient and environmentally sustainable development with effective disaster risk management, response and recovery*. The NDS also includes the following medium term strategies to be adopted to help achieve Objective 4:

- Medium Term Strategy 10: Improve disaster and climate risk management, including prevention, risk reduction, preparedness, response and recovery as well as adaptation as part of resilient development.
- Medium Term Strategy 11: Manage the environment in a sustainable resilient way and contribute to climate change mitigation.

Key initiatives that stem from the above strategies include: increasing risk awareness and knowledge; integration of risk management into public and private sector development planning; supporting community disaster and climate preparedness, protection and adaptation; strengthening preparedness for disaster response, recovery and reconstruction; improving programs to support environmental sustainability in the long term; and increasing support for climate change mitigation.

In line with these national policy documents, the Ministry of Lands, Housing and Survey completed the Greater Honiara Urban Development Strategy and Action Plan (GHUDS) in 2018. Supported by ADB, GHUDS has six strategic goals, including improving climate resiliency. One of the key strategies under this goal (Goal 2) is to promote an integrated watershed management approach to development. The GHUDS also identifies water supply and sanitation as a leading challenge and top priority for Greater Honiara and identifies that this challenge will be exacerbated by climate change. To meet this challenge, GHUDS recommends the implementation of the Solomon Water 30 Year Strategic Plan, 2017 – 2047. This project is central to implementing this Plan.

2. Forestry plans and strategies

There have recently been greater calls to find alternatives to unsustainable logging. Round log exports are increasingly seen to be an industry in decline due to unsustainable practices, underscoring the need to look at alternative industries to diversify the economy. This commitment is spelled out in various national-level strategies and policies.

The Forest Resources and Timber Utilization Act (2000) provides for the control and regulation of timber industries. Alongside the River Waters Act (1996), the Act provides the legal basis for integrated water resources management (IWRM) and integrated forest management in the Solomon Islands. The code of logging practice (2002) sets 13 priorities for regulation of logging activities. Its aim is ‘to ensure ecological and cultural functions including ecosystem services are maintained to its utmost effect. The priorities include:

- Environmental protection and sustainable forest developments;
- Protection of cultural, historical sites and spiritual significant areas;
- Proper harvesting, removing, scaling and grading of timbers and maximizing of benefits while minimizing waste;
- Ensuring that resources owners have received a fair return from their forest resources; and
- Ensuring compliance enforcements and monitoring as well as capacity building for local communities.

In addition, relevant sections of the Solomon Islands Reducing Emissions from Deforestation and Forest Degradation (REDD+) Roadmap 2014-2020 (sections 5-11) deal with: watershed protection; conservation of forest carbon stocks; customary rights; REDD+ safeguards; stakeholder engagement; financial management and benefit sharing; national forest monitoring; Reference Emissions Levels; and pilot activities.

The Solomon Islands Biodiversity Strategy and Action Plan 2016-2020 also includes the following relevant targets:

- Target 8: By 2020, reduce the current deforestation rate of native forest by industrial logging and agricultural development by 50%, restore 15% of fragmented logged areas and protect 10% of the remaining virgin forests, thereby enhancing the Solomon Islands forest ecology.
- Target 14: By 2020, ecosystems that provide essential services, particularly services related to water, its contribution to human health, livelihood and well-being, are restored and safeguarded, taking into account the needs of women, landowners, local communities, and the poor and vulnerable.

3. Climate change strategies and commitments

In response to the increasing knowledge associated with climate change and the need for climate adaptation and mitigation planning, the SIG has developed a National Climate Change Policy (2012 – 2017). The Policy recognized that climate change is a sustainable development issue that threatens the successful implementation and achievement of the NDS and places added burden on government resources. It also identified water supply and sanitation as a priority vulnerable area and stated that water resources are likely to be seriously affected by climate change.

The Solomon Islands Nationally Determined Contributions (NDC, 2015) focuses mostly on climate change mitigation and reducing GHG emissions. However, the following is also specifically noted the following:

“In the area around the capital city of Honiara a general decline per decade is occurring while the population is growing at a rate of approximately 6% per annum. To ensure adequate water supply for the growing population of the city, a robust and well enforced Integrated Water Resource Management strategy and programme needs to be put in place. Conservation and effective management of the forests surrounding Honiara is essential and increasing numbers of bore holes will need to be established over the coming years to supplement the Kongulai water source in the longer term. The proportion of annual rainfall from extreme rainfall has increased significantly which could result in longer drought periods in the dry season and more severe flooding.”

The Solomon Islands National Adaptation Programmes of Action (NAPA, 2008) identifies water supply and sanitation as one of five priority vulnerable areas. It also notes a lack of coordination and cooperation in the forestry sector. It calls for the following specific actions:

- Current forestry activities must be followed by reforestation and afforestation;
- Develop policy frameworks to protect mature forests to maintain carbon sinks;

- Utilize existing support projects to address climate change issues;
- Incorporate into the Forestry Licensing Procedures the requirement that is in the Environment Act for all timber enterprises to comply with requirements to obtain ‘development consent’;
- Develop a database on all environmental issues (past and present reports, studies and data) that are relevant to the Forest Sector;
- Liaise with the Ministry of Education to provide scholarships to study forestry and climate change impacts; and
- Incorporate climate change into relevant forestry courses in the School of Natural Resources.

4. Water-related plans and policies

The Solomon Islands Water Authority Act of 1992 established SW and outlined its management, such as the establishment of its Board of Directors and its functions and powers. Such functions and powers include the declaration of its area of operation, powers of entry to carry out works and the declaration of catchment areas.

SW Catchment Areas regulations were subsequently developed to protect water quality within some water supply catchments. The regulation prohibits certain undertakings within designated controlled catchment areas through such means as the control of pollution, wastes, pesticides, stock and other activities. This regulation applies to all catchment areas or parts thereof as identified in the corresponding schedule. The regulations have been poorly enforced and there are now many areas where there has been substantial development in contravention of the regulations. SW is now trying to improve its management of the catchment areas. However, in some cases, there has been too much development and Government is unlikely to support or enforce removal of the settlers in these areas.

