Initial Environmental Examination

October 2023

SOL: Renewable Energy Development Project

Prepared by Solomon Islands Electricity Authority for the Asian Development Bank.

CURRENCY EQUIVALENTS

As of 8 October 2023

The Solomon Islands dollar ('SBD') has been used in the Solomon Islands since 1977; prior to this time, the Australian pound sterling and subsequently the Australian dollar were used.

AU$1.00	=	SBD$5.41
SBD$1.00	=	AU$0.18

ABBREVIATIONS

AC	–	Alternating current
ADB	–	Asian Development Bank
BSAP	–	Biodiversity Strategy and Action Plan
BESS	–	Battery Energy Storage System
CCP	–	Communications and consultation plan (for the project)
CEMP	–	Construction Environmental Management Plan
CITES	–	Convention on International Trade in Endangered Species of Wild Fauna and Flora
DC	–	Direct current
DoE	–	Department of Environment
DDR	–	Due diligence report
ECD	–	Environment Conservation Division under the Solomon Islands' Ministry of Environment, Climate Change, Disaster Management and Meteorology
EEZ	–	Exclusive Economic Zone
EHSG	–	Environmental, Health, and Safety Guidelines (of the World Bank Group)
EIA	–	Environmental Impact Assessment
EMP	–	Environmental Management Plan
ENSO	–	El Niño Southern Oscillation
EPA	–	Environmental Protection Authority
ESCR	–	Environmental and Social Complaints Register
GDP	–	Gross Domestic Product
GFP	–	Grievance Focal Point
GHG	–	Greenhouse gas
GRC	–	Grievance Redress Committee
GRM	–	Grievance Redress Mechanism
ha	–	Hectare
IBA	–	Important Bird and Biodiversity Areas
IEE	–	Initial Environmental Examination
IUCN	–	International Union for Conservation of Nature
kW	–	Kilowatt
kWp	–	Kilowatt peak
MECDM	–	Ministry of Environment, Climate Change, Disaster Management and Meteorology
MoFT	–	Ministry of Finance and Treasury
MMRERE	–	Ministry of Mines Energy Rural Electrification
MWYCF	–	Ministry of Women, Youth, Children and Family
MWp	–	Megawatt peak
NDC	–	Solomon Islands Nationally Determined Contributions plan 2021

NDS	–	Solomon Islands National Development Strategy 2016 to 2035
NEP	–	Solomon Islands National Energy Policy (MMERE, 2019)
OHS	–	Occupational health and safety
PER	–	Public Environment Report
PPE	–	Personal Protective Equipment
PV	–	Photovoltaic
SEAH	–	Sexual exploitation, abuse, and harassment
SIEA	–	Solomon Islands Electricity Authority
SPS	–	Safeguard Policy Statement 2009 (of ADB)
SPREP	–	Secretariat of the Pacific Regional Environment Programme
SP	–	Solomon Power, trade name of the Solomon Islands Electricity Authority (Implementing Agency)
UNESCO	–	United Nations Educational, Scientific and Cultural Organization

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EXECUTIVE SUMMARY

The project. The Solomon Islands Government Ministry of Finance and Treasury (MoFT) will administer a grant from the Asian Development Bank (ADB) for the Solomon Islands Renewable Energy Development Project (SIREDP). The SIREDP will include subprojects on Guadalcanal and Malaita to increase grid stability through small-scale solar photovoltaic distributed generation and storage capacities and help transition Solomon Islands electricity generation from fossil fuel-based sources to renewable energy.

Solomon Power, as the implementing agency, will install a fixed-tilt, 1.0 MWp, ground-mounted solar photovoltaic (PV) array on 1.2 hectares of its land at Henderson, a 4 MW / 4 MWh Battery Energy Storage System (BESS) at the Honiara Power Station and a 5 MW / 20 MWh BESS at the East Honiara Substation. It will also install a solar hybrid system to augment the Auki electricity network on 4 ha of its land at Ambu, which will comprise a 1.5 MWp solar PV ground mounted array and 1.0 MW / 4.0 MWh BESS as well as auxiliary components such as electrical substation, switchboard, high-voltage distribution system and controls / communications. A solar schools program will also be piloted and will install 15 kW of rooftop solar PV panels and a 26 kW BESS at two schools, one in each of Guadalcanal and Malaita. The pilot program aims to improve electricity access in rural areas.

The subprojects will assist Solomon Islands to meet the goals of its National Energy Policy 2019 – 2030 (NEP) as well as its obligations under the Paris Agreement as outlined in the 2021 Nationally Determined Contributions (NDC) plan to reduce greenhouse gas emissions by 14% by 2025 below 2015 levels and by 33% below 2015 levels by 2030 compared to a business-as-usual projection.

Implementation arrangements. The Ministry of Finance and Treasury (MoFT) will be the executing agency for the project and Solomon Power (SP) will be the implementing agency. A Project Management Unit (PMU) will be established under the direction of SP and will report to the MoFT as required. A Project Implementation Consultant (PIC) will also be appointed.

Screening and categorisation. The SIREDP will create site-specific impacts which can be readily avoided or managed/mitigated and has been classified as Category B for environment following the ADB's Safeguard Policy Statement 2009 (SPS). A Category B project requires an environmental assessment commensurate with its level of impact, and this draft initial environmental examination (IEE) including a draft environmental management plan (EMP) has been prepared. The IEE also meets the requirements of an environmental assessment under Solomon Islands *Environment Act 1998*. The IEE will be (i) submitted to the Environment and Conservation Division (ECD) of the Ministry of Environment, Climate Change, Disaster Management and Meteorology (MECDM) as part of the approvals process under the Environmental Protection Act; and (ii) integrated into the bid and contract documents.

Potential Impacts. Environmental assessments have not identified any significant negative environmental impacts associated with the construction or operation of any of the proposed subprojects. Subproject 1b is located on land that is already cleared and Subproject 3 Will not require ground disturbance. Vegetation clearing is required for Subproject 1a and Subproject 2 however, ecological assessments have not identified any significant environmental values associated with either site. Potential construction impacts are considered to be readily managed. The subprojects will not result in any operational environmental impacts (e.g., air or noise emissions). Decommissioning will generate waste, including solar panels and lithium-ion batteries, that cannot currently be recycled in Solomon Islands. Unless a recycling facility is developed prior to decommissioning, solar panels and batteries will be transported to Australia for recycling.

The subprojects will not impact any species listed as critically endangered, endangered or vulnerable under the International Union for Conservation of Nature (IUCN) Red List nor any critical habitat as defined under the ADB's SPS.

Environmental Management Plan. Potential pre-construction, construction and operation impacts will be managed and reduced to acceptable levels through the implementation of the measures identified in the EMP. The IEE and EMP will be included in technical specifications and bidding documents. The IEE and EMP will be updated based on subprojects detailed designs. The recommended environmental mitigation measures will be incorporated into the design of the subprojects. Prior to construction works commencing, the successful construction contractor will prepare a construction EMP (CEMP) based on their methodology and construction approach that will be reviewed and approved by the Project Management Unit (PMU) (or a specialist consultant engaged on their behalf).

Consultation, participation and disclosure. Stakeholders have been consulted during the design of the project including government agencies and community members. Consultations will continue throughout project implementation as per the project's communication and consultation plan (CCP).

Grievance redress mechanism. At the start of project implementation, a grievance redress mechanism (GRM) will be established for the project and will be implemented through all stages of the project including pre-construction, design, construction and operation. A grievance redress committee (GRC) will be formed to help resolve complaints. The GRC will consist of two grievance focal points (GFPs), one for the subprojects on Honiara and one for Malaita, as well as a representative of the Ministry of Women, Youth, Children and Family (MWYCF), SP, contractor and IA. The GFPs will be chosen in consultation with Provincial Executive Committees in Honiara and Malaita. The GRM will separate the treatment of sexual exploitation, abuse, and harassment (SEAH) related complaints recognising the importance handling such complaints with urgency, sensitivity and maintaining the confidentiality of affected people. The public will be made aware of the GRM through information dissemination campaigns and orientation in the community prior to and during project construction and by the placement of signage, including information about the GRM and contact information, around the subproject sites.

Monitoring and reporting. Monitoring requirements are incorporated into the EMP. Monitoring will be carried out through all phases of the project development to ensure that the environmental mitigation measures are effective and that actual environmental impacts accord with predicted impacts and comply with environmental approval issued by the DoE and ADB safeguard requirements.

Safeguard implementation and compliance will be reported in contractor's monthly reports to SP, quarterly progress reports prepared by SP for MoFT and ADB, and semi-annual safeguards monitoring reports prepared by SP and submitted to the MoFT and ADB. ADB will disclose the monitoring reports.

Conclusion. This IEE has identified potential environmental impacts associated with the proposed subprojects. Measures required to mitigate or minimise impacts have been summarised in an EMP. Provided the mitigation measures outlined in the IEE and EMP are appropriately implemented, the subprojects are not expected to have any significant environmental impacts.

I. INTRODUCTION

A. Project Background

1. Solomon Islands is comprised of a scattered archipelago of islands located in the south-west Pacific to the east of Papua New Guinea and approximately 2,000 kilometres (km) northeast of Australia, as shown in Figure 1.1. With a total land area of 28,400 square kilometres (km^2) and a population of approximately 700,000 it is one of the largest countries in the Pacific region. Governance is administered nationally and through nine provinces and one Capital Territory.

2. Solomon Islands, like many Pacific Nations, has traditionally relied on imported fossil fuels for electricity generation. The high dependence on imported fossil fuel (equivalent to about 6% of the gross domestic product and 20% of total imports) is reflected in high electricity tariffs (average over USD$0.80 per kilowatt-hour in 2020[1]), and energy access remains one of the lowest in the Pacific. This has led the development of policies aimed at increasing electricity access and increasing renewable energy generation. Most recently this has been articulated in the Solomon Islands National Development Strategy 2016 to 2035 (NDS)[2] and Solomon Islands National Energy Policy (NEP) (MMERE, 2019). The NDS emphasises increasing access to affordable and clean energy whilst the NEP includes targets to increase access to electricity and to increase the use of renewable energy sources for power generation.

3. Increasing renewable energy generation is also key to Solomon Islands commitments to reduce greenhouse gas emissions with approximately 39% of emissions resulting from combustion of imported fossil fuels for electricity generation. Solomon Islands is a signatory of the 2016 Paris Agreement. The first Nationally Determined Contributions (NDC)[3] plan under the agreement was submitted in 2021 and contained updated commitments to reduce emissions by 14% by 2025 below 2015 levels and by 33% below 2015 levels by 2030 compared to a business-as-usual projection. With further international assistance emissions can be further reduced and the Solomon Islands can commit to net zero emissions by 2050.

4. The Asian Development Bank (ADB) established the Preparing Clean and Renewable Energy Investments in the Pacific technical assistance (TA) project (TA 6826) in 2021. The TA project will enable the development of renewable energy generation by supporting due diligence, providing project preparation and procurement support, capacity building and policy recommendation for a series of the projects in the Federated State of Micronesia, Marshall Islands and Solomon Islands.

5. The Solomon Islands - Renewable Energy Development Project (SIREDP) is a component of TA 6826 and aims to assist the development of Solomon Island's optimised investment plan for increased solar photo voltaic (PV) generation and grid stability with emphasis on the small-scale distributed generation and storage capacities.

6. **Implementation arrangements.** The Ministry of Finance and Treasury (MoFT) will be the executing agency for the project and Solomon Power (SP) will be the implementing agency. A Project Management Unit (PMU) will be established under the direction of SP and will report to the MoFT as required. A project implementation consultant (PIC) will also be appointed.

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[1] https://openjicareport.jica.go.jp/pdf/12341525_01.pdf

[2] https://solomons.gov.sb/wp-content/uploads/2020/02/National-Development-Strategy-2016.pdf

[3] https://unfccc.int/sites/default/files/NDC/2022-06/NDC%20Report%202021%20Final%20Solomon%20Islands%20%281%29.pdf

Figure 1.1: Map Showing Location of Solomon Islands

B. Objectives and Scope of IEE

7. This document provides an initial environmental examination (IEE) of the SIREDP. The IEE has been prepared following the requirements of the ADB's Safeguard Policy Statement 2009 (SPS)[4] and the laws of Solomon Islands.

8. The overall objective of the assessment process is to identify impacts associated with the project and measures to avoid, minimise/mitigate or compensate for them. The objectives of the IEE are to:

- Identify and describe the existing environmental conditions—physical, biological and socio-economic—in the subproject areas including the identification of critical habitat (as defined in SPS) potentially impacted by the project.
- Assess the proposed location, design, construction, and operation activities to identify and evaluate their potential impacts (positive and negative) and determine their significance.
- Propose appropriate mitigation and monitoring measures that are incorporated into an environmental management plan (EMP) that will avoid or minimise adverse impacts so that residual impacts are reduced to acceptable levels.

[4] ADB. 2009, Safeguard Policy Statement (Manila, Philippines)

- Consult with stakeholders on the potential impacts and understand the issues and concerns about the impacts and how they might be affected.
- Ensure that all statutory requirements for the project such as applicable legislation and regulations, permits required (if any) and policies have been identified.

9. The scope of the IEE includes the construction footprint of the subprojects as well as the potential area of influence of the subprojects such as potential materials sourcing, haulage routes etc to ensure that secondary or indirect impacts can be identified and managed.

10. The IEE is based on primary sources of information derived through field observations and consultations during site visits and secondary sources of information available in relevant reports and databases.

II. LEGAL AND POLICY FRAMEWORK

C. Legal and Policy Framework of Solomon Islands

11. **Institutional arrangements for environmental protection**. Environmental impact assessment in Solomon Islands is regulated by the ***Environment Act 1998*** (Environment Act) and the accompanying ***Environment Regulation 2008*** (Environment Regulation). The Environment Conservation Division (ECD) of the Ministry of Environment, Climate Change, Disaster Management and Meteorology (MECDM) administer the Environment Act and Environment Regulations.

12. **Legal framework.** The objectives of the Environment Act are to:

- *provide for and establish integrated systems of development control, environmental impact assessment and pollution control.*
- *prevent, control and monitor pollution.*
- *reduce risks to human health and prevent the degradation of the environment by all practical means.*
- *comply with and give effect to regional and international conventions and obligations relating to the environment.*

13. The Environment Act is comprised of 5 parts. Relevant to the SIREDP Part 3 of the Environment Act establishes a development consent process for all 'prescribed developments' which includes assessment of potential environmental impacts through either a public environmental report (PER) or environmental impact statement (EIS). The second schedule of the Environment Act lists prescribed developments. Part 4 of the Environment Act makes it an offence to emit pollution including, noise, odour or electromagnetic interference, that may impact people or the environment. Part 4 also establishes licences for the emission of pollution from prescribed premises. Part 1 states that in the event of a conflict between the Environment Act and other Acts, the provisions of the Environment Act shall prevail.

14. The Environment Regulations describe the process required to obtain development consent for a prescribed development as well as to obtain a licence for the emissions of pollutants from a prescribed premises.

15. The ECD have develop the Environmental Impact Guidelines; Solomon Islands[5] to provide guidance to government agencies, developers and resource owners on the environmental impact assessment process prescribed under the Environment Act and Environment Regulations.

16. The environmental impact assessment process, as summarised in the Environmental Impact Guidelines; Solomon Islands, is reproduced in Figure 2.

17. It is likely the that subprojects would be considered as prescribed development under Schedule 2 of the Environment Act (9(b) Public Works – Infrastructure). As a prescribed development SP would be required to submit a proposal application accompanied by either a PER or EIS. The Environment Act also contains the provision to waive the requirement for an

[5] https://library.sprep.org/content/environmental-impact-assessment-guidelines-solomon-islands

EIS/PER (Sec 17(4,5)). Consultation with ECD will continue to determine the environment impact assessment process for each subproject.