SW’s 30 Year Strategic Plan (2017-2047) further stresses the importance of improved catchment management, including forest management, as a key measure to reduce the vulnerability of the water supply from Kongulai, and for safeguarding water quality for future water supplies, including from the Lungga catchment.

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.

1. Project level

All three outputs of Outcome 5 will involve significant knowledge generation, as described below and summarized in Table 9. KM deliverables will be developed and financed as part of the activities listed under each output.

The mapping and modelling work under Output 1 will provide an improved picture of the hydrological and ecological status and trends of the target watersheds for use by government policymakers under an improved planning and management framework developed as part of Output 2. The final model, methodology, and modelling results will be made available to the Catchment Management Group (established under Output 2) and key government stakeholders and technical staff as a key output of this work. Activities under Output 1 will also include capacity-building through training workshops to engender government uptake, and are also envisioned to result in publication of several academic papers, and possibly shared at international conferences, by the contracted research team at their own expense.

Under Output 3, there will be a strong commitment to education and learning by both project proponents and participants, thus fostering a better understanding of where the ‘worlds’ of local custom and culture meet that of improved catchment management and forest carbon finance. A strong commitment to “informed participation” by all participants is essential to enabling genuine and effective participation.

Table 9: Key Knowledge Management Deliverables and Timeline (Outcome 5)

Project Output	Key Deliverable	Timeline
Output 1	Hydrological and land-use impact model and methodology developed for Kovi/Kohove/Kongulai watersheds	Developed by end of year 2.
	Hydrological and land-use impact model and methodology developed for the upper-Middle Lungga River watershed.	Developed by end of year 3.
	Share initial mapping and modelling results with watershed communities and government stakeholders as part of consultations and engagement for piloting work.	Conducted in years 2 and 3.
Output 2	Catchment management group; inter-sectoral committee for knowledge sharing, coordination and planning	Established by end of year 1
	Catchment Management Plans; inter-sectoral plan designed to coordinate multiple- agencies contribution to sustainable catchment management	Developed by end of year 3

Output 3	Forest carbon finance subprojects in target watersheds. Includes: <ul style="list-style-type: none"> - Project description templates - PES agreement templates - Ecosystem measurement methodologies - Benefit sharing system - Planning templates (e.g. project scale land use plan, conservation plan) 	The pilots are generating carbon finance by the end of year 3.
Cross-cutting	Government and /or other key project stakeholder knowledge-sharing of significant project design elements and achievements at international events.	To take place in years 3 and 4.

Informed participation will be a crosscutting requirement spanning project activities and outcomes. Local participants (and in particular participant group representatives) must be able to make informed decisions concerning project design, planning, development and implementation. This will necessitate a process of education, which shall be implemented prior to and throughout the decision-making and planning process.

The following project activities under Outcome 5 (Output 3) will enable local participants to understand community-based activities (including forest carbon finance) to a level where their participation is genuinely informed and effective:

- Assess participant’s prior knowledge of the activity to determine perceptions, misconceptions and knowledge gaps, and establish a baseline for monitoring change in understanding. Investments in community education by the project proponent shall be tailored to participant needs.
- Implement a relevant education programme (e.g. series of participatory workshops) to increase understanding and address any misconceptions or knowledge gaps noted in the assessment of prior knowledge.
- Create opportunities for ‘both ways’ learning, whereby project proponents also increase their understanding of participant knowledge, perspectives and decision making processes
- Enable opportunities for customary / local processes of information exchange and learning to occur.
- Assess learning outcomes to measure against capacity benchmarks (see details below on capacity benchmarks).
- Provide opportunities for ongoing ‘informal’ (non-structured) learning to occur, throughout the project, as required.

The knowledge generated under piloting work for Output 3 will be developed specifically to prepare for scaling up of interventions – replication of forest carbon projects – across the watershed.

Finally, as part improving governance and management under Output 2, to help engender a sense of “ownership”, key government officials and/or other project representatives may attend to important regional environmental events to present progress on program work (all three outputs).

2. Regional knowledge sharing

At the regional level, ADB will help ensure that the knowledge and lessons generated through this project are captured and disseminated through direct and indirect measures throughout the Pacific. Within ADB, this can happen in various ways.

ADB is currently developing water supply and/or sanitation investment projects in a number of different countries in the Pacific. These include the other child projects in Vanuatu, Tuvalu and Kiribati. Information can be shared with these projects through the ADB offices in Fiji, Sydney and Manila (perhaps through study tours between countries); and also by sharing through ongoing ADB regional Technical Assistance projects, including: *Strengthening Climate and Disaster Resilience of Investments in the Pacific* and the *Pacific Disaster Resilience Program*.

The project will also explore other pathways for knowledge sharing, such as through:

- ADB’s partnership with Pacific Region Investment Facility (PRIF), a multi-agency coordination mechanism aimed at improving the delivery of development assistance from donors and development partners to the infrastructure sector in the Pacific region;
- Pacific-based events, such as through the Asia Pacific Adaptation Network Forum or the Pacific Water and Wastewater Association, for which ADB has provided long-term support;
- Coordination with regional knowledge-sharing hubs, potentially including SPREP’s formal database for knowledge sharing and past projects, the Australian Humanitarian Partnerships (AHP) Disaster READY knowledge hub;[\[1\]](#) and/or
- Other ad-hoc sharing events and knowledge products via ADB’s Urban, Water and Climate Change Sector and Thematic Groups.

With respect to the forest carbon PES element, the activities will generate project design documents and methodologies that will become publicly available through the international certification standards. Some project methodologies (such as carbon accounting) will become community commons and available for broader use. Where possible, the project will also use or adapt the Nakau Programme PES approach, which includes an online knowledge-sharing platform. The platform provides a space for sharing of project methodologies, toolkits, templates and data between project proponents licenced to operate under the programme within the Pacific. At this stage, this includes proponents in Fiji, Vanuatu, Solomon Islands and Samoa.

[1] AHP, a five-year (2017-2022) partnership between the Australian Government and Australian NGO, maintains a website, which contains useful information on disaster response and preparedness.

9. Monitoring and Evaluation

Describe the budgeted M and E plan

For both the baseline and LCDF activities, M&E is conducted in line with ADB's project administration instructions[1] and the GEF Monitoring and Evaluation Policies.

Overall project monitoring, evaluation, and reporting (applies to baseline and GEF/LDCF)

For the overall project (baseline and GEF), overall responsibility for day-to-day project monitoring and implementation rests with the Project Director at the PMU. The Project Director will develop quarterly and annual work plans and also ensure that all project staff maintain a high level of transparency, responsibility and accountability in monitoring and reporting project results. The PMU will organize one independent evaluation at the financial close of the program.

Under the supervision of SW and the Project Director, the PMU will be responsible for project activity monitoring and reporting on deliverables. The PMU will prepare biannual reports on progress of the project, implementation challenges, and the financial status. The following provisions for monitoring, evaluation and reporting are described in the Project Administration Manual for the Baseline project.

Project performance monitoring. The PMU will establish a project performance and monitoring system. ADB and the government will agree on a set of indicators for monitoring and evaluating to what extent the project achieving its goals and purposes. These indicators will be refined and monitored during project implementation. The indicators will include data for monitoring economic development, quality of urban services, socioeconomic development, environmental impact, and institutional development. Monitoring and evaluation will be based on gender-disaggregated data for social and poverty impact indicators.

The PMU shall monitor and evaluate the indicators according to the agreed framework on a quarterly basis to determine the efficiency and effectiveness of the project. Disaggregated baseline data for output and outcome indicators gathered during project processing will be updated and reported quarterly through the Ministry of Finance and National Planning quarterly progress reports and after each ADB review mission. These quarterly reports will provide information necessary to update ADB's project performance reporting system. Beneficiaries will be involved in project monitoring and evaluation. In addition, the project steering committee will oversee and monitor the overall implementation of the project.

Compliance monitoring. Compliance monitoring will be provided through regular quarterly progress reports and during regular ADB review missions.

Safeguards monitoring. The PMU will be responsible for monitoring safeguard activities through the project implementation assistance consultants composed of a Land Management Officer. SW will submit semi-annual safeguard monitoring reports to ADB, and the findings will be incorporated into the progress reporting of the PMU. Safeguard monitoring is included as a requirement of the environmental assessment and review framework (see safeguards section below).

Monitoring of the contractor's work will be undertaken by the resident engineer with assistance of the safeguards officer. For social safeguards, monitoring will include reporting on progress of activities in the implementation schedule with particular focus on public consultations, updating the resettlement plan, timeliness of payment of compensation and relocation, timeliness of the resolution of grievances, and level of satisfaction among the affected households. ADB review missions will also check the progress on implementation of safeguard requirements. If any subproject involved significant safeguard issues.

Gender and social dimensions monitoring. A social/community/gender/safeguards specialist to provide guidance to the PMU in developing and establishing an effective monitoring and reporting systems and processes. Baseline surveys will be undertaken at the start of project implementation and all indicators in the GAP will be continuously monitored and reported. These will be included in the PMU quarterly reports and project monitoring reports. A mid-term review will be carried out and a project completion report will be undertaken at project end.

Evaluation. ADB and the government will undertake semi-annual reviews of the project to consider the (i) scope of the project, (ii) implementation arrangements, (iii) compliance with grant covenants, (iv) physical achievements against targets and milestones, and (v) project implementation issues requiring resolution or action. ADB will also undertake a review midway through project implementation. Finally, ADB will undertake a project completion review (PCR) of the project after 12 and 24 months from physical completion date.

Reporting. SW will provide ADB with (i) quarterly progress reports in a format consistent with ADB's project performance reporting system; (ii) consolidated annual reports including (a) progress achieved by output as measured through the indicator's performance targets, (b) key implementation issues and solutions, (c) updated procurement plan, and (d) updated implementation plan for the next 12 months; and (iii) a project completion report within 6 months of physical completion of the project.

Outcome-level monitoring (baseline)

The project results framework (design and monitoring framework) in Annex 1 will guide monitoring at the overall project level. A number of steps/measures will be taken to monitor the five project outcomes (baseline and LDCF/GEF) as follows:

Outcome 1 (urban water supply) and Outcome 2 (urban sanitation services). To monitor the installation and operation of infrastructure (e.g. trunks, mains, pumps, meters, outfalls, water treatment plant), field verification will be undertaken and the completion certificate submitted to the contractor will be used for verification. The reporting on various indicators (e.g. volume of treated water, infrastructure developed) will also be accomplished through Solomon Water's annual report and asset management database.

Outcome 3 (hygiene and water conservation). Monitoring of this outcome will be done through various means, including: Hygiene awareness and education program semiannual monitoring reports; annual report of Ministry of Education and Human Resources Development; and Ministry of Health reports issued periodically.

Outcome 4 (Solomon Water sustainability). To help monitor the technical and financial sustainability of Solomon Water, the main source will be SW annual reports regarding the water tariff framework and staff capacity (technical, financial or operation and maintenance) disaggregated by gender).

GEF/LDCF Monitoring and Evaluation

Monitoring and evaluation will also be aligned to GEF Monitoring Policy (GEF/C.56/03/Rev.01, 2019) and GEF Evaluation Policy (GEF/ME/C.56/02/Rev.01, 2019). A Project Support Specialist (national consultant paid for under PMCs) will be responsible for preparing GEF monitoring products, including: i) collecting data related to LDCF core indicators; and ii) preparing annual PIR.