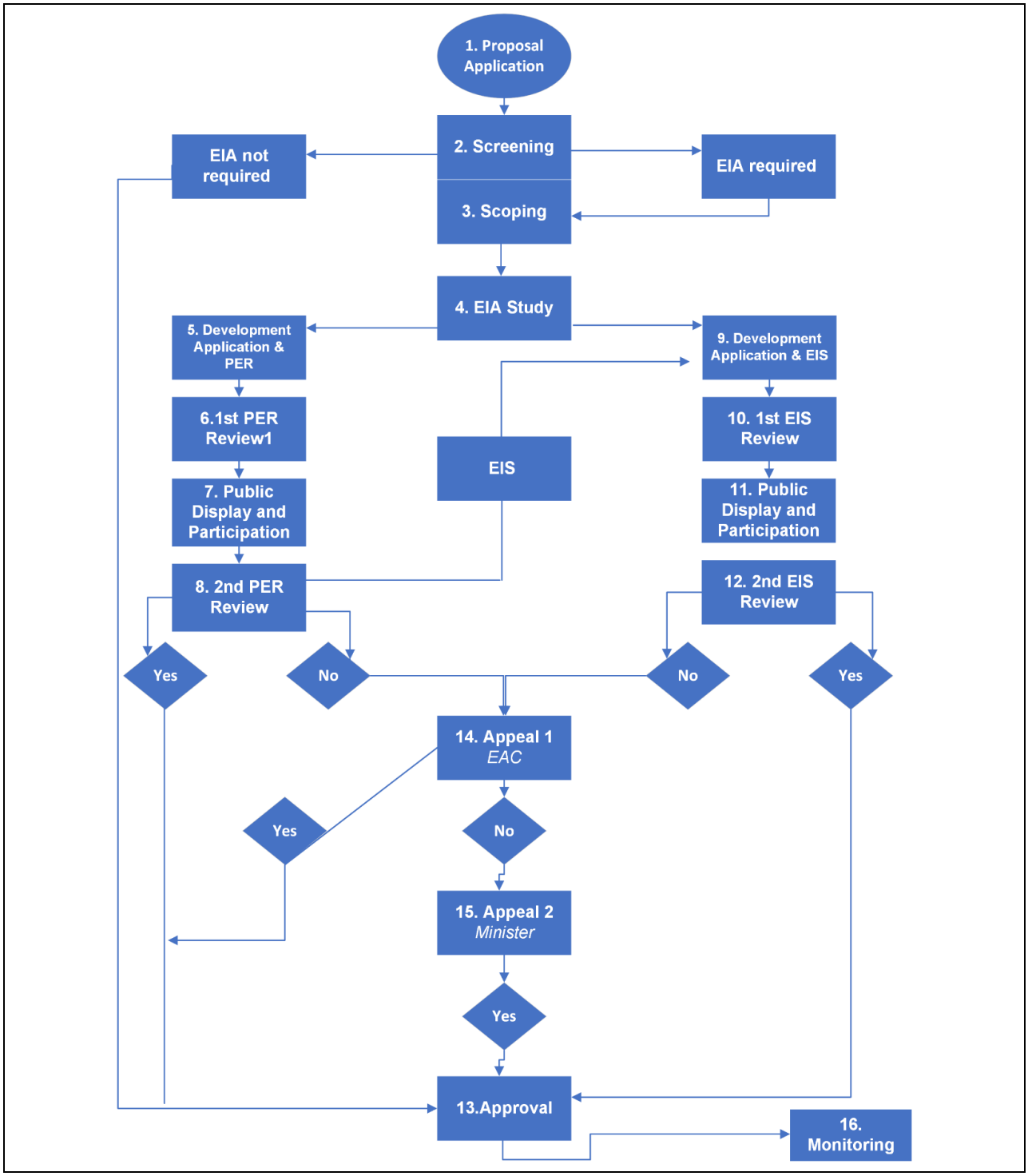

Figure 2.1: Procedural steps of an EIA. (Source: MECM,2010, Environmental Impact Assessment Guidelines 2010.)

18. **Other relevant legislation**. The ***Town and Country Planning Act 1980*** provides for the administration, control and regulation of land development in the Solomon Islands. It establishes town and country planning boards in each province and in Honiara, local planning areas and local planning schemes and set outs requirements for permission to develop or change the use of land through application to the relevant town and country planning board. Subprojects 1a and Subproject 1b (East Honiara Substation) fall within the Henderson Local Planning Scheme and Subproject 1b (Honiara Power Station) within the Honiara Local Planning Scheme. Subproject 2 is captured by the Auki Local Planning Scheme. Development approval will be required from both the Guadalcanal and Malaita Provincial Government Town and Country Planning Boards.

19. The ***Provincial Government Act 1997*** establishes an elected Provincial Assembly for each province of Solomon Islands and gives power to the assembly to enact laws and pass ordinances. Ordinances relevant to the SIREDP include the Malaita Province Wildlife Management and Licensing Ordinance 1995, the Malaita Province Management Area Ordinance 1990 and the Guadalcanal Province Wildlife Management Area Ordinance 1990 (GPWMAO).

20. The ***Land and Titles Act 1988*** (last amended 2018) defines land tenure in Solomon Islands and enables the purchase or lease of land titles. Under the Land and Titles Act 1988 Customary Land is dealt with under separate provisions that recognise customary usage.

21. The ***Protected areas Act 2010*** enables the Government of Solomon Islands to declare any area to be a protected area *of biological diversity significance* subject to the consent of landowners including customary owners.

22. The ***National Parks Act 1978*** provides for the establishment of National Parks and restricts the use of areas declared as National Parks. Queen Elizabeth II National Park on Guadalcanal is the only National Park in the Solomon Islands and is maintained in name only.

23. The ***Wildlife Protection and Management Act 1998*** provides for the conservation, management and protection of wildlife in Solomon Islands. It regulates the export and import of wildlife ensuring compliance to obligations set under the Convention on International Trade in Endangered Species (CITES).

24. The ***Forest Act 1999*** provides for the ecologically sustainable management of forest resources including promotion of commercial timber industry and conservation of ecological processes and genetic diversity. It makes provisions for the control of harvesting, processing, marketing and export of timber as well as for forest access rights. The *Forest Act 1999* repealed the ***Forest Resource and Timber Utilization Act of 1991*** however, it has yet to be gazetted and so is unenforceable. The ***Forests Bill 2004*** is plans to repeal both the *Forest Act 1999* and *Forest Resource and Timber Utilization Act of 1991* however, the Bill has yet to pass parliament.

25. The ***Bio-Security Act 2013*** regulates the movement of animals, plants and their products to and within Solomon Islands to control the entry, establishment and spread of animal and plant pest and diseases. It establishes biosecurity border controls as well as import, export and quarantine procedures.

26. The ***Safety at Work Act 1996*** establishes the duty of every employer to provide a safe workplace and to ensure the health and safety at work of its employees.

27. The ***Electricity Act 1996*** establishes the Solomon Islands Electricity Authority (SIEA) and, via associated regulations, provides for the SIEA as the responsible authority for the generation, transmission, distribution and sale of electrical energy throughout Solomon Islands.

28. **Policy framework**. The aim of the **National Environment Management Strategy 2020-2023 (NEMS)**[6] is to maintain sustainable development in the Solomon Islands. The NEMS is aligned with other government plans and policies and is intended to coordinate and promote collaboration amongst stakeholders. The NEMS follows the 7 themes of the Solomon Islands State of the Environment Report[7] and outlines strategies, targets and performance indicators for each theme. Further investment in renewable energy and the setting of targets on renewable energy interventions in energy policy are included in the NEMS.

29. The **National Biodiversity Strategic Action Plan 2016-2020**[8] (NBSAP) is designed to implement existing Acts and regulations and to provide environment protection for development. It supports other policies, particularly the National Development Strategy (see below). The NBSAP identifies four strategic goals broadly aimed at reducing the loss of biodiversity, enhancing the protection and restoration of biodiversity and equitable sharing of benefits derived from biodiversity. To achieve these goals action plans have been developed containing targets and indicators.

30. The vision of the **Solomon Islands National Development Strategy 2016–2035**[9] (NDS) is Improving the Social and Economic Livelihoods of all Solomon Islanders. To achieve this vision the NDS sets out five long term objectives together with medium term strategies to meet these objectives. The NDS prioritises expanding and upgrading climate resilient infrastructure to achieve the long-term objective of inclusive economic growth and to improve climate risk management to achieve the long-term objective of resilient and environmentally sustainable development with effective disaster risk management, response and recovery. The NDS recognises the importance of renewable energy development to achieving sustainable economic growth and sets the development of renewable energy resources as a priority medium term action. The NDS is consistent with the NDC.

31. The Solomon Islands **National Energy Policy, 2019** (NEP) (MMERE, 2019) aims to support the NDS by providing an enabling platform to support increased access to reliable, affordable and clean sources of electricity. The NEP recognises the key role the energy sector can play in achieving the NDS aims of poverty alleviation, access to better health care and education services, and improving the standard of living and livelihoods of communities. The NEP sets goals for access to electricity in rural and urban areas and for increase in renewable energy sources for power generation.

32. Solomon Islands developed a **Renewable Energy Strategies and Investment Plan 2014 to 2019**[10] (RESIP) with the objectives of; providing guidance in utilising renewable energy

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[6] Solomon Islands Environment Data Portal | Environmental Information for Decision Making (sprep.org)

[7] https://solomonislands-data.sprep.org/dataset/state-environment-report-2019

[8] https://pacific-data.sprep.org/dataset/solomon-islands-national-biodiversity-strategic-action-plan-nbsap-2016-2020

[9] Solomon Islands Environment Data Portal | Environmental Information for Decision Making (sprep.org)

[10] https://policy.asiapacificenergy.org/sites/default/files/re_strategy-investment_plan.pdf

potential, identify and provide plans to supply unelectrified households with renewable energy and to provide policy guidance and instruments to enhance the use of renewable energy resources. The RESIP set a target of 50% renewable energy use for power generation by 2020 which was to be achieved through the Tina River Hydropower Development and Savo Geothermal projects.

33. The **Climate Change Policy 2012 - 2017**[11], aims to provide a strategic framework to address climate change. The policy is linked to other international and regional climate change strategies and is aligned with the NDS. A range of commitments, principles and strategies are described to achieve the policies vision of *a resilient, secure and sustainable Solomon Islands responding to climate change*. An updated Climate Change Policy 2022 – 2026 is currently under review and due to replace the older policy.

34. The formulation of the **National Waste Management and Pollution Control Strategy 2016-2024**[12] (NWMPCS) is part of the ongoing efforts in Solomon Islands to address the issue of waste and pollution. The strategy has 11 objectives broadly aimed at minimising and effectively managing waste and includes the management of e wastes such as batteries. The NWMPCS adopts the “Polluter Pays Principal", the “Sustainable Development Principal" and the “Extended Producer Responsibility Principal" as Guiding Principles.

35. **International agreements and conventions**. Solomon Islands has ratified numerous environment-related international and regional commitments and remains in general compliance with the spirit of such commitments (Table 2.1).

D. ADB Safeguard Policy Statement

36. The goal of the ADB’s SPS is to promote the sustainability of project outcomes by protecting the environment and people from any potential adverse impacts of the project.

37. The objectives of the SPS are to: (i) avoid adverse impacts of projects on the environment and affected people, where possible; (ii) minimize, mitigate, and/or compensate for adverse project impacts on the environment and affected people when avoidance is not possible; (iii) help borrowers/clients to strengthen their safeguard systems and develop the capacity to manage environmental and social risks.

38. The SPS contains three safeguard requirements; SR1: environment, SR2: involuntary resettlement and SR3: indigenous peoples. Each of the safeguard requirements comprises an objective, scope and triggers, and a set of policy principles that must be met. Each of the safeguard requirements follows a due diligence process of screening, categorization, scoping, consultation, impact assessment, management, and monitoring and reporting. Documentation of the due diligence is subject to disclosure as per the requirements of the Public Communications Policy 2011.

39. ADB will not finance projects that do not comply with the SPS and the host country’s social and environmental laws and regulations, including those laws implementing host country

[11] https://www.adaptation-undp.org/sites/default/files/downloads/solomon_islands-national_climate_change_policy.pdf

[12] https://library.sprep.org/sites/default/files/solomon-islands-national-waste-management-pollution-control-strategy-2017-2026.pdf

obligations under international law. The SPS also contains a prohibited activities list identifying specific activities that ADB will not finance.

40. As per SR1, the SIREDP has been screened as Category B i.e., its potential adverse environmental impacts are less adverse than those of Category A projects. These impacts are site-specific, few if any of them are irreversible, and in most cases mitigation measures can be designed more readily than for Category A projects. This IEE identifies as far as practicable the various components of the project and assesses the potential adverse environmental impacts and identifies the measures required to mitigate or minimize them and includes these in the EMP.

Table 2.1: International agreements and conventions (adapted from Islands State of the Environment Report 2008[13])

International and Regional			
Chemicals, Wastes and Pollution			
Biodiversity			
Climate			

[13] https://www.sprep.org/att/IRC/eCOPIES/Countries/Solomon_Islands/49.pdf

III. PROJECT DESCRIPTION

A. Rationale

41. The Solomon Islands NEP (MMERE, 2019) provides policy direction and strategies for improving the effectiveness of the Solomon Island energy sector and achieving Solomon Islands NDS through increased access to reliable, affordable and clean sources of electricity. The NEP includes the following aims:

- Increase access to electricity in urban households to 80% by 2025.
- Increase access to electricity in rural households to 35% by 2025.
- Increase the use of renewable energy sources for power generation in urban and rural areas to 50% by 2035.
- Improve energy efficiency and conservation in all sectors by 10% by 2030.

42. Through the NDC plan submitted in 2021 as part of its obligations under the Paris Agreement Solomon Islands has committed to reduce greenhouse gas emissions by 14% by 2025 below 2015 levels and by 33% below 2015 levels by 2030 compared to a business-as-usual projection. With international assistance a further 27% reduction in emissions by 2025 and 45% reduction in emissions by 2030 could be contributed together with achieving net zero emissions by 2050.

43. Solomon Islands proposes to achieve emissions reductions committed to in the NDC primarily through the development of new renewable energy generation, including solar PV.

44. A Renewable Energy Roadmap (RERM)[14] was developed in 2021 that provides a framework to convert 100% of Honiara's electricity gird to renewable energy by 2030. The RERM identifies solar photo voltaic (PV's) and battery energy storage systems (BESS's) as the only renewable energy resources that can feasibly be developed to meet this aim.

45. The SIREDP will assist the Solomon Islands meet the goals of its NEP as well as its obligations under the Paris Agreement as outlined in the 2021 NDC plan. The subprojects proposed as part of the SIREDP will increase renewable energy generation in Honiara, in alignment with the RERM, and also increase renewable energy generation in Malaita as well as increasing access to electricity in both Guadalcanal and Malaita.

[14] https://openjicareport.jica.go.jp/pdf/12341525_01.pdf

E. Proposed Works and Activities

46. Three subprojects have been identified in Solomon Islands as outlined in Table 2.

Table 3.1: Solomon Islands subprojects proposed composition.

Subproject
Subproject 1 Honiara
1a – Henderson solar farm
1b – Honiara batteries
Subproject 2 Ambu solar hybrid
Subproject 3 Solar schools' pilot

47. **Subproject 1** – Honiara. Solar PV and battery projects will be installed at three locations in Honiara, Guadacanal as shown in Figure 3.1. The total capacity of solar PV installed will be approximately 1.0 MWp and the battery capacity will be approximately 9 MW with 24 MWh of storage. All sites are within the boundaries of the Honiara electricity grid allowing relatively straight forward electrical connections via use of existing infrastructure.

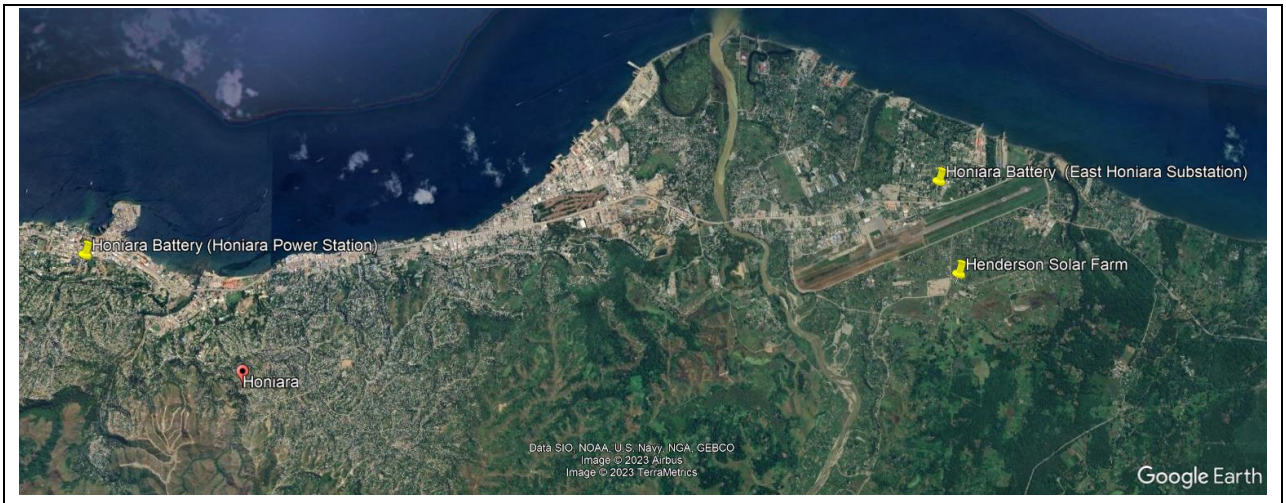

Figure 3.1: Map showing locations of Subprojects 1a to b.