The mid-term review (MTR) will be conducted after Year 2, and Terminal Evaluation (TE) will be conducted by external specialists within the final 3-6 months of the project implementation period. A separate budget allocation for the MTR and TER has been provided (\$ 66,000). These GEF-related M&E costs will be distinct from the PMC.

Outcome 5 monitoring (under GEF/LDCF)

Due to the voluntary and participatory nature of Outcome 5, consistent with the principles of FPIC, the monitoring will be more extensive than the other project outcomes (as explained above).

Outcome 1 monitoring. As previously stated, Outcome 1 will involve extensive monitoring, including installing hydrological monitoring equipment in select locations to collect sufficient data to contribute to meaningful modelling and assessment of the water system. As a key part of their contract, a service provider will conduct the site selection, installation, and maintenance of this equipment.

Social baseline and annual monitoring (Outcome 5). As previously explained, activities in Output 3 will follow the participatory model developed by the Nakau Programme, which requires establishing a project intervention / social impact baseline and then measuring the change caused by the project intervention. Under the Nakau model, the monitoring will continue after the GEF funding period has ended and continue as standard practice.

During the GEF-funded period, the social impact survey and baseline will be repeated in the fourth year. The frequency of survey replication is proposed as three years to ensure there is sufficient time between surveys for change to occur. There is also recognition that survey work is labour intensive and can be disruptive to the daily lives of participants.

Annual monitoring of project impacts on participants will be conducted in between the social impact survey activities. Annual monitoring will examine similar parameters to those described above, but will be carried out at ‘low resolution’ relative to the social impact surveys. Annual monitoring will involve interviews with project participants at annual monitoring meetings. The data collected will be mostly qualitative, However, annual monitoring is considered very important and will be used to identify potential risks (e.g. conflicts or unintended impacts) that will be further investigated and used to improve project implementation.

The project will repeat the baseline survey in the final months of the project. It aims to target an improvement in the wellbeing indicators identified in the social impact baseline undertaken at the beginning of the project. Forest carbon finance projects should continue to monitor social impacts of the project for years after the project is established. Over time, it is anticipated that the majority of the wellbeing indicators within the social impact baseline should improve as regards the project.

Forest carbon PES project monitoring (Outcome 5). A measurement, reporting and verification (MRV) system is a required element for the certification of the forest carbon PES project developed under Output 3. This requirement is subject to criteria established by the chosen certification standard, which includes scope of monitored parameters, frequency of monitoring and verification of results (through independent audit). In practice the MRV requirement is very useful because it brings a strong commitment and discipline to monitoring. Monitoring is required to measure ecosystem services outcomes so that they can be attributed (issued) to a project. I.e. carbon credits are only issued upon acceptance of an approved, independently verified monitoring report.

The scope of MRV system will include ecosystem service outcomes (e.g. emissions reductions), in addition to social parameters such as social impact monitoring (against the baseline, see above), benefit sharing, participation in decision-making, and other non-carbon environmental parameters such as biodiversity indicators. The disciplined approach to MRV will allow qualification and reporting of outcomes due to the PES element of Output 3.

Table 10: Monitoring and evaluation plan for GEF/LDCF (costed)

Item	Cost	Financing
GEF/LDCF*		

Mid-term Review	\$22,000	LDCF
Terminal Evaluation	\$44,000	LDCF
Safeguards (environmental and social) specialist to undertake the safeguards due diligence for site-specific components and activities.	\$120,000	LDCF
Outcome 5 (Output 3): Social baseline and annual monitoring, with inputs from both the national and international NGO	\$50,000	
Outcome 5 (Output 3): Detailed forest carbon PES measurement, reporting, and verification	\$100,000	
Baseline** – Cost estimates for consultant packages that will include monitoring (e.g. project performance, compliance, safeguards, gender and social dimensions), evaluation, and/or reporting		
Project manager	\$520,000	Baseline for contracts that include M&E components.
Contracts Engineer	\$500,000	
Environmental Specialist	\$225,000	
Social Safeguards Specialist	\$220,000	
WASH Specialist	\$240,000	
Hygiene Awareness Program – Part A and B	\$2,000,000	
Project contract administration and supervision services	\$1,500,000	
Project monitoring and evaluation	\$225,000	
Data management including SCADA	\$500,000	

* Does not include costs for hydrological monitoring in Outcome 5 (Output 1).

**Based on procurement plan available at <https://www.adb.org/sites/default/files/project-documents/51271/51271-001-pp-en.pdf>

[1] Further details available online at <https://www.adb.org/sites/default/files/institutional-document/33431/pai-5-08.pdf>.

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)?

Direct benefits to communities. Community forest-carbon finance pilots will deliver direct benefits to the communities involved in the form of flows of carbon finance, capacity-building for business entrepreneurship, and development of sources of alternative livelihoods. During project development, communities will also be employed in riparian zone restoration employment.

A preliminary conservative (upper) estimate of average logging royalties received by communities for a 15-year logging rotation is around SBD530/ha/year. In comparison, forest carbon finance, after accounting for program management costs, can deliver around SBD554/ha/year once operational.^[1] Demonstrating that forest carbon finance sources can realistically compete with logging, not to mention the development of other alternative livelihood activities to augment this, has real potential to catalyze community interest and willingness to embark in pilots.

Economic co-benefits. Downstream communities will also benefit from reduced severity and frequency of flood damages and improved water delivery, due to improved climate resiliency and reduced turbidity as a result of upper watershed nature-based interventions. Improved access to a modern and reliable water supply (provided as part of overall project) will lead to significant time savings for large numbers of people – the saved time can be devoted to economic activities – and more economic opportunities for the many small enterprises that are dependent on a reliable water supply.

These benefits will accrue to the entire population of the Greater Honiara Area, a population projected to rise to an estimated 300,000 by 2047. As demonstrated in earlier sections, women are amongst the most vulnerable to impacts on the water sector, and the baseline and GEF funding are designed to (i) overcome these gender biased vulnerabilities and (ii) directly support women to benefit.

Health benefits. Generally speaking, by providing affordable, reliable access to clean water, the overall project will greatly improve social conditions for the population of the informal settlements, up to half of Honiara's population. This can mostly be seen in terms of health. Solomon Islands has a high incidence of waterborne disease. Diarrheal diseases are the sixth most common cause of deaths in Solomon Islands accounting for 4.1% of deaths (or 28.1 deaths per 100,000 people). The high incidence of waterborne disease can be primarily attributed to limited access to safe water and improved sanitation and poor hygiene awareness and behaviors. Moreover, although based on limited data, there is some evidence to suggest a correlation between flooding and water borne diseases. This project should play a key role in addressing these public health issues through the resilient supply of clean water and investments in sanitation (under the baseline project), thereby breaking the correlation between flooding and disease.

Gender-sensitive development impact. Currently women (and children) are the most vulnerable to inadequate water supply and they suffer disproportionately from related challenges. Particularly in the informal settlements, women are responsible for collecting water (from shallow wells or from water courses), and it is the women’s livelihoods that are most immediately impacted when the traditional water sources are damaged by the climate. They have to allocate more time, energy and household budget to obtaining fresh water, and they typically are more responsible for addressing any negative health impacts. Accordingly, the project will lead to disproportionately improved livelihoods for women in the informal settlements.

[1] Timber royalties calculated based on value of round log exports from the CBSI Annual Report 2018, combined with a ~15% royalty fee based on informal discussions with MOFR (royalties might be much lower), assuming timber yield of 40-50 m3/ha. Forest carbon finance estimates based on other forest carbon projects in the Solomon Islands (Nakau Programme), assuming a carbon price of US\$ 7.65/tonne, and net carbon credits/ha of 14.48.

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/Approval	MTR	TE
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.			

Environment. SW's environmental management capacity is limited, so an international and national environment specialist have been engaged through the baseline project. An initial environmental examination (IIE) and environmental assessment and review framework (EARF) were also prepared for the baseline project (the water treatment plant included).

This EARF provides guidance on: (i) pre-construction requirements; (ii) anticipated environmental impacts; (iii) suggested mitigating measures; (iv) environmental assessment documents preparation; (v) consultations and information disclosure; (vi) grievance redress mechanism; (vii) institutional requirements and capacity development, and (viii) monitoring and reporting.

Based on above, there is no need for further environmental assessment study, a full EIA is not warranted, and the Project is classified as Category B. The IEE provides environmental management plans (EMP) for each sub-project, recommending detailed steps, further studies required, expertise required, and capacity and institutional strengthening required. Adverse environmental impacts of the project will be site-specific, largely related to construction activities, which are expected to be minimal for land-based works and for which mitigation measures can be readily implemented.

In addition, a separate EARF was developed specifically for Outcome 5. The EARF provides a generic assessment of the types of activities and works included and their likely impacts on the physical, biological, and socio-economic resources and identifies measures to ensure potential environment impacts will be avoided or managed/reduced to acceptable levels. It also provides environmental assessment and review procedures, particularly related to the forest restoration activities. These pertain to: screening and site selection; environmental assessment, mitigation and management; and environmental monitoring and reporting. The EARF is attached as "evidence".

Involuntary resettlement. The project is classified as Category B for resettlement. For the baseline project and Outcome 5, separate resettlement frameworks (RFs) were prepared in accordance with ADB's Safeguard Policy Statement. The PMU, which includes a social safeguards specialist, will support SW in implementing these frameworks and provide safeguard capacity building to SW staff. Links to the RFs are provided here:

- **RF for baseline:** <https://www.adb.org/projects/documents/sol-51271-001-rf>
- **RF for Outcome 5:** <https://www.adb.org/projects/documents/sol-51271-003-rf>

Per the RF for Outcome 5, the PMU will screen each subproject to identify potential land acquisition and resettlement impacts, and enable the project to adopt measures to avoid, mitigate or minimize the impacts. A screening form will be completed after site visits, and, as relevant, in consultations with potential affected people to understand land use/ownership arrangements. Where the screening identifies that a subproject will require land acquisition and resettlement, a Social Impact Assessment (SIA) will be undertaken for the purposes of preparing a Resettlement Plan (RP).

Supporting Documents

Upload available ESS supporting documents.

Title	Module	Submitted
SOL UWSSSP Environmental Assessment and REview Framework	CEO Endorsement ESS	

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).

Project Results Framework

Impact the Project is Aligned with: Access to safe water and improved sanitation in towns increased (Solomon Islands Medium-Term Development Plan 2016–2020).			
Results Chain	Performance Indicators with Targets and Baselines	Data Sources and Reporting Mechanisms	Risks
Outcome	By July 2027:		

Efficiency, accessibility, climate change and disaster resiliency, and sustainability of safe water and sanitation improved in GHA, Auki, Gizo, Noro, Munda, and Tulagi towns.	<p>a. 16,500 households, including 12% headed by women use improved and climate- and disaster-resilient water supplies. (2019 baseline: 9,000)</p> <p>b. Nonrevenue water in GHA is reduced to 30%. (2019 baseline: 62%)</p> <p>c. 4,000 households (20%) in GHA are covered by sewer network. (2019 baseline: 1,000 households)</p> <p>d. 14,000 households (64%) in GHA, access improved on-site sanitation policies and fecal sludge management. (2019 baseline: 0 households)</p> <p>e. Sewage discharged from the sewer system complies with water quality standards in GHA. (2019 baseline: 0%)</p> <p>f. SW continues to recover its annual operation and maintenance costs, asset depreciation costs, and debt servicing costs from user charges and government community service obligation payments. (2019 baseline: 100%)</p> <p>g. 16,500 hectares of watershed area in GHA managed for improved climate resilience,</p>	<p>a. (i) SW annual report; and (ii) SW water production records released monthly</p> <p>b. (i) SW annual report; and (ii) Pacific Water Utility Benchmarking Report, Pacific Water and Wastewater Association, published annually</p> <p>c. (i) SW annual report; and (ii) Pacific Water Utility Benchmarking Report, Pacific Water and Wastewater Association, b published annually</p> <p>d. Honiara City Council Environmental Health Unit reports</p> <p>e. (i) SW annual report; and (ii) Pacific Water Utility Benchmarking Report, Pacific Water and Wastewater Association, b published annually</p> <p>f. (i) SW annual report; and (ii) SW annual audit reports,</p>	<p>Population growth of the greater Honiara area exceeds growth projections</p> <p>Work overload for SW finance unit if mainstream finance personnel is utilized for project implementation</p>
Outputs	By July 2027: <u>Selected subprojects</u>		