48. **Subproject 1a** – Henderson ground mounted solar (Figure 3.2). An approximately 1.0 MWp ground-mounted solar photovoltaic (PV) array on 1.2 hectares of land owned by Solomon Power and is located approximately 600 metres from the Honiara International Airport. The land is currently fenced and secured with restricted access to the public. The solar farm is surrounded by several residential properties within a 50 - 100 metre proximity. The solar farm will connect to an adjacent 11kV overhead power line located either within the project boundary or within close proximity.

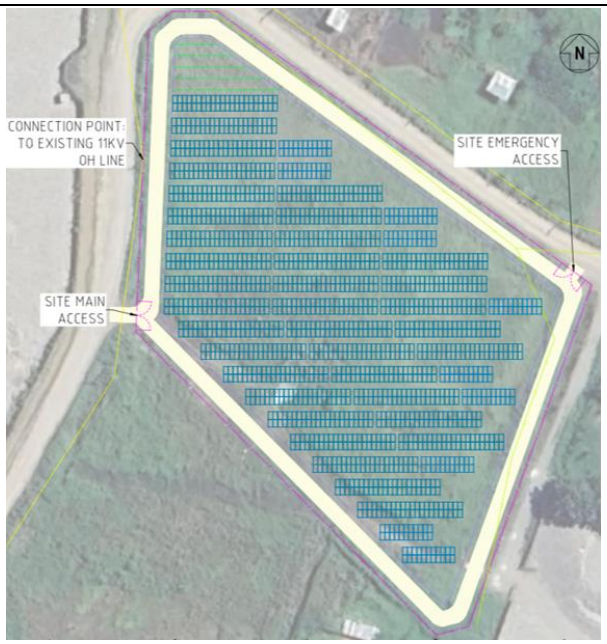

Figure 3.2: Map showing locations of Subproject 1a (Henderson Solar farm)

49. **Subproject 1b** – Honiara batteries (Figure 3.3). A unit with an approximate 4 MW power rating and 4 MWh of storage capacity would be co-located within the existing Solomon Power owned and operated Honiara Power Station. The battery will be located within the 0.8-hectare land parcel and installed directly adjacent to an existing 11kV switchboard where electrical integration will occur. To avoid flood inundation from a nearby creek, the battery will be raised to a sufficient height from the ground. Several residential properties within 50 metres currently surround the Honiara Power Station.

50. A second unit with an approximate 5 MW power rating and 20 MWh of storage capacity would be co-located with the Solomon Power owned and operated East Honiara Substation. The battery will be integrated into existing switchboard.

51. Both Honiara batteries will be modular and it is possible that either battery will be relocated in the future. A checklist has been included in Annex 1 to guide the selection of potential future sites in compliance with ADB's SPS. The checklist will be completed, including input and evidence from relevant experts demonstrating compliance with all requirements, prior to relocating the battery.

Figure 3.3: Map showing locations of Subproject 1b (Honiara Batteries)

52. **Subproject 2** – Ambu Solar Hybrid (Figure 3.4). Subproject 2 will install a solar and battery hybrid system approximately 3.0 km south-east of the Auki town centre in Malaita Province. The solar and battery components will be installed on 4 hectares of land owned by Solomon Power, with an additional 0.15 hectares of land also procured to host construction and operational access as well as overhead power lines from the site. The solar hybrid system will further augment the Auki electricity network by connecting into an existing 11kV overhead power line via use of nearby public road easement. The subproject will include a 1.5 MWp solar PV ground mounted array and 1 MW / 4.0 MWh battery system storage as well as auxiliary components such as electrical substation, switchboard, high-voltage distribution system and controls / communications.

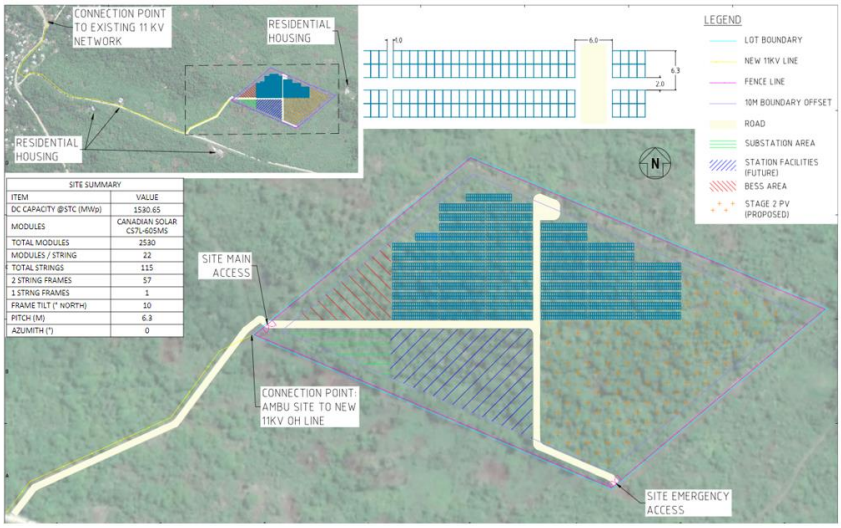

Figure 3.4: Map showing locations of Subproject 2.

53. **Subproject 3** – Solar schools pilot. This subproject will pilot rooftop solar photovoltaic generation on two schools, one in Guadalcanal and one in Malaita. To ensure compliance with ADS SPS in the selection of pilot schools a checklist has been developed and is contained in the SIREDP Poverty, Social and Gender Analysis.

The subproject will deliver expected benefits to social services where access to electricity is not readily accessible. Solar school systems will consist of approximately 15 kW of solar PV panels, a 26 kW BESS and associated inverters or charge controllers. The systems will be simple standalone, self-contained roof mounted systems, with inverters and BESS enclosures to be mounted within the building itself. The systems will be connected to each buildings wiring system.

54. **Project components**. A description of the anticipated key components of the subprojects are provided below.

55. Solar PV arrays:

- Fixed-tilt solar PV arrays are recommended as they are a low-maintenance technology with a strong track record in island electrical grids. Solar PV modules will be modern, high-quality panels with a temperature / loss co-efficient suitable for the climate of Solomon Islands. All fixed tilt solar PV systems are either directly piled, screwed or concrete cast into the ground.
- Solar PV module mounting: For sub project 3, solar PV modules will be installed on a pre-manufactured solar PV array mounting system constructed of stainless steel, anodised aluminium and/or galvanised steel mounted directly to the timber or steel roof sub-structure through use of traditional fasteners.
- Solar PV Inverters: Solar PV string inverters will be installed within the solar PV array to convert direct current (DC) electricity produced by PV panels to alternating current (AC) for injection into the electrical grid.

56. BESS projects:

- For Honiara batteries (Subproject 1b only): A 4 MW / 4 MWh BESS and a 5 MW / 20 MWh BESS together with grid-forming battery inverters will be installed within a fenced compounds nearby to existing switch rooms switch room. A control and communications system would be included.
- For Ambu hybrid (Subproject 2 only): A 1 MW / 4 MWh BESS and grid-forming battery inverter will be installed within a fenced compound on a concrete slab adjacent to the solar PV array. A control and communications system would be included.

57. **Associated infrastructure**. A perimeter security fence has been established around all sub projects. For BESS sites (sub project 1b: Honiara BESS's and sub project 2: Ambu hybrid), an additional fence compound will be installed to address additional safety concerns.

58. **Existing infrastructure**. Local infrastructure including roads and both the Honiara and Auki Ports will be used for all sub projects. The Honiara Port and local roads were inspected during the site visits and found to be suitable for use during the construction of Subprojects 1a and 1b.

59. The Auki Port and local roads were also inspected during site visits however its ability to transport materials and equipment to the project site may require some additional planning considerations prior to construction commencement. All shipping and general access shall be via Honiara.

60. Auki can be accessed all year round by express ferry or by flights to/from Honiara. Part of the road from Auki town to the Ambu project site (Subproject 2) is rutted and steep in places and may require some use of smaller all-terrain vehicles to transport materials and equipment.

61. **Project construction (Subprojects 1a, b and 2).** Construction of the ground mounted solar PV and battery sub projects will generally include:

- Clearing of existing vegetation on site (sub project 1a, b and 2).
- Spreading of fill material, compaction and levelling (sub project 2).
- Installation of site drainage, erosion and run off controls.
- Installation of security fencing around perimeter of battery and substation compounds
- Trenching and installation of underground cables and conduit.
- Installation of solar PV mounting system (sub project 1a and 2)
- Installation of solar PV panels on mounting system (sub project 1a and 2)
- Landscaping of site including planting low growing native vegetation (e.g. grasses) beneath the solar PV modules to help stabilise the site (sub project 1a and 2)
- Connection to overhead 11kV distribution line – from Lungga Power Station (sub project 1a)
- Connection of new underground distribution cable to Honiara Power Station and East Honiara Power Station (sub project 1b)
- Connection of new overhead distribution line to Auki Grid (Feeder 2) intersection – 11kV line (sub project 2)

62. **Project construction (Subproject 3)**. construction of the rooftop solar sub project will generally include:

- Inspection and upgrade of the existing roof structure (if required).
- Survey for asbestos of all material likely to be disturbed and, if found, removal and disposal by an appropriately qualified contractor, approved by the PIC Environment Safeguards Expert.
- Installation of solar PV mounting system on existing rooftops.
- Installation of solar PV panels on mounting system.
- Installation of batteries and control system in building.
- Installation of cabling, ancillary electrical infrastructure.
- Commissioning (load testing) of all equipment.

63. **Project operation (sub project 1a).** The Solar PV is planned to export electricity directly into the wider Honiara electricity network. A control system installed shall integrate into any SCADA network and manage operation and control of the plant in conjunction with other solar PV, diesel and battery generators running in parallel. Any control system (EMS) operation shall aim to minimise overall diesel consumption whilst ensuring reliability of the customers electricity supply.

64. **Project operation (sub project 1b).** The BESS's shall accommodate any new and existing solar PV projects. They shall also provide increased network support, minimise solar energy spill, reduce overall diesel consumption and be an enabler for future investment in any Solar PV. Any control system (EMS) installed shall integrate into any SCADA network and manage operation and control of the plant in conjunction with other solar PV and diesel generators running in parallel. Any control system operation shall aim to minimise overall diesel consumption whilst ensuring reliability of the customers electricity supply.

65. **Project operation (sub project 1a, 1b and 2).** The Honiara batteries (sub project 1b) will unlikely benefit from diesel-off operation. That is, it is expected that even after solar PV and batteries are added, diesel generators will continue to run at all times and that an energy management system (EMS) will be required to balance energy in the network considering the increasing renewable energy contribution.

66. At the Ambu solar hybrid site (sub project 2), diesel off operation will occur as part of normal operations. An Energy Management System (EMS) is therefore critical to managing diesel scheduling and solar PV curtailment considering the battery state of charge and load.

67. For all sub projects, the typical control and operation approach will consist of the following:

- Solar PV and BESS plant both to include standard automated grid support functionality including voltage and frequency support.
- BESS to be 'grid forming' with comprehensive control specification to ensure very fast response to fault conditions and high rate of change of frequency.
- SCADA and fibre optic communications required to monitor real-time state of BESS, solar PV, load, and diesel generators in each grid.
- EMS to be installed to:
  - Determine real-time spinning reserve requirements for each grid.
  - Schedule diesel generator operation to maximise renewable energy use while ensuring grid stability and spinning reserve requirements are met.
  - Curtail solar PV output where necessary considering the state of charge of the BESS and status of diesel generators.
  - Flexibly integrate with new solar PV (or other forms of generation) as it is installed.
  - Provide a site-specific human-machine interface (HMI) and operator workstation (or utilise existing workstation) for monitoring and control.

68. The EMS represents the core of operations on each sub project.

69. **Project decommissioning**. The subprojects are expected to have a lifespan of approximately 25 years. It is likely that the system will be replaced with similar equipment. Solar PV modules, batteries, inverters and other electronics and metal will be collected for recycling in Solomon Islands (if facilities exist) or be transported to Australia.

70. Implementation schedule. The following implementation schedule (Table 3.2) is indicative and still to be confirmed:

Table 3.2: Implementation schedule

Activity	Q4 2023	Q1 2024	Q2 2024	Q3 2024	Q4 2024	Q1 2025	Q2 2025	Q3 2025

Completion of feasibility studies and technical advisory consulting services								
Approval and completion of contractor procurement								
Selection of preferred contractors								
Sub project detailed design, material procurement and mobilisation.								
Earthworks and civil works								
Install PV and electrical equipment								
Integration with Solomon Power assets								
Commissioning								
Training of operators and handover of manuals. Completion								

IV. BASELINE INFORMATION

A. Physical Resources[15]

71. Solomon Islands consists of six main islands and almost 1000 smaller islands with a total land area of 28,400 km^2 Spread over an Exclusive Economic Zone (EEZ) of 1.34 million square kilometres.

72. **Guadalcanal Province** includes the largest island in Solomon Islands, Guadalcanal, and several small adjacent islands which together have a total land area of 5,340 km^2 (accounting for 19% of the country's land area). The national and provincial capital is Honiara, from which the national and provincial governments administer services. The province is divided into 22 wards, 193 enumeration areas and 1,493 recognized villages.

73. **Malaita Province** is located approximately 50 km northeast of Guadalcanal across Indispensable Strait. Malaita is approximately 4,307 km^2 in area and is divided into 33 wards. The provincial capital is Auki.

74. **Geology and topography.** Solomon Islands, a double chain archipelago of islands, lies at the boundary of three major tectonic plates which form part of the Solomon Islands Subduction Zone, which includes the Pacific, Australian and the Woodlark plates. Northwest of the Solomon Islands is the Solomon Sea plate, which is the source of most of the volcanoes in the Solomon Islands. The uplift of the Pacific plate along with intermittent volcanic and seismic activity has contributed to the island masses that now form the Solomon Islands. The islands are, geologically speaking relatively young, and the larger islands are almost entirely volcanic in origin and consist of basalt surrounded by uplifted coral terraces.

75. The geology of Guadalcanal is dominated by extrusive igneous rocks generated by volcanism during the Oligocene to Pleistocene periods, and there are also significant alluvial deposits along the coast and along the river valleys. The island's topography and physical environment is marked by extremes, with rugged mountainous terrain including the country's two highest peaks; Mount Popomanaseu (2,335 m) at the eastern end of the island and Mount Makarakomburu (2,310 m) approximately 32 km south of Honiara, flanked by hills, narrow coastal terrace with interspersed swamps, valleys, significant river catchments and highly productive area in the north, known as the Guadalcanal Plains. The island's key landforms are ridge volcanic mountains, karst, moderately, narrow and lightly dissected ridges, low terraces, flood plains and colluvial fans.

76. Malaita is made up of two islands parted by the Maramasike passage, which is about 400m wide. The rugged central range contains several high peaks rising to an elevation of 1000 meters including Mt. Kolourat (1,438 m), which is the highest peak in Malaita. Drainage is north westerly from the middle of the island with north easterly offsets, to the south, the offset runs to the eastern side of the island. The volcanic ridges are bordered by limestone rich bands forming distinct karstlands. The deep valleys and narrow ridges flanking the volcanic basement have

[15] Sources of information:
Solomon Islands State of Environment Report 2019. Apia, Samoa: SPREP, 2019. Accessed at https://solomonislands-data.sprep.org/system/files/Sols%20SOE%20Final.pdf
Solomon Power (2021). *Dala Solar Hybrid Subproject*: Environment Social Management Plan/Public Environment Report (PER).

developed over calcareous sediments. The island's key landforms are volcanic cones, steep, dissected narrow ridges, fluvial plains, karst, valleys, swamps and coastal landforms (MECMA 2008).

77. **Soils**. Depending on parent material and land use, soils in the Solomon Islands exhibit a range of fertility – from volcanic parent material resulting in fertile soils or limestone parent material derived from old coral reef resulting in calcareous infertile soils. Soil fertility varies widely between and within the islands, ranging from relatively infertile to highly fertile soils derived from volcanic ash and alluvial deposits; potassium deficiency is commonly associated with calcareous and limestone parent material, while phosphorus deficiency is frequent over volcanic rocks. Land clearing as a result of timber harvesting, intensive agriculture and to a lesser extent the extension of subsistence farming as a result of increasing population, all place extreme pressures on the soil resources.

78. The soil types on Guadalcanal are a mixture of volcanic and sedimentary rocks, humus-rich, base- poor, shallow loams and clays at high altitudes and young loams, clays and peats in valleys and coastal plains. The soil types on Malaita range from strongly weathered and leached soils with low base status to slightly and moderately weathered leached soils, to organic soils with decomposed peat.