<p>1. Continuous, safe, and climate resilient urban water supply ensured</p>	<p>1a. The volume of treated water for the GHA increases by 5 MLD. (2019 baseline: 32 MLD)</p> <p>1.b. Improved quality and resiliency of water supply to Kongulai Spring through turbidity removal (2019 baseline: 58 shutdown days)</p> <p>1c. 11 km of new climate-proofed water trunks are installed and 2 new storage reservoirs of 12 million liters are built in GHA. (2019 baseline: 0)</p> <p>1d. Construction contractor personnel will comprise at least 20% women. (2019 baseline: 0%)</p> <p><u>Additional subprojects</u></p> <p>1e. 70 km of new water supply mains are installed, and 10 km of the existing water supply mains upgraded in GHA to ensure reliable delivery to households. (2019 baseline: 0%)</p> <p>1f. Three water supply systems upgraded in Auki, Noro and Tulagi towns. (2019 baseline: 0%)</p> <p>1g. Two new water supply systems built in Gizo and Munda towns. (2019 baseline: 0%)</p> <p>1h. 7,500 prepaid water meters installed in GHA and five towns. (2019 baseline: 0%)</p>	<p>1a – 1g. (i) SW annual report; and (ii) SW asset management database updated annually</p>	<p>Government and community commitment to improving water supply services and sanitation services wanes</p> <p>Monitoring of project expenditure, contractor payments, and auditing delayed as SW accounting systems do not incorporate project-specific accounting and financial reporting</p> <p>Delays in land acquisition result in delays in project implementation and result in cost and time overruns.</p>
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<p>2. Effective, efficient, safe, and climate resilient urban sanitation services provided in GHA.</p>	<p><u>Selected subprojects</u></p> <p>2a. Three ocean outfalls rehabilitated and a new outfall constructed.</p> <p>(2019 baseline: 0)</p> <p>2b. Six new sewer pump stations constructed and two sewage pump stations rehabilitated.</p> <p>(2019 baseline: 0)</p> <p>2c. New septage treatment facility (60 m³/day) constructed.</p> <p>(2019 baseline: 0)</p> <p>2d. Construction contractor personnel will comprise at least 20% women.</p> <p>(2019 baseline: 0)</p> <p>-</p> <p><u>Additional subprojects</u></p> <p>2e. 7 km new sewer pipes built.</p> <p>(2019 baseline: 0)</p>	<p>2a – 2e. (i) SW annual report; and (ii) SW asset management database updated annually</p>	
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<p>3. Awareness and behaviors of hygiene and water conservation in GHA and five towns enhanced and sustained</p>	<p><u>Selected subproject</u></p> <p>3a. 10,000 persons are reached directly with gender-sensitive awareness and behavior programs of hygiene and water conservation (disaggregated by gender), of which 70% are women. (2019 baseline: 0 persons)</p> <p>3b. At least 80% of children aged 5–15 years have improved awareness of hygiene and water conservation (disaggregated by gender) of which 50% are girls. (2019 baseline: less than 0%)</p> <p>3c. 3,000 women and girls are provided with menstrual hygiene training and products. (2019 baseline: 0)</p>	<p>3a. Hygiene awareness and education program semiannual monitoring reports</p> <p>3b. (i) Annual report of Ministry of Education and Human Resources Development; and (ii) Ministry of Health reports issued periodically</p> <p>3c. Hygiene awareness and education program semiannual monitoring reports</p>	
<p>4. SW is financially and technically sustainable</p>	<p><u>Selected subproject</u></p> <p>4a. Water tariff framework with regular review is set up and reviewed. (2019 baseline: 0)</p> <p>4b. All SW staff have updated knowledge on technical, financial or O&M (disaggregated by gender). (2019 baseline: 0)</p>	<p>4a. SW annual report</p> <p>4b. (i) SW annual report</p>	

<p>5. Management of Honiaria's watershed area strengthened to build resilience to climate change</p>	<p>5.a. New/improved information systems deployed to inform watershed management planning.</p> <p>5.b. Communities empowered to implement solutions for effective management, protection, and restoration of the forest and riparian habitats of the watershed.</p> <p>5.c. Interagency and inter-sectoral coordination and governance facilitated.</p> <p>-</p>	<p>5.a. Completed assessments on watershed biophysical and social boundaries, resources, and processes.</p> <p>5.b. 2 completed forest carbon payment for ecosystem services (PES) projects</p> <p>5.c. 2 catchment management plans developed</p>	<p>Continued erosion, land degradation and stream damage due to lag times in commencing land restoration works</p> <p>'Elite capture' of decision making or benefit sharing</p> <p>Inability to access carbon markets, insufficient demand for carbon offsets, or price inadequate.</p>
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Key Activities with Milestones