79. There is a low risk of soil contamination at the sites for all subproject sites. There are no known historical potentially contaminating land uses associated with any of the subproject sites. There is potential for soil contamination in the areas surrounding Subproject 1b Honiara Power Station and East Honiara Substation due to their historical and continuing use as an electrical substations. Electrical substations are associated with a range of contaminants, notably Polychlorinated Biphenyls (PCBs) which were historically used in electrical transformers. However, the areas set aside for installation of the batteries have reportedly not been used for potentially contaminating activities such as oil, diesel or transformer storage.

80. **Seismicity**. The risk of earthquake and tsunami varies across the Solomon Islands, depending on the location with respect to subduction zones. The country is surrounded by the Pacific "ring of fire," which aligns with the boundaries of tectonic plates. These tectonic plate boundaries are extremely active seismic zones capable of generating large earthquakes and, in some cases, major tsunamis that can travel great distances. A total of 42 probable and definite tsunamis have occurred in the Solomon Islands since 1897, with four caused by volcanos and 38 from earthquakes. As the majority of tsunamis are caused by earthquakes, most have occurred on the southern side of the Solomon Islands, reflecting their proximity to earthquakes.

81. **Tides and waves**. Inclement weather systems, e.g., storms, can have a marked impact on the tidal height and can cause increased coastal erosion if they coincide with high water periods. Sea level variations occur annually depending on the strength of the El Nino Southern Oscillation. The waters adjacent to Honiara include a maximum tidal variation of less than 1.1 meters. The wave environment is generally made up of four major components: i) prevailing northeast to southeast seas and swell waves associated with prevailing easterly trade winds; ii) periods of westerly seas generated by westerly gales during the wet season in equatorial regions; iii) short-term, large seas and swell waves from variable directions generated by tropical storms and cyclones; and iv) seasonal north and south swell waves generated by mid-latitude storms in the north and south Pacific Ocean.

82. **Climate.** The Solomon Islands has a typical tropical oceanic climate (high temperature and high humidity) throughout the year with a pronounced wet season from November to March

and a dry season from April to October. The wet season is affected by the movement and strength of the South Pacific Convergence Zone. This band of heavy rainfall extends across the South Pacific Ocean and is caused by air rising over warm water where winds converge, resulting in thunderstorm activity. Humidity is highest in the morning and frequently reaches 90 percent. Solomon Islands has a relatively uniform temperature ranging from 22 degrees Celsius (°C) to 31°C throughout the year. The monthly average maximum temperatures are 30-31°C and the monthly average minimum temperatures range from 22 to 23°C. GuadalcanaI ranges from lows of 19°C Jul-Sep to 21°C Jan-Mar and highs of 29°C Nov-Dec.

83. The most important driver of global climate is the El Niño Southern Oscillation (ENSO), the ocean-atmosphere mechanisms of which impact the equatorial Pacific. ENSO oscillates with a period of 2-7 years between El Niño, which brings lower than normal sea levels, weaker trade winds, cooler ocean temperatures and higher barometric pressures across the western equatorial Pacific, and La Niña, which brings the opposite conditions.

84. The nation is subjected to tropical cyclones that are associated with the southeasterly trade winds (November to March). Tropical cyclones affecting Solomon Islands are usually relatively small but can result in serious damage due to strong winds and heavy rainfall; they are more frequent in El Niño years and least frequent in La Niña years. In addition, tropical cyclones will result in abnormally high ocean tides that may rise 3-6 m above the regular tide. This is due to the pooling of seawater by the frictional effect of very strong winds persistently gusting on shore as the cyclone approaches a shallow coastline. This can result in inundation of low-lying coastal plains and impacts on the shoreline and beach, potentially disrupting road access, increasing soil salinity, contaminating groundwater and enhancing coastal erosion processes, the resulting flooding causes agricultural losses and damage to buildings. In November 1966, Cyclone Angela brought significant devastation and hardship.

85. **Climate change.** Wave climate and climate change trends around the Solomon Islands are affected by processes occurring over large areas of the Pacific Ocean, from the northern to the southern subtropical zones (35° north to 35° south). Climate change projection scenarios are typically divided into four representative concentration pathways, based on a range of emissions output scenarios. These were developed by others and refined for the Pacific by the Pacific Australia Climate Change Science and Adaptation Planning Science Program (PCCSP). By 2030, annual temperatures are projected to increase by approximately 0.7°C, irrespective of the emissions trajectory over the next decade and a half, while by 2090, a ‘business as usual’ high emissions scenario could result in as much as a 4.0°C annual temperature increase and that there is very high confidence that both sea surface and air temperatures will continue to increase across the Solomon Islands (PCCSP 2014). It is projected that the intensity and frequency of days of extreme heat will increase over the course of the 21st century.

86. Extreme rainfall, with lower drought incidence, and a decline in the number of tropical cyclones in the south-west Pacific Ocean are the key weather projections. Satellite data indicates the sea level has risen near the Solomon Islands by about 8 mm per year since 1993, more than double the global average of 2.8–3.6 mm per year and is expected to continue to rise (PCCSP 2013). The ocean around the Solomon Islands is increasing in acidity, impacting corals and reef ecosystems (PCCSP 2013).

87. Ocean acidification is projected to continue (very high confidence). Projections from all analyzed CMIP3 models indicate that the annual maximum aragonite saturation state will reach values below 3.5 by about 2045 and continue to decline thereafter. This will impact the coastal ecosystems, especially of reef ecosystems. It may be compounded by other stressors including

coral bleaching, storm damage and fishing pressure. Key projections suggest increase in average annual rainfall and intensity of extreme rainfall events, sea level rise, storm surge, increased temperatures, and changes in wind and wave climate and increases in extreme wave heights and ocean acidity.

88. A climate change assessment has been completed for the SIREDP and provides a detailed summary of current climate and predicted climate change (Entura 2023).

89. **Air quality[16].** In 2015, the United Nations Environment Programme (UNEP) conducted research on air quality and air quality policies around the world. Key findings for Solomon Islands included:

- There are no localised air quality monitoring systems in place, nor any policies or programmes to reduce emissions.
- 95% of households use solid fuels (wood) for cooking and indoor heating with 79% of these households using kerosene for lighting.
- As Honiara continues to rapidly urbanise, poor air quality is expected to increase because of increased vehicular traffic and traffic congestion.
- Burning of municipal waste in outdoor, open areas is common.

90. Some measures have been put in place to help limit air pollution (such as the Solomon Islands Renewable Energy Roadmap), however, air quality throughout the Solomon Islands (particularly in Honiara) is still considered moderately unsafe in accordance with WHO guidelines where the annual mean concentration of PM2.5 being 12 µg/m3 exceeds the recommended maximum of 10 µg/m3 (2021)[17]. Neither the construction or operation of the subprojects have the potential to significantly impact long term air quality and background air quality monitoring was not considered to be warranted for the SIREDP.

91. **Water resources**. Freshwater availability varies considerably across the Solomon Islands; on the large volcanic islands like Guadalcanal, water resources derived from river systems are abundant due to the mountainous topography and weather conditions whilst (SIWA, 2013). The country's longest river is the Lungga river is located on the north coast of Guadalcanal with a catchment area of 377 km^2. Aquifers are small and depend mainly on precipitation for recharge (Sullivan and Guglielmi, 2007); aquifers are highly vulnerable to the effects of sea level rise and saltwater intrusion related to climate change. Water supplies are typically obtained directly from the source, such as from streams, springs, wells and roof runoff.

92. Freshwater quality throughout Solomon Islands is generally of good quality, however water resource quality associated with the urban and village areas, especially Honiara, is in decline. There is however a lack of adequate time series reliable hydrological data available to properly address historic and current water quality issue. Poor management of sanitation (e.g., sewage, rubbish) and waste from light industry (e.g., petrochemicals) are the main causes of pollution that has significantly decreased water quality in the urban and semi-rural locations. In addition, logging and the traditional slash and burn method of farming have gradually degraded rivers and streams, threatening key catchment areas. Neither the construction of operation of the subprojects will require significant freshwater resources nor do they have the potential to

[16] SolomonIslands.pdf (unep.org)

[17] https://www.traveldoctor.network/country/solomon-islands/risk/air-pollution/

significantly impact water quality of existing resources. Baseline water quality sampling was not considered to be warranted for the SIREDP.

93. **Noise.** Existing noise conditions vary through Solomon Islands from low in rural areas where noise emissions are limited to occasional sources such as the use of vehicles, machinery (e.g., chainsaws) or small generators to high in urbanised environments such as Honiara. Subproject 1a and 1b located in Honiara are expected to have high existing background noise, particularly Subproject 1a located adjacent to the airport and 1b located adjacent to the existing Honiara substation. Subprojects 2 and 3 are expected to have lower background noise levels. Background noise sampling at the subproject sites was not considered to be warranted as the subprojects do not have potential to significantly impact existing noise conditions. There are no long term or significant noise emissions anticipated during construction and no significant noise emissions during operation of the subprojects.

F. Terrestrial Biological Resources[18]

94. **Terrestrial vegetation/habitat types**. Despite the geographical spread of islands and relatively varied flora in the Solomon Islands, the climax vegetation in the Solomon Islands archipelago shows the similarity of appearance between islands. The major vegetation types that have been identified in the Solomon Islands were described by Mueller and Dubois (1998) and Whitmore (1966) and include:

- Coastal strand vegetation (saline swamps) - are found on lands subject to inter-tidal flooding, such as estuaries and foreshores. These are primarily mangrove areas that occur on 2.3% of Solomon Islands land area and are poor in species diversity (dominated by *Bruguiera spp*. and *Rhizophora spp*.). Extensive areas of this vegetation type are found on Isabel, New Georgia, Malaita, Marovo lagoon, Makira and east Guadalcanal. Saline swamps play critical roles as food and cultural resources for rural communities.
- Riverine forests (freshwater swamps) - are characterized by mixed herbaceous species, palms, *Pandanus* spp. and other wetland or wet ground species such as sago and rosewood. Such areas are particularly sensitive to soil compaction from logging. Lauvi Lagoon area of Guadalcanal and west-central Makira are notable areas of this vegetation type.
- Lowland forest - including hill forest, is the climax vegetation and the most common forest type in the country. Lowland forest forms the bulk of commercial forest in Solomon Islands. This vegetation community has close affinity to Malaysia, Philippines, Indonesia, and PNG forests, although there are fewer genera and species, and trees are smaller. There are 60 major tree species, twelve of which form the canopy layer. Hill forest is lowland forest found on higher slopes and well drained sites. It has a Pometia dominated canopy. The lower slopes of Mt. Maetambe in Choiseul are a good example of lowland hill forest.

[18] Sources of information:
Solomon Islands State of Environment Report 2019. Apia, Samoa: SPREP, 2019. Accessed at https://solomonislands-data.sprep.org/system/files/Sols%20SOE%20Final.pdf
Ministry of Infrastructure Development (2020). Solomon Islands: Land and Maritime Connectivity Project – Multitranche Financing Facility: Initial Environmental Examination.
Solomon Power (2021). Environment Social Management Plan/Public Environment Report (PER) Dala Solar Hybrid Subproject

- Montane, or cloud forest - occurring at higher altitudes is present in Solomons as low as 700m. No clear lower montane forest zone is distinguishable, while upper montane comprises stunted moss-covered trees such as *Dacrydium* and *Eugenia*. There is little commercial exploitation of this area. Kolombangara Crater and Popomanaseu on Guadalcanal are good examples.
- Non-forest communities, such as the seasonal dry forests or grasslands cover 1-2% of Solomon Islands land area. These are believed to be human induced landscapes from the use of fire.

95. Coconut (*Cocos nucifera*), oil palm (*Elaeis guineensis*) and cocoa (*Theobroma cacao*) are commercially important plantation crops.

96. **Subsistence gardens** typically comprise of potatoes (*Solanum tuberosum*), cassava (*Manihot esculenta*), and banana (*Musa* spp.), and common cash crops include coconut (*Cocos nucifera*) and cocoa (*Theobroma cacao*). Sweet potato is by far the most important source of food energy in the Solomon Islands. Other important food crops are cassava, banana, kongkong taro, island taro, coconut, pana and yam.

97. **Flora**. Numerous plants are identified across the Solomon Islands as having uses for timber, food, medicinal, handicraft, traditional and other uses. The country has been recognized as a "Centre of Plant Diversity", counting 4,500 species of plants, 3,200 of which are known to be native (indigenous). Despite this high level of biological diversity, endemism for plant species is generally low relative to that of Western Melanesia. However, 57% of palms, 50% of orchids (230 species), 75% of climbing pandanus species are considered endemic (MECMA 2008). Solomon Islands has over 25 threatened tree species, including ebony, rosewood, rattan and some palms. Ebony (*Diospyros insularis*) is listed as critically endangered. According to the 2008 State of the Environment report, the dominant invasive plant species include *Broussonetia papyrifera* (paper mulberry), *Acacia fanersiana* (Ellingtons curse), *Eichhornia crassipes* (Water hyacinth), *Lantana camara* (lantana), *Mikania macrantha* (mile-a-minute), *Mimosa invasa* (giant sensitive), *Mimosa pudica* (sensitive plant), *Psidium guajava* (common guava), *Solanum torvum* (prickly solamun or devil's fig), *Solanun mauritianu* (tobacco weed), *Stachytarpheta jamaicencis* (blue porter weed), *Sida rhombifolia* (arrow leag or narrow leag sida), and *Sida acuta* (broom weed). The introduced fungus *Phytopthora colocasiae* causes the plant disease Taro Leaf Blight.

98. **Fauna**. Tropical and subtropical environment of Solomon Islands is home to animal species that can be found nowhere else in the world. The forests of Guadalcanal and Malaita are known to support considerable number of bird and vertebrate endemism.

99. **Bird life** in Solomon Islands exhibits a high level of avian species diversity and endemism. Currently known bird species total 223 species, of which 82% are endemic. Larger islands have their own endemic species and/or subspecies (the New Georgia group has 10 endemic species, Malaita 3, Guadalcanal 3, Makira 13, Kolombangara 2, Vella Lavella 1, Ranongga 1, Ghizo 1, Rennell 5, Santa Cruz 3). In total, the Solomon Islands (including Rennell, Bellona and the Santa Cruz Islands) have 94 bird species with a Restricted Range, 16 of which are classified as threatened; Solomon Islands has the highest number of birds of unique restricted range of all of the world's Endemic Bird Areas (MECM 2008). Among endemic birds are the Solomons sea eagle (*Haleetus sanfordi*) and the Ghizo white-eye (*Zosterops luteirostris*) arguably the most restricted range full-species eagle and passerine birds on earth (MECMA 2008). The Guadalcanal Watersheds form a site that has been identified by BirdLife International as an important bird area, because it supports populations of threatened or endemic bird species. The Guadalcanal

Watersheds covers 376,146 ha (70% of the island) extending along the southern coast inland to the central highlands, and contains riverine and lowland tropical rainforest, as well as the greatest contiguous area of cloud forest in the Solomons. Significant birds for which the site was identified include chestnut-bellied imperial pigeons, Woodford's rails, Guadalcanal moustached kingfishers, Meek's lorikeets, Guadalcanal honeyeaters, Guadalcanal thicketbirds, and Guadalcanal thrushes. The Malaita Honeyeater (*Myzomela malaitae*) is a rare species that is endemic to Malaita; the International Union for Conservation of Nature (IUCN) have listed it as a near threatened species. Other rare bird species on Malaita include the Malaita dwarf kingfishers (*Ceyx malaitae*), Malaita fantail (*Rhipidura malaitae*) and Malaita Boobook (*Ninox malaitae*).

100. **Reptiles** are common, especially geckos, skinks, goannas and snakes such as the brown tree snake (*Boiga irregularis*). Approximately 80 reptiles (of which 61 are land reptiles) are recorded in Solomon Island, and more than one-third of these are endemic; five are identified as threatened species.

101. **Amphibians**. There are 21 reported frog species in Solomon Islands, of which two species are endemic (MECM 2008).

102. **Invertebrates** of Solomon Islands include at least 130 butterfly species, of which 35 are endemic; 25 endemic snail species; and 31 species of cicada.

103. Solomon Islands has more **mammal species** than most Pacific Island countries, with 53 known species of mammals; most of these are bats, rats and possums. Twenty mammal species on Solomon Islands are identified as threatened (MECM 2008). There are 20 endemic mammal species, including several Macrochiropterans such as the *Pteralopex* spp. complex of large megabats. Monkey-faced bats (genus *Pteralopex*) are a distinctive and poorly studied group of flying-foxes known only from the Solomon Islands and Fiji; all *Pteralopex* species have restricted and declining distributions, and most are listed as 'Critically Endangered' by the IUCN. According to the 2008 State of the Environment Report, there are 8 species of rats, three of which are endangered including Spechts mosaic tailed rat (*Melomys specti*), Poncelet's giant rat (*Solomys ponceleti*) and Emperor rat (*Uromys emperata*); the endemic *Solomys* genus of giant rats are amongst the largest rats in the world. Further, there are 41 species of bats, of which 19 are endemic and three are critically endangered, including the Montane Monkey-faced bat (*Pteralopex pulchra*), Guadalcanal monkey faced bat (*Pteralopex atrata*) and Bougainville monkey-faced bat (*Pteralopex ansep*). Solomon Islands has the highest number of *Pteropus* and *Pteraloopex* flying foxes of any country in the world. Guadalcanal is home to a native marsupial known as the phalanger or grey cuscus (*Phalanger orientalis*).

104. **Invasive species** are seen as a key threat to biodiversity in Solomon Islands. Invasive species found on Guadalcanal and Malaita Islands include fauna (e.g., black rat - *Rattus rattus*, house mouse - *Mus musculus*, cane toad - *Rhinella marina*, giant African snail - *Lissachatina fulica*, rosy wolf snail - *Euglandina rosea*) and flora (e.g., sensitive plant – *Mimosa pudica*, mile-a-minute - *Mikania macrantha*, blue rats' tail - *Stachytarpheta jamaicensis* and other grasses, herbs, shrubs and climbers). Terrestrial alien and native invasive species have not been well documented to date, however a list produced by the Pacific Islands Ecosystem at Risk project in Hawaii contains a total of 368 invasive and potential invasive species for Solomon Islands. Fourteen invasive species are listed on the IUCN Global Invasive Species Database (GISD) as potentially occurring on Guadalcanal and Malaita. Species include terrestrial fauna (e.g., rats, mice and ants) and flora (grasses and shrubs).

105. **Subproject sites biological resources**. An ecological survey of the proposed locations of the ground mounted solar PV arrays in Henderson and Ambu (Subprojects 1a and 2) was completed in July 2023 (Annex 2 and Annex 3).

106. The **vegetation** cover at Subproject site 1 is characterised by a high level of disturbance. The ecological assessment identified that the dominant vegetation cover at the site was the introduced grass *Urochloa mutica* (para grass) which is also referred to as *Brachiaria mutica*. Other flora species present were also introduced grasses and weed species including *Sida rhombifolia* (sida grass) and *Sorgum halepense* (Johnson grass), *Mikania micrantha* (mile-a-minute), *Mimosa pudica* (sensitive plant) and *Stachytarpheta jamaicensis* (blue rats' tail). There were several banana plants (*Musa* species) present of the eastern edge of the site. The introduced invasive cane toad (*Rhinella marina*) was also recorded. No species listed as threatened under the IUCN Red List were recorded.

107. **Vegetation** at Subproject site 2 can be characterised as secondary lowland forest, based on the proximity to the coastline and the vegetation at the site. The ecological assessment found that the dominant tree cover was *Alstonia macrophylla* (hard alstonia) and *Rhus taitensis* (sumac). *Alstonia macrophylla* is native to southeast Asia. It has been introduced to the Solomon Islands. There were also mature *Cocos nucifera* (coconut palms) trees present. Other trees present included *Ficus spectica* (fig), *Homalanthus populifolius* (bleeding heart tree), *Morinda citrifolia* (noni) and *Artocarpus altilis* (breadfruit). The native bamboo *Schizostachym tesselatum* was also present as a tall understorey plan as is the tree fern (*Dicksonia munzingeri*). The understorey was dominated by the swordfern *Nephrolepis biserrata*. Other understorey and ground layer species included *Alpinia purpurata* (madikeri) and the climbing palm *Calamus vestitus* and the epiphytic orchids *Liparis condylobulbon* and *Grammatophyllum scriptum*. There were a number of introduced weedy subshrubs present in the understorey including *Stachytarpheta jamaicensis* (blue rats' tail) and *Mikania micrantha* (mile-a-minute) and *Mimosa pudica* (sensitive plant) were also present. The Solomons Cockatoo (*Cacatua ducorpsi*) was also recorded. The introduced invasive cane toad (*Rhinella marina*) was also recorded. No species listed as threatened under the IUCN Red List were recorded.

108. **Rare, regionally significant or protected fauna species.** There are 16 threatened terrestrial fauna species listed on IUCN Red List[20] known to occur on Guadalcanal. They include five mammal species, six bird species, one reptile species and three invertebrate species (Table 4.1). None of these threatened fauna species are considered likely to occur at Subprojects 1a or 1b because of the absence of suitable habitat (Table 4.1). Four threatened plant species are also known to occur on Guadalcanal (Table 4.1). They are all tree species, and none are considered likely to occur at the sites of Subproject 1a or 1b (Table 4.1).

109. There are twelve **threatened terrestrial fauna** species listed on the IUCN Red List[20] known from Malaita. They include five bird species, one reptile species and one invertebrate species (Table 4.2). There are no known threatened mammal species on Malaita. None of the threatened fauna species recorded as occurring on Malaita are considered likely to occur at the Subproject 2 site as the site is either outside of the known range of the species or there is no suitable habitat present. The near-threatened chestnut bellied imperial pigeon *(Ducula brenchleyi*) may visit the site of Subproject 2 to feed on *Ficus septica* (fig) trees. The fruit of this fig species have been reported to be eaten by 22 species of birds (Shanahan et al. 2001). However, the site is unlikely to be important habitat for this species given its disturbed nature. There are five threatened flora species known from Malaita on the IUCN Red List (Table 4.1). However, none of the threatened flora species are considered likely to occur at Subproject 2 site as the sites is

either outside of the known range of the species (e.g., they are montane species) or there is no suitable habitat present.

Table 4.1: Threatened fauna and flora known from Guadalcanal in the Solomon Islands (source: IUCN) [19]

Scientific name	Common name	IUCN Category	Habitat	Likelihood of occurrence
Mammals				
Pteralopex atrata	Guadalcanal monkey-faced bat	Endangered	Appears to be dependent on undisturbed, old growth forests, and seems to roost in tree hollows (IUCN Red List).	**Unlikely to occur** as the site is a lowland grassland site and there is no old growth forest on site.
Pteralopex pulchra	Montane monkey-faced bat	Critically Endangered	Montane species only known from a single specimen collected on the southern slopes of Mount Makarakomburu, Guadalcanal at 1,230 m asl (IUCN Red List).	**Unlikely to occur** as the site is a lowland grassland site.
Uromys mperator	Emperor rat	Critically Endangered	The species appears to be restricted to mossy montane forest (IUCN Red List).	**Unlikely to occur** as the site is a lowland grassland site with no forest.
Uromys porculus	Guadalcanal rat	Critically Endangered	This species is known only from the holotype collected between 1886-1888 at Aola, Guadalcanal (IUCN Red List). It appears to have been a terrestrial species that may have inhabited caves and probably lived in lowland tropical forests (IUCN Red List).	**Unlikely to occur** as the site is a grassland site with no forest.
Uromys rex	King rat	Endangered	The species is absent from large parts of Guadalcanal (IUCN Red List). It appears to be restricted to primary tropical moist forest, including relict patches of native forest. (IUCN Red List).	**Unlikely to occur** as the site is a grassland site with no forest.
Birds				
Actenoides excelsus	Guadalcanal moustached kingfisher	Endangered	Observations and reports from Guadalcanal indicate that the species only occurs in closed-canopy forest between	**Unlikely to occur** as the site is a lowland grassland site with no forest.

[19] IUCN (2023) *International Union for Conservation of Nature's (IUCN) Red List of Threatened Species*. Accessed July 2023.

Scientific name	Common name	IUCN Category	Habitat	Likelihood of occurrence
			900 to 1,600 m (IUCN Red List).	
Aplonis brunneicapillus	White-eyed starling.	Vulnerable	The species has been recorded breeding colonially in both lowland swamp and hill forest (IUCN Red List)	**Unlikely to occur** as the site is a lowland grassland site with no forest.
Columba pallidiceps	Yellow-legged pigeon	Vulnerable	It has primarily been recorded in primary or tall secondary forest (IUCN Red List). It has been seen occasionally in lowland coastal forest, and most frequently seen in hill forest between 400 and 600m altitude (IUCN Red List).	**Unlikely to occur** as the site is a lowland grassland site with no forest.
Ducula brenchleyi	Chestnut bellied imperial pigeon	Near threatened	Recorded most frequently in primary forest but has also been record in fruiting trees in degraded forest and gardens (IUCN Red List). Feeds on fruits, including figs (IUCN Red List). Occurs from sea-level to 700 m elevation (IUCN Red List).	**Unlikely to occur** as the site is a lowland grassland site with no forest or fig trees.
Eurostopodus nigripennis	Solomons nightjar	Vulnerable	A coastal species that occurs in forests and woodland alongside beaches (IUCN Red List).	**Unlikely to occur** as the site is a lowland grassland site away from the coast with no forest or woodland.
Haliaeetus sanfordi	Sanford's sea-eagle	Vulnerable	Scavenges and hunts for food along forested coasts (IUCN Red List). Available evidence indicates that nesting habitat is mangrove forest or rainforest (IUCN Red List).	**Unlikely to occur** as the site is a lowland grassland site away from the coast with no forest suitable for nesting.
Zoothera turipavae	Guadalcanal thrush	Vulnerable	A montane species that has been recorded at between 1,450 to 1,500 m at the altitudinal intergrade of montane and mossy forest (IUCN Red List).	**Unlikely to occur** as the site is a lowland grassland site with no forest.

Scientific name	Common name	IUCN Category	Habitat	Likelihood of occurrence
Reptiles				
Loveridgelaps elapoides	Solomon Islands black-headed krait	Vulnerable	Occurs from sea level to approximately 800 m elevation (IUCN Red List). Shelters under leaf litter, fallen timber and is active in the evening and at night (IUCN Red List). Appears to inhabit primary forest (IUCN Red List).	**Unlikely to occur** as there is no suitable primary forest habitat at the site.
Insect				
Lieftinckia lairdi	damselfly	Endangered	Occurs at running water including rivers; a slow flowing pools and backwaters of streams (IUCN Red List). Appears to be a species of forest habitats (IUCN Red List). Larvae are dependent on aquatic habitats (IUCN Red List).	**Unlikely to occur** as the site is a lowland grassland site with no suitable aquatic habitats.
Parantica garamantis	Angled tiger butterfly	Vulnerable	The habitat description for this species is that is '*a montane species'* (IUCN Red List)	There is little information on this species on the IUCN Red List other than it is found in Papua New Guinea and Solomon Islands and '*there is a continuing decline of mature individuals'* and a *'continuing decline in area, extent and or quality of habitat'*. **Unlikely to occur** at either Subproject site 1 or 2 as both are lowland sites.
Tiradelphe schneideri	Schneider's surprise	Vulnerable	This butterfly species is only known from two specimens collected close to the summit of Mt Popomanateseu on Guadalcanal (IUCN Red List).	**Unlikely to occur** as the site is a lowland grassland site.
Plants				
Aglaia brassii	In the mahogany family	Vulnerable	An understorey tree which is regarded as relatively common in lowland primary and	**Unlikely to occur** as the site is a lowland grassland site with no trees.

Scientific name	Common name	IUCN Category	Habitat	Likelihood of occurrence
			secondary forest up to 500 m (IUCN Red List).	
Archidendron oblongum (Archidendropsis oblonga)	In the Acacia group of the Fabaceae family	Vulnerable	A large tree is restricted to lowland rainforest in alluvial valleys in the Solomon Islands (IUCN Red List).	**Unlikely to occur** as the site is a lowland grassland site with no trees.
Intsia bijuga	Merbau	Near threatened	A small to large tree species up to 35 m which occurs in lowland forest, often along coastlines, behind and within mangrove ecosystems (IUCN Red List).	Was previously listed as Vulnerable but reassessed as Near threatened in January 2020 (IUCN Red List). **Unlikely to occur** as the site is a lowland grassland site with no trees.
Terminalia rerei	A tree from the white mangrove family	Vulnerable	A lowland rainforest species	**Unlikely to occur** as the site is a lowland grassland site with no forest.

Table 4.2: Threatened fauna and flora known from Malaita in the Solomon Islands (source: IUCN) [20]

Scientific name	Common name	IUCN Category	Habitat	Likelihood of occurrence
Birds				
Columba pallidiceps	Yellow-legged pigeon	Vulnerable	It has primarily been recorded in primary or tall secondary forest (IUCN Red List). It has been seen occasionally in lowland coastal forest, and most frequently seen in hill forest between 400 and 600m altitude (IUCN Red List).	Not recorded on Malaita but may occur in suitable forested habitat. Given its preference for primary forest or tall secondary forest this species is **unlikely to occur** at the site.
Ducula brenchleyi	Chestnut bellied imperial pigeon	Near threatened	Recorded most frequently in primary forest but has also been record in fruiting trees in degraded forest and gardens (IUCN Red List). Feeds on fruits, including figs (IUCN Red List). Occurs from sea-level to 700 m elevation (IUCN Red List).	Was previously listed in 2016 as vulnerable but reassessed as near threatened in 2021 (IUCN Red List). May occasionally visit the Ambu site to feed on fruiting fig trees but **unlikely to be important habitat**.
Haliaeetus sanfordi	Sanford's sea-eagle	Vulnerable	Scavenges and hunts for food along forested coasts (IUCN Red List). Available evidence indicates that nesting habitat is mangrove forest or rainforest (IUCN Red List).	**Unlikely to occur** at either site as it is away from the coast have suitable forested habitat for nesting.
Ninox malaitae	Malaita boobook	Vulnerable	The species is known from specimens collected in forest at 900 to 1,200 m (IUCN Red List). The has not been recorded in degraded lowland forest and forest edge (IUCN Reed List).	**Unlikely to occur** at the site as it is a lowland site.
Rhipidura malaitae	Malaita fantail	Vulnerable	The species is endemic to the high mountains of Malaita where it occurs in montane forest (IUCN Red List).	**Unlikely to occur** at the site 1 or 2 as it is a lowland site.

[20] IUCN (2023) *International Union for Conservation of Nature's (IUCN) Red List of Threatened Species*. Accessed July 2023.

Scientific name	Common name	IUCN Category	Habitat	Likelihood of occurrence
Reptiles				
Loveridgelaps elapoides	Solomon Islands black-headed krait	Vulnerable	Occurs from sea level to approximately 800 m elevation (IUCN Red List). Shelters under leaf litter, fallen timber and is active in the evening and at night (IUCN Red List). Appears to inhabit primary forest (IUCN Red List).	**Unlikely to occur** at the site as it does not have any suitable primary forest habitat.
Insect				
Parantica garamantis	Angled tiger butterfly	Vulnerable	The habitat description for this species is that is '*a montane species*.	There is little information on this species on the IUCN Red List other than it is found in Papua New Guinea and Solomon Islands and '*there is a continuing decline of mature individuals'* and a *'continuing decline in area, extent and or quality of habitat'*. **Unlikely to occur** at the site as it is a lowland site.
Plants				
Aglaia brassii	In the mahogany family	Vulnerable	An understorey tree which is regarded as relatively common in lowland primary and secondary forest up to 500 m (IUCN Red List).	**Unlikely to occur** as not recorded at the site.
Aglaia rubrivenia	In the mahogany family	Critically endangered	Only known from the type locality in Malaita (IUCN Red List). A medium sized tree up to 20 m high where it grows in primary forest (IUCN Red List).	**Unlikely to occur** at the site as it does not have any suitable primary forest habitat.
Archidendron oblongum (Archidendropsis oblonga)	In the Acacia group of the Fabaceae family	Vulnerable	A large tree is restricted to lowland rainforest in alluvial valleys in the Solomon Islands (IUCN Red List).	**Unlikely to occur** as not recorded at the site.
Calophyllum obscurum		Vulnerable	A tree which is restricted to primary forest on ridges or flooded coral platforms (IUCN Red List).	**Unlikely to occur** as there is no primary forest habitat at the site.

Scientific name	Common name	IUCN Category	Habitat	Likelihood of occurrence
Intsia bijuga	Merbau	Near threatened	A small to large tree species up to 35 m which occurs in lowland forest, often along coastlines, behind and within mangrove ecosystems (IUCN Red List).	Previously listed as Vulnerable but reassessed as Near threatened in January 2020 (IUCN Red List). **Unlikely to occur** as not recorded at the site.

110. **Protected areas and areas of biodiversity significance areas**. There are 4 terrestrial and 1 marine area currently formally protected under Solomons Island legislation. The table below shows the Protected areas that are legally recognised in Solomon Islands.