1. Continuous, safe and climate resilient urban water supply ensured

- 1.1 Increase water production capacity from 32 MLD to 35 MLD by 31 December 2025
- 1.2 Install equipment for coagulant dosing, flocculation, and clarification to remove turbidity at Kongulai Water Treatment Plant by 31 December 2025 (GEF financed)
- 1.3 Commission new trunk mains to service Mataniko–Panatina and White River (11 km) by 31 December 2025
- 1.4 Construct new water supply reservoirs at Titinge (6 ML) and Kola (6 ML) by 31 December 2025
- 1.5 Fully implement leak-detection repairs and metering programs by 31 December 2026
- 1.6 Construct 70 km of new water mains in Honiara by 30 June 2027
- 1.7 Upgrade provincial town water supply schemes to Auki, Gizo, Noro, and Tulagi by 31 December 2025
- 1.8 Commission and construct Munda water supply scheme by 31 December 2024

2. Effective, efficient, and safe urban sanitation services

- 2.1 Reduce sea outfalls from 15 to three and eliminate river outfalls by 31 December 2025
- 2.2 Rehabilitate two existing sewage pump stations, and construct 6 new pump stations by 31 December 2025

3. Enhanced sustained awareness and behavior of hygiene and water conservation in GHA and five towns

- 3.1 Deliver hygiene awareness program from June 2020 to June 2024

4. SW is financially and technically sustainable

- 4.1 Prepare and implement financial management policies including tariff management framework and tariff review process
- 4.2 Design and implement capacity building programs for SW staff including the on-the-job training
- 4.3 Design and implement preventative maintenance programs and asset management

Inputs	
Asian Development Bank:	\$28.0 million (concessional ordinary capital resources loan)
	\$9.0 million (Asian Development Fund grant)
European Union:	€18.0 million
World Bank:	\$15.0 million (concessional loan)
Government of Solomon Islands:	\$11.5 million (taxes and duties)
Solomon Water:	\$9.0 million
Global Environment Facility	\$4.59 million

HH = households; km = kilometer, GHA = the greater Honiara area, ML = million liters, MLD = million liters per day, O&M = operation and maintenance, SW = Solomon Islands Water Authority.

a Government of Solomon Islands. 2016. *Medium-Term Development Plan, 2016–2020*. Honiara.

Source: Asian Development Bank.

b Pacific Water and Wastewater Association. Annual benchmarking reports. Apia

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).

Response to Reviews

COMMENTS ON THE PROGRAM FRAMEWORK DOCUMENT (April/May 2019)	
GEF Secretariat comments on Program Framework Document (Review Sheet 18 April 2019)	
1. Specific information on project sites and actions to be supported by the LDCF	Provided in full in Request for CEO Endorsement document, with maps provided.
2. A detailed knowledge management plan, including how successes, best practice and failures can be shared and learned from, for various stakeholders, across each country and across the region	Provided in full in Request for CEO Endorsement document, notably in Knowledge Management section.
3. Detailed information on how the private sector will be engaged	See Private Sector Engagement section of the CEO Endorsement document.
4. Detailed information on stakeholder consultations and plans for continued engagement	Provided in full in Request for CEO Endorsement document. See Stakeholder Participation and Engagement Plan section and Annexes L and M.
5. The Gender Action Plan	Provided in full in Request for CEO Endorsement document. See Gender Equality and Women's Empowerment section and Annex N.
6. The CEO Endorsement stage CCA indicators for each child project	Provided in Request for CEO Endorsement document. See Annex A.
US Council Member Comments on Program Framework Document (comments made on 2 July 2019)	
(Urge ADB to) Continue to involve Pacific Region Infrastructure Facility (PRIF) as an institutional partner as PRIF has a strong working group in urban development and is a great repository of knowledge in this area.	See Knowledge Management section. ADB is a leading supporter for PRIF, and PRIF is an institutional partner of ADB in the Pacific. Specific partnership and collaboration arrangements will be developed on an activity basis during project implementation.

(Urge ADB to) Provide more specific details about activities being developed, including the activity to “enhance awareness of climate change issues.”	Provided in full in Request for CEO Endorsement document, notably in the Stakeholder Participation and Engagement Plan and Knowledge Management sections.
(Urge ADB to) Explain how you will work with Pacific countries who have already integrated climate change and disaster in both policy and institutional structures.	ADB is working with 15 Pacific nations, including on climate change adaptation and disaster. This is just one of many projects. This is explained further in Knowledge Management section.
(Urge ADB to) Expand upon how ADB will cross-reference the work outlined in this PIF with similar or related programs and projects that are being carried out by other implementers and / or funding, and how ADB will adjust this project to make sure that it is complimentary and not duplicative of ongoing activities.	ADB’s role in the project, including in knowledge management and in coordination, is explained in the Request for CEO Endorsement, particularly in the Institutional Arrangement and Coordination section and Knowledge Management section.
Provide more information on how beneficiaries, including women, have been involved in the development of the project proposal and will benefit from this project.	Provided in full in Request for CEO Endorsement document. See Stakeholder Participation and Engagement Plan section, Gender Equality and Women’s Empowerment Section and Annexes L & M.
Engage local stakeholders, including community-based organizations, environmental non-governmental organizations and the private sector in both the development and implementation of the program.	Explained in full in the Request for CEO Endorsement document. See Stakeholder Participation and Engagement Plan section, Private Sector Engagement section, and Annexes L&M.
Clarify on how the implementing agency and its partners will communicate results, lessons learned and best practices identified throughout the project to the various stakeholders both during and after the project.	Information is provided in the Request for CEO Endorsement document, notably in the Knowledge Management section and Stakeholder Participation and Engagement Plan section.
German Council Member Comments on Program Framework Document (comments made on 28 June 2019)	
Although the single components in section 1.a.4. are backed up by examples of activities and the LDCF intervention is thoroughly described, it is not completely clear which activities will be implemented and which organisation will carry out each single activity. Germany suggests shortening the general information with reference to what the LDCF will support and instead (or on top, if applicable) add more detailed information on the overall project design, including information on the activities’ enablers, outputs and outcomes. Regarding the outputs described in 1.a.4. Germany considers it particularly important that these are backed up by thorough information for the Child PIFs.	Provided in full in Request for CEO Endorsement document.
Germany welcomes the list of the ADB projects in the region up to 2017 and the tentative time line of up-coming projects, yet asks for additional information on how project activities will be coordinated with other organisations working on the same topics and region.	Provided in full in Request for CEO Endorsement document, notably in the sections on stakeholder participation and institutional arrangements.