Table 4.2: Solomon islands protected areas

#	Gazettal order/date	Name of Protected Area	Location (Ward, Constituency, Province)	Type of PA (marine, terrestrial or both (marine-terrestrial))	Size of PA (Ha)	PA Category	Management Committee
1	LN #32 10/05/2017	Arnavon Community Marine Park (ACMP)	Kia Ward Hograno/Kia/ Havulei Isabel Province	Marine-terrestrial	16,909 Ha	Nature Reserve	Arnavon Community Marine Park Management Committee
2	LN #90 19/10/2019	Sirebe Forest Conservation Area	Babatana Ward South Choiseul Choiseul Province	Terrestrial	800 Ha	Resource Management Area	Sirebe Forest Conservation Management Committee
3	LN #89 19/10/2019	Siporae Tribal Forest Conservation Area	Babatana Ward South Choiseul Choiseul Province	Terrestrial	666 Ha	Resource Management Area	Siporae Tribal Forest Management Committee
4	LN #245 15/10/2021	Padezaka Tribal Rainforest Area	Babatana & Susuka Wards South Choiseul and East Choiseul Choiseul Province	Terrestrial	4,823 Ha	Resource Management Area	Padezaka Protected Area Management Committee
5	(tbc)	Vuri Forest Conservation Area	Babatana Ward South Choiseul Choiseul Province	Terrestrial	574 Ha	Resource Management Area	Vuri Forest Conservation Management Committee

111. East Rennell on Rennell Island is the only listed UNESCO world heritage site in Solomon Islands. It is currently in the process of being adopted under the *Protected Areas Act 2010*. Mt Popmanaseu on Guadalcanal is on the UNESCO Tentative List as part of the Tropical Rainforest Heritage of Solomon Islands Listing.

112. Queen Elizabeth National Park is the only National Park in Solomon Islands and is located on Guadalcanal. The park was declared under the *National Parks Act 1953* however, it is not recognised, and it is not actively managed. It has been extensively disturbed (e.g., logging, settlement) since it's declaration in 1953 and is now highly degraded.

113. Approximately 3% of the Solomon Islands are managed in a way that protects conservation values[21]. Protected sites on Gudalcanal and Malaita are described in Annex 3.

114. The National Solomon Islands Museum keeps a National Tambu Site Register which records several thousand sites. Some provinces also maintain tambu site registers, but a lack of funding means that the recording and registration is not systematic. Site visits and consultation to date has not identified any tambu associated with the proposed subproject sites.

115. The predominate presence of introduced species and the previous disturbance of all subproject sites are consistent with modified habitat as defined by ADB SPS 2009. Measures outlined in the EMP (e.g., control of pathogens and invasive species) will be implemented to minimise the further degradation of subproject sites.

G. Socio-economic Resources

116. **Demographics.**[22] The population of the Solomon Islands, across its ten administrative provinces, at the last census in 2009 was 551,525, living in 92,241 households, with a growth rate in the ten years prior of 2.3%. The population density was relatively low at 20 persons per km^2. Based on provisional counts from the yet to be released full 2019 census, the Solomon Islands' population has increased to 721,455 across 124,247 households (as of November 2019), showing a 2.7% annual growth rate from the last census in 2009. The population density, as a result has also increased with 24 people per km^2. In 2019, the ratio of males to females was fairly even, with 51.2% of the country identifying as male and the other 48.8% as female. The provisional population counts for each province is shown in Table 4.3.

117. The urban population of the Solomon Islands has gradually increased over time with approximately 26% of Solomon Islanders currently residing in urban areas. The other 74% live rurally, having declined from 80.2% of the population in 2009. For the Solomon Islands, urban areas are defined as the administrative centres of each province except for Honiara where the whole province is classed as urban. Because of this, Honiara contributes two thirds of the country's urban population[23]. This is exemplified when comparing the population density of Honiara to every other province where the largest density after Honiara's 5,950 people per km^2 is the Central province with 49 people per km^2 (Table 4.3). The urban population is expected to increase over time with a projected 3.57% rate of urbanisation annually between 2020 and 2025. Most urbanisation is expected to happen internally however, with an overall net migration of -1.52/1000 indicating that more people are leaving the country (emigrating), than there are people entering (immigrating).

118. The majority of the population (93%) is comprised of Melanesians, with the remaining 7% being split between Polynesians (4%) and other ethnic groups (3%). Although English is the official language of the country, it is only spoken by 1-2% of the population, with most of the population speaking Melanesian pidgin as well as a combination of the 120 indigenous dialects spread across the islands.

Table 4.3 Population of Solomon Islands
(As of 2019)

Province	Total Population			

[21] https://solomonislands-data.sprep.org/dataset/state-environment-report-2019

[22] https://www.solomonchamber.com.sb/media/1997/provisional_count-2019_census_result.pdf

[23] https://www.cia.gov/the-world-factbook/countries/solomon-islands/#people-and-society

	2009	2019	2019 Male population	2019 Female population	Population density (per km^2)
Solomon Islands	551,525	721,455	369,252 (51.2%)	352,204 (48.8%)	24
Choiseul	26,372	30,619	15,767 (51.5%)	14,852 (48.8%)	8
Western	76,649	94,209	49,061 (52.1%)	45,148 (47.9%)	13
Isabel	26,158	30,399	15,836 (52.1%)	14,563 (47.9%)	7
Central	26,051	30,326	15,432 (50.9%)	14,894 (49.1%)	49
Rennell-Bellona	3,041	4,091	2,259 (55.2%)	1,832 (44.8%)	6
Guadalcanal	106,023	154,150	79,093 (51.3%)	75,057 (48.7%)	29
Malaita	152,307	173,347	87,004 (50.2%)	86,343 (49.8%)	41
Makira-Ulawa	40,419	52,006	26,830 (51.6%)	25,176 (48.4%)	16
Temotu	21,362	22,132	10,905 (49.3%)	11,227 (50.7%)	25
Honiara (capital)	73,143	130,176	67,064 (51.5%)	63,112 (48.5%)	5,950

Source: https://www.solomonchamber.com.sb/media/1997/provisional_count-2019_census_result.pdf

119. **Economy, livelihoods, and income**: The country's GDP in 2021 was US$1.63B[24]. According to the 2019 State of the Environment Report, Solomon Islands has a dual economy: the formal or cash economy and informal or subsistence economy[25]. Approximately 85% of the people are dependent on the subsistence economy, deriving their livelihoods largely from subsistence agriculture, fisheries and forestry.

120. The Solomon Islands is one the poorest countries in the Pacific. Agriculture and other raw materials (such as logging) account for 92% of exports and therefore leaves the country highly vulnerable to economic shocks if any event were to impact production. This was seen in 2020 where the COVID-19 pandemic contributed to a decline in GDP of 4.5%. Economic modelling done by the Australian Department of Foreign Affairs and Trade (DFAT) estimates that the Solomon Islands economy will have substantially bounced back to a pre-covid state by the end of 2023.[26]

121. Despite this, poor infrastructure, under-developed labour skills, land tenure issues, and limited capacity to manage public administration and finances continue to act as major constraints to growth. As a result, the Solomon Islands is somewhat reliant on aid programmes, with Australia being the country's main development partner, providing approximately AU$161M in assistance payments over the course of 2021-22.

122. As outlined, most of the Solomon Islands population is based in rural areas, this is due to the agriculture and productive forestry industries being the largest economic sectors for the country as well as its largest exporters and hence the main source of employment and income. Agriculture throughout the country is divided into three areas: market production, commercial export crops, and subsistence smallholder farming. The latter makes up most livelihoods with approximately 84% of Solomon Islanders engaging in some form of subsistence smallholder farming practice (as of the 2009 census).[27]

[24] https://data.worldbank.org/indicator/NY.GDP.MKTP.CD?locations=SB

[25] https://www.sprep.org/publications/state-of-the-environment-soe-report-2019-solomon-islands

[26] https://www.dfat.gov.au/geo/solomon-islands/solomon-islands-country-brief

[27] https://www.adb.org/sites/default/files/linked-documents/cobp-sol-2017-2019-ld-01.pdf

123. Although not as prominent as the agriculture industry, aquaculture and fisheries also play a role in contributing to economic development in the Solomon Islands. Both offshore and inshore fisheries contribute to the sector with the former being the major income earner due to the licensing of foreign fishing vessels for tuna fishing. Inshore fishing, though not as economically profitable, is a larger source of livelihoods with many subsistence fishers taking up coastal and atoll areas. The aquaculture industry has been targeted as a source of economic development in the coming years with steady 1-2% increases in GDP contributions yearly. Resulting from this growth comes several environmental concerns such as overfishing leading to disruptions in the coastal ecosystems. More regulation management of the industry is therefore required in the coming years to ensure environmental protection whilst also maintaining this source of protein as a mainstay of food security.

124. Tourism is among one of the smaller sectors when it comes to contributing to the national economy, however, its recent growth has been targeted as a source of diversifying economic development in the coming years. In 2019, the country hit a record number of visitors with just under 29,000 people coming to the islands for a mixture of tourist and work purposes. The COVID19 pandemic offset this trajectory, but visitor numbers are slowly increasing again. 41.5% of people visiting the country in 2019 were Australian residents, making up most visitors to the islands.

125. Mining is another growth area that has been targeted for the country with significant mineral resources including gold, cobalt, nickel, bauxite and copper. A greater development of mining regulations in required however to ensure best practice, bolstering the economy whilst ensuring sustainable development.[28]

126. **Poverty and regional and urban development:** Although there have been some development improvements seen in the more urban areas such as Honiara, unfortunately, this development has not been evenly filtered into the more rural areas of the Solomon Islands. Poverty, a lack of food security, and basic water and sanitation needs not being met are all prevalent issues amongst the 75% of Solomon Islanders living rurally. These all contribute to the Solomon Islands' poverty rate of 25.1% and a Human Development Index of 151 of 189[29]. The major area for poverty is the Guadalcanal province with an estimated poverty rate exceeding 34%. Although poverty rates across the rest of the provinces are reasonably lower, this does not account for the large proportion of the population that are classed as poor (as opposed to living in poverty) who are more than likely to be encountering a similar experience to those living in poverty.[30]

127. Furthermore, there are growing concerns surrounding poverty in more urban areas as more and more people, particularly young people, are moving to cities but not finding employment and therefore reversing the developmental progress that has been made over the past decade.

128. **Public Health.**[31] Access to public health is limited across the country with approximately one doctor for every 3,300 people and then roughly 13 nurses and midwives for every 10,000 people. Despite this, around 87% of the population continues to seek health care when sick. The major hospital is in Honiara with each province having smaller hospitals that often lack the

[28] Ibid., pp. 22

[29] https://actiononpoverty.org/our-impact/where-we-work/solomon-islands/

[30] https://www.statistics.gov.sb/images/SolomonFiles/Social-and-Demography-Statistics/Solomon_Islands_Poverty_Maps_/SI_Poverty_Maps_Brochure_2018.PDF

[31] https://sph.med.unsw.edu.au/sites/default/files/sphcm/Centres_and_Units/LM_SolomonIslands_Summary.pdf

appropriate infrastructure and staffing provisions to offer any surgical or specialist services[32]. Demographic trends (between 1980 and 2013) that have had, and continue to have, impacts on the public health system.

129. **Energy access.[33]** Most rural communities in the Solomon Islands either have limited access, or are unable to afford energy services, such as electricity where, for example, 95% of rural households (and 63% of urban households), continue to use wood for cooking. According to the Solomon Islands NDS, it is hoped that the proportion of homes with no electricity drops from 50% of the country (calculated in 2010) to 20% by 2035, with a further target of increasing solar powered homes from 15% to 50% at around the same time (by 2035).

130. **Renewable energy**: According to the latest Nationally Determined Contribution (NDC) Report,[34] renewable energy plants produce 1.6 MW, generated from two solar hybrid systems (224 kV solar farm in Taro, Choiseul, and 168 kW solar farm in Seghe, Marovo), two grid-connect solar systems (1000 kW solar farm in Henderson, and 50 kW in Ranadi HQ), and one 150 kW hydro-diesel power station in Buala and 160 kW at Selwyn College.

131. **Land use and tenure[35]** Most land in the Solomon Islands is held under customary tenure and therefore every member of a landholding (such as tribe, clan, or family) has equal rights to use and access that land. Acknowledgement of these rights are particularly important in the Solomon Islands as connection to land is a fundamental element of traditional culture. Customary tenure further helps protect the rights of rural subsistence farmers, many of which, as previously mentioned, are living in states of, or near enough to, poverty.

132. **Education and gender equality**: The Solomon Islands has one of the lowest rates of participation at all levels of education throughout the Pacific, with these rates being even lower again for girls[36]. In 2004, the New Zealand government made a $30 million development contribution to the Solomon Islands' education sector. This partnership and continual investment from New Zealand have elevated the provision of education throughout the Solomon Islands with the introduction of elements such as a homestay scholarship program where successful applicants are offered to live and study in New Zealand as well as helping implement national education plans (NEAP). Despite seeing some improvements from these actions over the past two decades, it is recorded that less than 50% of children living in the Solomon Islands complete the full six years of primary education as there is no minimum amount of education required by the law.[37]

133. According to the 2019 performance assessment report published by the Solomon Islands Ministry of Education and Human Resources Development[38], girls generally performed better across almost all academic areas. However, enrolment levels for girls were significantly lower and

[32] https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwj-1ui7hLCAAxX8amwGHTgADsMQFnoECBUQAQ&url=https%3A%2F%2Fapps.who.int%2Firis%2Frest%2Fbitstreams%2F1246935%2Fretrieve&usg=AOvVaw3hFhLwXJQ3YTi0kax_cXm1&opi=89978449

[33] Ibid., pp. 22

[34] https://unfccc.int/sites/default/files/NDC/2022-06/NDC%20Report%202021%20Final%20Solomon%20Islands%20%281%29.pdf

[35] https://dpa.bellschool.anu.edu.au/sites/default/files/publications/attachments/2017-03/ib_2017_05_foukona_final_1.pdf

[36] https://www.mfat.govt.nz/en/aid-and-development/our-aid-partnerships-in-the-pacific/case-studies/a-pathway-to-peace/

[37] https://uis.unesco.org/en/country/sb

[38] https://www.mehrd.gov.sb/documents?view=download&format=raw&fileId=4367

dropout rates were far higher with 14.2% of girls dropping out of school altogether as opposed to the 2.1% of boys in 2018. In many cases, this is largely due to a lack of access to facilities such as sufficient toilets, making younger girls uncomfortable and not feeling safe in their school environment.

134. A lack of access for women goes beyond the school environment. In their government system, for example, only three women have been elected to parliament since 1978. When it comes to paid work, 62% of women are in a position of paid employment in comparison to 88% of men.[39]

135. **Transport.** There are 36 airports however only the Honiara International Airport has a paved runway[40]. There is only one registered air carrier (Solomon Airlines) who has six registered aircrafts. The latest figures for the annual passenger traffic on the registered air carrier indicate 427,806 passengers, and 3.84 mt-km of freight in 2018.[41]

136. The road network is very limited, with around 60 % located on Guadalcanal and Malaita[42]. According to the National Transport Plan[43], there are 1,463 km of roadway in Solomon Islands, of which 174 km is paved. The remaining roads are made of coral, gravel, or are dirt tracks. The Ministry of Infrastructure Development is responsible for providing transport services throughout the islands.

137. Maritime activities are managed by the Solomon Islands Maritime Administration. Major ports include Honiara, Malloco Bay, Viru Harbour and Tulagi. The Solomon Ports operate two ports: Honiara Port and Noro Port[44]. Honiara Port has one domestic berth with a minimum of 2m depth and 7m length, and two international berths with a minimum of 10.5m depth and 110m length. Noro Port is located at New Georgia Islands and has a berth of 12m depth and 60m length.

138. **Water supply.** Solomon Islands Water Authority is responsible for providing municipal water and wastewater services on the islands.[45]

139. **Waste management.** Solid waste, particularly plastic, is a major pollution problem in Solomon Islands[46]. Approximately 80 tonnes of household and commercial waste are generated daily in Honiara, of which approximately 23% remains unmanaged[47]. The National Waste Management and Pollution Control Strategy 2017 – 2026 identifies that the waste composition (based on a 2011 survey) is predominantly kitchen waste, paper/cardboards, textiles and plastics that make up over 75% of the waste composition[48]. Provision of a waste collection system is limited to only Honiara where there is a mix of door-to-door service as well as collection points

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[39] https://iwda.org.au/solomon-islands/#:~:text=Life%20for%20women%20in%20Solomon%20Islands&text=In%20government%2C%20just%20three%20women,violence%20from%20an%20intimate%20partner.

[40] Solomon Islands - The World Factbook (cia.gov)

[41] Ibid

[42] Solomon Islands: Roads/Routes to Success (adb.org)

[43] Ministry of Infrastructure Development (2016), *National Transport Plan*, NTP 2017-2036

[44] Solomon Islands Ports Authority (sipa.com.sb)

[45] Solomon Water - Home

[46] Plastic habit: Reducing waste with behavioural insights in Solomon Islands | United Nations Development Programme (undp.org)

[47] Centre of Environment, Fisheries and Aquaculture Science (2019), *Solomon Islands Waste Data Report*

[48] Solomon Islands: waste management and pollution control strategy 2017-2026. (mecdm.gov.sb)

within the city boundary provided by Honiara City Council (HCC). Waste is collected and transported to the Ranadi dumpsite, situated on reclaimed land located 500 m from the coastline, and is said to be at capacity with no space for unloading[49]. It is noted that the biggest challenge is associated with road conditions as well as condition of the waste collection vehicles. Those residing outside of the city boundary can put their waste into drums that are ultimately picked up by HCC contractors, however the frequency of pick up can be as sparse as once every three months. As a result of this, health hazards associated with uncollected rubbish, including domestic and wild animals raiding the waste drums, are very prevalent.

[49] Centre of Environment, Fisheries and Aquaculture Science (2019), *Solomon Islands Waste Data Report*

V. ANTICIPATED IMPACTS AND MITIGATION MEASURES

A. Overview

140. This IEE provides an analysis of the anticipated environmental impacts associated with the subprojects recommended by the feasibility assessment. Environmental safeguard measures will be incorporated into the project as follows:

- Pre-construction phase – the IEE and EMP will be submitted to the Solomon Islands ECD in support of an application for Development Approval in accordance with the *Solomon Islands Environment Act 1998* and *Environment Regulation 2008*. The IEE and EMP will be included in bidding and contract document documents. This IEE and EMP will be updated as the subprojects are further defined during detailed design. Environmental mitigation measures will be incorporated into project design. Once the contract is awarded, the successful contractor may mobilise to site but not commence works (including site clearing) until a notice to proceed is issued by the PMU. The contractor shall prepare a site-specific construction EMP (CEMP), including sub-plans as specified in this IEE and EMP, that will be reviewed and approved by the PMU. No physical works (including site clearance) will be undertaken before the CEMP is approved.
- Construction phase - the period from the time that the 'notice to proceed' is issued to the contractor to when the 'certificate of completion' is issued. The contractor will complete the project as per the design and technical specifications and implement the measures included in the approved CEMP. This process will be monitored and documented by PMU and PIC.
- Operation and maintenance phase - the period starting when the 'certificate of completion' has been issued until the end of the agreed lifetime of the project. SP will be responsible for implementing the measures identified in the operation phase of the EMP to mitigate post-construction impacts.

H. Design and Pre-construction Impacts

141. **Access to land**. Subprojects 1a, 1b and 2 are located on land owned by Solomon Power. The locations for Subproject 3 are yet to be determined but, if privately owned, will be accessed voluntarily. No subprojects will require involuntary land acquisition or resettlement. As such the subprojects are classed Category C for Involuntary Land Acquisition and Resettlement.

142. **Adaptation for climate change.** A Climate Change and risk vulnerability assessment has been completed for the SIREDP and assessed the physical climate change risk as low (Entura 2023). The assessment included the potential for the SIREDP to increase the risk of wildfire and found that the subprojects will not increase the risk of wildfire. Although predicted increases in temperature and precipitation associated with climate change is likely to increase the risk of wildfire in the Solomon Islands, vegetation management associated with the operation of the subprojects (e.g., maintenance of asset protection zone) may reduce the risk of fire.

143. Mitigation measures to maximise the subprojects climate resilience will include:

- Solar PV arrays are susceptible to strong winds and the technical specifications will ensure that all subprojects are designed to relevant standards to withstand extreme winds.
- Subprojects 1a and 2 will be designed and installed to withstand inundation.
- Equipment installed for Subproject 1b and Subproject 3 will be at least 0.5 m above historic flood levels and to avoid flooding impact.
- As sites for Subproject 3 are yet to be identified, site screening will include consideration for climate impacts including:
    - check of building structural strength
    - local flood history
    - land slope and landslide risk
    - building environs, such as shading and soiling.
- Components will meet international standards (e.g., IEC 61730 Photovoltaic (PV) module safety qualification).
- All components procured for the Subprojects will be suitable for tropical marine and coastal environments (preassembled where possible) and will be as resistant to corrosion as practicable (e.g., stainless or galvanized steel mounting systems).

144. **Fire**. The SIREDP has the potential to increase the risk of wildfire both on the subproject sites and surrounding areas. The risk of fire resulting from Subprojects 1a and 2 is considered low as the projects include ongoing vegetation management and an asset protection zone to prevent the spread of fire from or to surrounding areas. BESS equipment is relatively new and there are specific fire and explosion risks associated with BESS. Mitigation measures to ensure the safe operation of BESS's associated with Subprojects 1b and 3 include:

- BESS shall be subject to a site-specific risk assessment in accordance with IEC 62933-5.2 (Electrical energy storage (EES) systems - Part 5-2: Safety requirements for grid-integrated EES systems - Electrochemical-based systems). This standard provides a comprehensive and up-to-date coverage of the hazards associated with BESS (electrical, mechanical, chemical, fire, explosion), relevant standards or practices that should be complied with in each, and testing and validation that should be demonstrated prior to deployment including:
    - BESS must be subject to fire safety testing in accordance with a standard such as UL9450A and can only be installed in accordance with the findings of such tests to eliminate risk of propagation of any fire from cell to cell; module to module; or beyond the BESS enclosure.
    - Minimum stand-off distances from combustible surfaces (including existing infrastructure and neighbouring properties) of 3 m (or OEM recommendations) will be specified.
    - The control system must action appropriate safe and emergency shutdown procedures as relevant under abnormal events, including loss of communications.
    - Training for both system operators and local emergency services is required, emphasising the specific requirements and action for management of BESS fire. In particular, highlighting the potential for delayed or re-ignition, or gas build-up, and the required practices and procedures for managing emergency events, taking into account available skill sets.

145. **Pathogens and invasive species.** One invasive fauna species (Cane toad - *Rhinella marina)* and three known invasive plant species *Mimosa pudica* (sensitive plant), *Mikania macrantha* (mile-a-minute) and *Stachytarpheta jamaicensis* (blue rats' tail) were found at the Subproject site 1a and 2. Invasive species at the site have potential to be spread by the construction of the subprojects e.g., through tracking of seeds on vehicles or machinery.

146. Pathogens and invasive species may also be carried on, or in, materials, equipment (including vessels used to transport materials or workers) and any workers brought to Guadalcanal and Malaita for the subprojects. This includes materials, equipment and workers bought from other countries or elsewhere in the Solomon Islands.

147. Mitigation measures to prevent the introduction or spread of invasive species and pathogens will include:

- The contractor must obtain all required biosecurity and phyto-sanitary clearances (e.g., permits) for any material or equipment imported onto Solomon Islands.
- The contractor will comply with all measures stipulated in the *Bio-Security Act 2013* and obtain all permits and clearances for import of any materials and equipment to be used for the project as required by Biosecurity Solomon Islands.
- Materials will be inspected, and any equipment imported for project purposes will be steam-cleaned and certified under biosecurity and phyto-sanitary procedures in Honiara prior to mobilization.
- Immediately following clearing and construction, the subproject sites will be planted with low growing ground cover to help stabilise the site and minimise the establishment of weeds at each location.
- Weed hygiene measures will be implemented to prevent introduction or spread of invasive species, including cleaning machinery before it enters and leaves the subproject sites.

148. **Unexploded ordinance**. There is potential for unexploded ordinance (UXO) to be disturbed by earth works associated with Subprojects 1a and 2. A UXO survey has previously been completed for Subproject 1b (Honiara Power Station and East Honiara Substation) and subproject 3 includes no ground disturbing activities. A survey for UXO will be undertaken and clearance issued for subprojects 1a and 2 prior to any ground disturbing activities.

149. **Visual impacts.** The installation of the subprojects has the potential to impact the visual amenity of the view shed in which they are constructed. Subprojects 1a and 1b are located amongst existing industrial infrastructure (e.g., airport, fuel storage, substation) and the installation of solar PV arrays and associated infrastructure is not anticipated to have a significant impact. Subproject 2 is located in a vegetated area with nearby residences. Views of the site from residences are likely to be constrained by topography and existing vegetation however, it is likely that the solar PV, BESS and associated infrastructure will be visible from several residences. The addition of solar PV to rooftops of existing buildings as part of Subproject 3 is likely to have a negligible visual impact. The design of the subprojects will minimise visual impacts by using antireflective panels or coatings to ensure reflected light from PV surfaces does not create a nuisance to any nearby residents

150. **Noise.** The subprojects 1a, 2 and 3 do not contain any noise generating components that may impact the amenity of nearby residents. Subproject 1b has the potential generate minor

operation noise from BESS inverters and associated cooling equipment. Although background noise levels are high at both the Honiara Power Station and East Honiara Substation (located within the Honiara Power Station compound and adjacent to Kukum Highway respectively) there is still potential for noise from the BESS's to impact nearby residences. To mitigate potential noise impacts from the Subproject 1b BESS inverters will be located centrally and contained within a noise wall. Overall, the subprojects are anticipated to result in a reduction in the use of existing diesel generators thereby reducing noise emissions from the existing power stations and generators.

151. **Contaminated soils**. Soils at Subproject 1b Honiara Power Station and East Honiara Substation have potential to be contaminated due the sites historical and continued use as substations. Depending on the design of the foundations for the BESS's minor excavation may be required. If the final design of the BESS foundations requires soil disturbance, prior to the commencement of construction, the contractor will arrange for a preliminary site investigation of the disturbance footprint. The preliminary site investigation will include a detailed site history review to assess the risk of contamination and, if required, soil sampling and analysis where a contamination risk is identified. If soil analysis identifies the presence of contamination the contractor shall include a contaminated soil management and disposal plan in their CEMP.

152. **Local contractor engagement.** The construction of the subprojects is likely to lead to increased employment opportunities for local people. The contractor is encouraged to engage local people as workers (or contractors as the case may be) wherever practicable.

153. **EMP update, bid documents and national requirements**. The IEE and EMP will be submitted to the Solomon Islands ECD in support of an application for Development Approval of the project in accordance with the Solomon Islands *Environment Act 1998* and *Environment Regulation 2008*.

154. The IEE and EMP will be updated following the preparation of detailed designs for the subprojects. The update will include consideration of potential environmental impacts of changes or modification to the design of the subprojects.

155. The successful contractor will prepare a construction EMP (CEMP) reflecting their approach to the work and construction methodology (detailed with sub-plans and work statements as required) including the number of workers to be brought to the site, length of time they will be there, accommodation and water and food security/supply etc for the period. The CEMP will also detail how emergency situations and medical evacuations will be addressed. Prior to the contractor mobilising to each site the CEMP will be reviewed by the PMU and ADB and approved by SP and the PIC.

I. Construction Impacts on Physical Resources

156. **Erosion and sedimentation control**. Prior to onsite geotechnical investigations there is little available information about the susceptibility of the soils on the subproject sites to erosion. Clearing of existing ground cover and potential minor civil works (e.g., site levelling) for the construction of Subprojects 1a, 1b and 2 have potential to result in erosion. Erosion may also occur on material stockpiles and open trenches.

157. Measures to minimise and mitigate erosion at the subproject sites will include:

- Erosion control works and measures will be installed to control surface water runoff and prevent the export of sediments from the site by ensuring:

  - discharge of storm water is to stable preferably vegetated land; and
  - erosion control measures closely follow land contours to reduce runoff velocity from exposed soils.
- All land disturbances will be confined to the minimum practicable working area to ensure that the minimum area of land is exposed to erosion for the shortest possible time.
- Existing drainage lines will be protected, and diversion of drainage lines avoided.
- Sediment traps (e.g., silt fences) will be constructed across all drainage lines and erosion controls from site that are likely to receive runoff from exposed or disturbed soils.
- Sediment and erosion control measures will be monitored regularly to ensure their continued correct functioning.
- Cable trenches will remain open for the shortest duration possible to reduce erosion and where possible will not be open during periods of heavy rain or forecast weather events that may inundate the trench.
- Spoil from excavated trenches will be stored on the uphill side of the trench such that any sediment from the spoil is deposited in the trench.
- A shade tolerant low groundcover (e.g., grass) will be established as soon as practicable after site clearance at Subprojects 1a and 2. The species selected will not shade the PV modules.

158. **Water resources and quality**. The construction of the subprojects has the potential to interfere with local water resources (ground or surface water). Water resources may also be impacted through inappropriate abstraction of ground water for construction, alteration of surface water flow across the subproject site leading to sedimentation of adjacent environments (refer Erosion Control) and pollution of water resources through accidental spillage of hazardous materials (refer Hazardous Materials). Mitigation measures will include:

- Where feasible construction techniques will be specified that minimise the need to alter the topography (e.g., mass concrete blocks for ground mounted solar arrays) and hence surface water drainage on the site.
- Implementation of hazardous material mitigation measures (refer Hazardous Materials).
- Provision of adequate sanitation facilities for construction workers (refer Health and safety)
- Water required for construction (e.g., concrete mixing) will be sourced with the agreement of the PIC Environmental Safeguards Expert.

159. **Use of local materials.** The construction of the subprojects may involve the use of local materials such as fill and aggregate (sand or coralline) and water (refer above). The requirement for fill and aggregate will be dependent on the contractors preferred construction method but may be used to level the ground mounted solar PV site as well as in concrete for solar PV anchors (if not pre-cast off site). If fill or aggregate is sourced locally there is potential to negatively impact the source site through clearing of vegetation, erosion and sedimentation, noise and over extraction impacting local projects. If fill and aggregate is required, it will be sourced from licensed suppliers with the agreement of the PIC Environmental Safeguards Expert. If required, a Building Material Permit (BMP) / Extraction permit will be sought from Ministry of Mines and Energy.

160. **Hazardous materials**. Hazardous materials (e.g., fuels, oils, chemicals) will be required for the construction of the subprojects. The inappropriate transport, storage and use of hazardous materials has the potential to negatively impact the aquatic, groundwater and terrestrial environments of the subproject locations. Additionally, in the event of an accidental spill, failure to adequately contain and clean up the spill has the potential to negatively impact the surrounding environment. Mitigation measures will include:

- The contractor(s) will prepare a hazardous materials management plan that shall, at a minimum, include:
  - The type and quantity of hazardous materials that will be present on site.
  - Safety Data Sheets for all hazardous materials.
  - A spill response plan, including training, for staff in the use of spill kits.
  - Details of planned transport, storage and disposal of hazardous materials (including compliance with commitments contained within this IEE).
- The transport of hazardous materials will be undertaken by an appropriately qualified, experienced and equipped contractor.
- Hazardous materials storage areas will be located at least 50 m from water, including the drainage lines, and will consider contamination pathways (e.g., proximity to ground water receivers, risk of inundation).
- Hazardous materials will be stored in appropriate containers that are in good condition with adequate labelling.
- Hazardous materials (including fuel and oils) storage will be appropriately bunded (e.g., self-bunded containers or a bund with a minimum of 110% capacity of the largest container).
- Refuelling will take place in a designated area and drip trays, or containment devices will be used when refuelling equipment and machinery.
- Spill kits and containment devices appropriate for the type and volume of hazardous materials on site will be located at the storage area(s), on site and on vehicles carrying hazardous materials.
- All personnel involved in the handling of hazardous materials will be trained in the handling, emergency procedures and storage requirements for the materials they are handling.

161. **Waste management**. The subprojects are not anticipated to produce a significant volume of waste. Wastes will predominately include packaging materials and general waste. There are expected to be few hazardous wastes generated during construction however, there are few facilities for the disposal of hazardous wastes in Honiara or Auki. The inappropriate management of waste during construction of the subprojects has the potential to pollute surrounding water, groundwater and land. Waste management during all phases of the subprojects will seek to reduce, reuse and recycle waste as far as possible and dispose of waste in an appropriate way. Mitigation measures will include:

- Hazardous waste (if generated) will be disposed of in accordance with the manufacturers requirements at a facility licenced to accept the type and quantity of waste (or approved by the PIC Environment Safeguards Expert). If no such facility exists in Solomon Islands hazardous waste will be shipped to an appropriately licenced facility.

- Vegetation cleared from the Subproject 2 site will be temporarily stockpiled on site and disposed of at a location agreed with the PIC Environment Safeguards Expert. Stockpiled vegetation will not be burnt unless no viable alternative can be identified in consultation with PIC Environment Safeguards Expert.
- The construction contractor will consult with the PIC Environment Safeguards Expert to identify opportunities to avoid and reduce the generation of waste and to recycle or re-use waste generated.
- If excess spoil is generated during site preparation it will be stored at an existing stockpile site for re-use.
- Bins for recycling and general rubbish will be provided at the project site and materials laydown area for the disposal of construction wastes and will be removed off-island at end of construction period.