Although the relation to crucial national strategies is well mentioned in the proposal, Germany welcomes the addition of contributions to other existing (international) conventions.	Section on Consistency with National Priorities mentions SI's climate change commitments.
In the proposal, private sector involvement in the project is mentioned, but mostly described in the form of ADB involvement in private sector development activities in the Pacific. Germany would appreciate if the focus would be directed more precisely to the proposed project. In this context, Germany would suggest to stress the interdependency of the proposed programme with the intervention fields of urban planning, improved housing design, incentives for private housing improvement, networked water management systems and provision of reticulated water to those most vulnerable.	See section on Private Sector Engagement. The project will explore creation of a catchment management fund that could raise funds from local private sector sources to finance livelihood and PES activities in the catchment. In addition, forest carbon PES finance development under the project will involve direct contracting with private sector buyers of forest carbon credits.
The PIF outlines several barriers on p.15. However it is not evident, how all of these barriers (e.g. Barrier 2) are addressed by the project. Germany suggests adding some additional information about how to overcome the barriers within the project. Similarly, the risk analysis highlights that 3 out of 4 types of risks are rated as "medium". In this context, Germany would welcome a more clear-cut explanation on how these risks are planned to be mitigated in the different country contexts.	Detailed information is provided on barriers in the CEO Endorsement document and also in Annex J. A detailed table on risks is provided in the Risk section (Section E).
With regard to the beneficiaries listed on p. 24, Germany suggests to include additional information on how the different types of beneficiaries are set to profit from project outcomes/ activities.	Detailed information is provided in the CEO Endorsement document proposal, notably in the section on stakeholders (Section B) and benefits (Section J).
Germany asks for the inclusion of the date of the Operational Focal Point endorsement letter as it is not displayed in the proposal and is a requirement in the PIF.	Noted
COMMENTS ON THE REQUEST FOR CEO ENDORSEMENT	
PENDING	

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

Not Applicable

ANNEX D: CALENDAR OF EXPECTED REFLOWS (if non-grant instrument is used)

Provide a calendar of expected reflows to the GEF/LDCF/SCCF/CBIT Trust Funds or to your Agency (and/or revolving fund that will be set up)

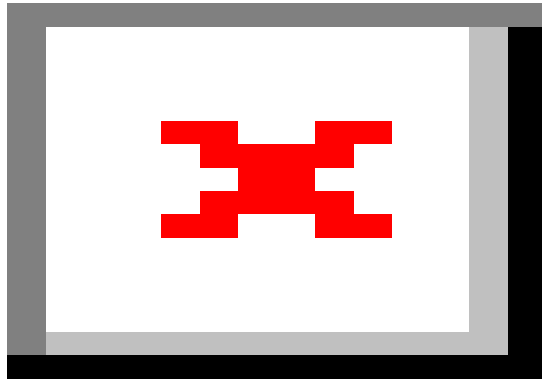
Not Applicable

ANNEX E: Project Map(s) and Coordinates

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

Project Maps

Map of Solomon Islands



Map of Guadalcanal (with coordinates)



Map of Honiara City and Greater Honiara Area



Boundaries of Aquifers in Greater Honiara Area

ANNEX F: Project Budget Table

Please attach a project budget table.

Appendix A: Indicative Project Budget Template

Expenditure Category	Expenditure	Detailed Description	Component (USD eq.)					Total (USD eq.)	Responsible Entity <i>(Excluding Entities receiving funds from the GEF Agency [1])</i>	
			Outcome 2	Outcome 5			M&E			PMC
			Output 2	Output 1	Output 2	Output 3				
Works	Forest restoration and protection	Labour (fencing)				37,000			37,000	Solomon Island Water Authority will be executing agency for all funds.
		Labour (weeding prep, blanking & maintenance)				51,000			51,000	
		Community rangers/watershed wardens				30,000			30,000	
Goods	Turbidity removal (amounts rounded)	Coagulant Dosing (tanks and pumps)	86,000						86,000	
		Flocculation tank	405,000						405,000	
		Four clarifiers	768,000						768,000	
	Forest restoration	Seedlings	120,000						120,000	
		Fencing	50,000						50,000	
Vehicles									0	
Grants/ Subgrants	Catchment community education and training fund	26 Scholarships				130,000			130,000	
Revolving funds/ Seed funds / Equity	Micro-enterprise seed funding	Support for 6 micro-enterprises				120,000			120,000	
Sub-contract to executing partner/ entity									0	
Contractual Services – Individual									0	
Contractual Services – Company	Service provider for mapping and modeling	Remote sensing and modeling work		40,000					40,000	
		Hydrological and forest cover data collection (includes field visits)		220,000					220,000	
		Mapping and modeling platform		50,000					50,000	
	Non-government organisation (locally-based)	Forest restoration (coordination and restoration expertise)				180,000			180,000	
		Forest carbon PES subprojects (community work)				155,000			155,000	
		External services (legal, auditor, anthropologist)				210,000			210,000	
		Alternative livelihoods and industry support				66,000			66,000	
		Social baseline and annual monitoring					30,000		30,000	
	Private sector PES subproject developer	Core team (to develop and implement PES subprojects)				345,000			345,000	
		Social baseline and annual monitoring					20,000		20,000	
		Detailed forest carbon PES measurement, reporting, and verification					100,000		100,000	
		Forest restoration coordination				21,000			21,000	
		Support to livelihoods activities				18,000			18,000	
International Consultants		Catchment governance							0	