J. Construction Impacts on Biological Resources

162. **Removal of vegetation**. The construction of Subproject 2 will require the removal of approximately 4 hectares of vegetation. The locations of Subprojects 1a and 1b have previously been cleared of vegetation and Subproject 3 will not require vegetation clearance. In addition to the loss of vegetation for Subproject 2, the subproject may impact vegetation by:

- unauthorised clearing outside the subprojects site boundary
- clearing elsewhere e.g., to store materials.
- causing damage to surrounding vegetation through erosion (refer *Erosion control*)
- changes to surface drainage (refer *Water resources and quality*)
- introduction of invasive species (refer *Pathogens and invasive species*).

Mitigation measures include:

- The subproject site boundary will be clearing marked on a plan and approved by the Engineer/supervision consultant prior to the commencement of clearing. Only vegetation identified on the plan will be removed.
- Ensure vegetation clearance is restricted to within the subproject site boundary and is the minimum practically required for the proposed works, including allowance for shading. The proposed site boundary will be approved by SP and the PIC prior to the commencement of clearing.
- Cleared vegetation will be removed from the subproject site and disposed of at a location approved of by PIC Environment Safeguards Expert (noting cleared vegetation includes weeds and potentially weed seeds). Vegetation will not be permanently stockpiled on site or pushed into existing vegetation adjacent to the site.
- Where possible machinery storage and materials lay down areas will be established in previously disturbed areas to avoid increasing the footprint of the project site.

As far as is practicable, existing stockpiles of fill material will be used. If new fill material is required, it will be sourced from locations by licensed suppliers approved by the PIC Environment Safeguards Expert.

163. **Impacts to threatened and protected species and habitats**. Subproject 3 will not disturb vegetation, fauna or fauna habitat. A survey of the site of Subproject 1a found that it was

a grassland dominated by the introduced para grass (*Urochloa mutica*). There is little native flora on the site. There are no trees on the site although there are several banana plants (Musa species) present of the eastern boundary. There were no species recorded or that could potentially occur that are listed as threatened on the IUCN Red List. Subproject 1b will be co-located within the existing SP owned and operated Honiara Power Station / East Honiara Substation and there will be no disturbance to vegetation, fauna or fauna habitat.

164. The clearance of vegetation from the site of Subproject 2 may result in the loss of native flora and loss of fauna habitat. However, no species listed on the IUCN Red List have been recorded or are considered likely to occur at the site due to the disturbed nature of the site and its lowland location. The Solomons cockatoo (*Cacatua ducorpsi*) was recorded at the site of Subproject 2. However, this species is common across most of the Solomon Islands and is considered a species of Least Concern on the IUCN Red List. The near-threatened chestnut bellied imperial pigeon (*Ducula brenchleyi*) may visit the site of Subproject 2 to feed on the fig (*Ficus septica*) trees there but it is unlikely to form important habitat for this species which prefers to inhabit primary forest.

165. There are no terrestrial areas currently formally protected under Solomons Island legislation on Guadalcanal or Malaita. There are, however, informally protected areas and areas proposed for listing under the *Protected Areas Act 2010* on Guadalcanal and Malaita (Annex 4). None of the subproject sites are located within a protected area nor are likely to impact a protected area.[50]

166. Critical habitat as defined by ADB SPS 2009 includes not only habitat for endangered species and areas of social, economic or cultural importance but also areas that have significance for endemic or restricted range species, are critical for the survival of migratory species, support globally significant numbers of a species, have unique assemblages of species or that provide key ecosystem services. None of the subproject sites meet the definition of critical habitat.

167. The subprojects are not expected to impact any threatened and protected species or habitats, critical habitat as defined by ADB SPS 2009 or any protected areas.

K. Construction Impacts on Socio-economic Resources

168. **Cultural heritage.** There are no known cultural values or artefacts associated with the subproject sites. Consultation with local community members to date has also not identified any cultural values associated with the subprojects sites.

169. If an artefact is discovered during site clearance that may be of cultural heritage significance work will cease immediately. The PMU will be notified immediately. A chance finds protocol will be included in the CEMP.

170. **Noise and vibration**. The construction of the subprojects will generate noise through the operation of machinery on the subproject sites and movement of vehicles and machinery transporting equipment and materials to subproject sites. All subproject sites have sensitive receptors including residential houses. The proposed rooftop solar installations for Subproject 3 are likely to utilise government owned buildings such as schools, hospitals or community buildings

[50] https://pipap.sprep.org/country/sb

which are sensitive to noise disturbance. Construction noise impacts will be sporadic and are expected to be minor. Mitigation measures will include:

- Working hours will be between 8am and 5pm Monday to Friday unless otherwise agreed between the contractor, and PMU (or operators of buildings for Subproject 3). Where safety or technical reasons require work to be completed outside of these hours, noise levels will be kept to a minimum and nearby residents will be kept informed.
- For Subproject 3 work will be completed during non-school hours or school activities will either be temporarily relocated for the duration of construction works.
- Noise generating activities will be carried out in the least sensitive time periods (to be determined in consultation with building managers for Subproject 3). Wherever possible works will be scheduled to avoid disruption to the normal use of buildings.
- Equipment and plant will be maintained in good order. Noise reduction components (e.g., mufflers) will be inspected prior to the commencement of works to ensure they are fully functional. Noise emissions from construction equipment will not exceed 75 dBA.

171. **Air quality and dust**. The construction of the subprojects has the potential to generate dust through earth moving associated with site clearance and levelling for Subprojects 1a, 1b and 2 (if required), by the movement of vehicles and machinery and by exposed soil on cleared sites or in soil stockpiles. Exhaust emissions will also be generated from machinery and vehicles. Measures to mitigate impacts to air quality and the generation of dust will include:

- Vehicles and machinery will be maintained in good order.
- Vehicles will not be left idling when not in use.
- Vehicles carrying soil, sand, crushed aggregate or other fine materials to or from the subproject sites will be covered.
- The subproject sites, material stockpiles and access roads, including those from the wharf and material stockpile areas, will be wetted or stabilised if dust is generated.

172. **Influx of labour – impacts of foreigners and non-local workers.** The subprojects are likely to require foreign contractors and technical specialists for the duration of construction. It is anticipated that, dependent on the number of local workers employed, between approximately five and ten foreign workers would be present for the duration of construction. Despite the size of the non-local workforce being expected to be small there is potential for conflict between foreign workers and local communities. Mitigation measures will include:

- A code of conduct will be agreed between the PMU and the contractor which will govern the conduct of all workers for the period they are working at each site. The protocols will govern workers' conduct while at work and in communities, behavior around women and children, restrictions on alcohol consumption, prohibitions (with sanctions for non-compliance) on workers hunting or fishing, implementation of awareness programs, implementation of the GRM and handling of complaints, hiring of local labor, and implementation of the health and safety plan (HSP).
- All non-local workers will receive an induction that outlines the social and cultural expectations when working in Solomon Islands (on Guadalcanal and Maliata) and the code of conduct they must adhere to. Any worker not complying with the code of

conduct will be expelled from the Solomon Islands and repatriated at the contractor's expense.

- A grievance redress mechanism (GRM) has been established for the project (refer Section 8) and will be communicated through the engagement programme and by prominent display of the GRM process at the subproject sites prior to the commencement of onsite works.

173. **Health and safety – workers**. The construction of the subprojects will involve health and safety risks to contractors and SP staff. Except by agreement with SP, the contractor will be responsible for access to the subproject sites during construction. The contractor shall be required to prepare a Health and Safety Plan that complies with the World Bank Group's *Environmental, Health, and Safety Guidelines (EHS Guidelines)*[51] that describes the safety measures that will be implemented to protect staff and contractors during construction. The HSP, as part of the CEMP, will at a minimum:

- Include measures and equipment required to protect workers and link to the emergency response plan and other plans as necessary.
- Identify responsibilities and authorities within the contractor's staff for adhering to occupational health and safety (OHS) requirements.
- Identify and provide required personal protection equipment (PPE) for staff and sub-contractors (before they start work).
- Install fencing on all areas of excavation greater than 1 m deep whether temporary or permanent.
- Define appropriate emergency and medical process including evacuation procedures.
- Prepare appropriate work method statements for each construction activity.
- Provide daily hazard identification checklists and risk assessments.
- Identify mandatory meeting requirements including toolbox sessions, to ensure all personnel understand the task before commencing work for the day.
- Set procedures for safe handling of toxic materials and other hazardous substances.
- Provide for installation of lights and cautionary signs in hazardous areas.
- Ensure operators of vehicles and equipment are properly licensed and trained.
- Ensure safety and inspection procedures are implemented, setting schedules for regular checking.
- Ensure movements of heavy vehicles is managed to minimise impacts to existing traffic and the wider community.
- Provide for the provision of adequate sanitation and potable water for staff and contractors for the duration of construction works.

174. The construction of the subprojects will also involve health and safety risks to the local community. The contractor's HSP will also include measures to protect the community at a minimum including:

[51] https://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/sustainability-at-ifc/policies-standards/ehs-guidelines

- Before construction commences the contractor/s will conduct training for all workers on environmental safety, environmental hygiene, and the code of conduct.
- Child and/or trafficked labour will be strictly prohibited for any activities associated with the project.
- Children will be prohibited from entering the sites (including worker's accommodation, works area/construction zone) and prohibited from playing on any equipment or machinery.
- Access will be controlled to subproject sites for the duration of construction to prevent public access e.g., through the use of security fencing or restricting access to roof tops.
- Advisory signage warning of the dangers of unauthorised access will be placed where clearly visible on security fencing.
- All advisory and warning signage will be clear, secured on fences, gates and signboards and be posted in Pidgin, the language of the main nationality of workers and repeated in English.

175. **Unanticipated environmental impacts**. If unanticipated environmental impacts occur during construction phase, in consultation and agreement with the PMU, the Contractor will update the CEMP. The environmental protection measures will be designed to address the impacts.

L. Operation Impacts

176. **Waste and hazardous materials**. The operation of the subprojects will generate waste, including hazardous waste (e.g., inverters and batteries may require replacement during the life of the subprojects), which must be appropriately managed to prevent contamination. Mitigation measures will include:

- Where possible batteries and inverters will be recycled. If recycling is not possible, they will be disposed of at a facility approved by the relevant regulatory agency or, if no facility is available, transported to an appropriately licenced facility outside of Solomon Islands (refer to Decommissioning Waste Management).
- Hazardous waste (e.g., batteries or inverters) will be sent for disposal at regular intervals and not allowed to accumulate at the subproject sites.
- Inverters and batteries that are replaced during the operating lifetime of the power station will be removed, transported and disposed of by an appropriately experienced and equipped contractor.
- Washing of solar PV panels will only be undertaken on an 'as needs' basis to minimise the generation of wastewater.
- All infrastructure containing hazardous materials (e.g., batteries, transformers) will be inspected regularly to ensure they function correctly, and no hazardous materials are being discharged.

177. **Water resources**. Water will be required for washing solar PV modules during operation of the subproject. A source of water will be agreed with the relevant regulatory agency prior to the commencement of operation.

178. **Erosion control**. If localised erosion is detected during operation of the subprojects, effective mitigation measures will be installed such as:

- application of mulch
- covering with open weave jute matting and reseeding with ground cover
- protection with geotextile fabric
- localised flow dispersal and diversion structures.

179. **Fauna**. The subprojects do not provide habitat for any species of fauna however, some species, including birds, may pass through or overfly the sites. The collision risk of birds and solar panels (e.g., through glare) in generally considered to be low and the small size of the arrays would not prevent birds moving between preferred habitats. The subprojects will not result in a significant impact on any fauna species, including birds.

180. **Employment**. It is expected that existing employees will be retained to operate the new solar power systems. Training will be provided to SP employees in the operation and maintenance of the new infrastructure.

181. **Emergency response**. SP will prepare (or update) an operational emergency response plan. The plan will be included in the training provided to employees and be implemented during the operation of the power station.

M. Decommissioning impacts

182. **Decommissioning of solar PV arrays and batteries facility**. The subproject's solar PV modules are expected to have an economic life of at least 25 years. At this time, it is expected that they will be replaced by new solar PV modules. The removal of the solar PV modules will be contracted to a specialist supplier.

183. The batteries installed are expected to have an economic life of between 10 and 20 years depending on the battery type selected. All equipment will be removed from the subproject sites (e.g., PV modules, batteries, inverters) and will be reused or recycled.

184. Reuse or recycling of batteries, solar panels, inverters and other e-waste is currently limited throughout the pacific. Fiji, Singapore, Australia and New Zealand have recycling capabilities however, shipping constraints including costs and compliance with hazardous waste conventions (e.g., Solomon Islands is a member of the Waigani Convention) often make recycling unviable. PacWaste has previously partnered with the ECD and local solar supplier and installer Sol Power Solomon Islands Ltd. (SPSIL) to trial lead acid battery collection and recycling. The trial collected lead acid batteries from solar home systems and pack them for export to recyclers in Fiji. There are no known similar initiatives for solar panels, lithium-ion batteries or inverters currently proposed in the Solomon Islands.

185. There are no know solar panel or lithium-ion battery (the type of battery proposed by the subprojects) recycling facilities on the Solomon Islands. The closest know recycling facilities for solar panels and lithium-ion batteries are in Australia. In the absence of any other options at the time of decommissioning (or operational waste collection) solar panels, batteries and inverters will be shipped to Australia for recycling.

186. There are several existing commercial scale solar developments in Solomon Islands and there are numerous other solar / battery projects in proposed or under development. All these projects will generate waste during operation and decommissioning. If a Solomon Island based recycling facility is not developed consideration should be given to establishing a centralised collection and storage facility in Honiara for e-waste including solar panels and lithium-ion batteries.

187. Waste that cannot be reused or recycled will disposed of at a facility approved by the relevant regulatory agency or, if no facility is available, transported to an appropriately licenced facility outside of Solomon Islands.

188. **Hazardous materials**. The decommissioning contractor will be required to develop a hazardous materials management plan prior to the commencement of any works on site.

189. **Revegetation**. If the site is not reused it will be revegetated with species appropriate to the future land use of the site.

VI. ANALYSIS OF ALTERNATIVES

190. Solomon Islands is committed to transitioning its electricity generation from fossil fuel-based sources to renewable energy. This transition it required to enable Solomon Islands to meet the aims of its NEP and its NDC commitments under the Paris Agreement.

191. Solomon Islands has other potential renewable energy generation sources, including hydropower and geothermal. However, in alignment with the findings of the RERM, the SIREDP considers that geothermal is not currently viable, and that there is limited opportunity for hydropower beyond the current Tina River Hydropower Project. It therefore focusses solay PV, BESS and system integration projects. Solar PV is considered the only renewable energy resource that can feasibly be developed to meet short term renewable generation targets and will inherently require the support of BESS to manage variability and match demand.

192. For networks with low levels of renewable energy, the least cost development pathway is to add renewable generation since this typically provides the lowest cost of energy and can directly displace diesel generation. Thus, the highest priority projects for both Honiara and Auki grid are the addition of solar. In Honiara, the available land limits the capacity of new solar that can be added to 1 MW (well below the ability of the grid to utilise renewable energy), hence the selection of this project over any alternate. In Auki, the Ambu site (Subproject 3) can potentially host 3 MW of solar, however, this is more than is required to meet load. The Ambu site therefore provides the opportunity to shift Auki to a high renewable grid, in which case an alternate challenge arises in that the day-time generation of solar does not directly meet night-time consumption without use of storage. Since battery energy storage systems (BESS) are currently the lowest cost method of storing electrical energy at this scale, Auki requires a balance of BESS and solar PV that achieves least cost generation. Energy modelling was used to choose the least cost solution, which provides about 80% renewable energy contribution. This is typical of many similar projects and avoids the alternative of very high renewable contribution (>90%) where the costs necessary to manage variability increase exponentially.

193. The BESS selected for the Honiara Grid provides a different primary function to that in the Auki Grid. With no other solar PV project options directly available, there is no excess solar energy that would need storing for night-time. However, in a system with even low to moderate levels of solar PV, diesel generators can operate in-efficiently due to redundancy requirements necessary to manage variation in output. These requirements mean there is significantly more diesel generation capacity operating than the load. The Honiara Substation BESS is intended to meet this requirement instead of using diesel generators. This will reduce the number of operating diesel generators, reduce their operating costs, and increase machine loading and hence efficiency. In the event of a fault in the electrical feeder connecting the solar PV, the BESS can cover the shortfall with no interruption to supply.

194. Notably, substantial future solar PV is planned for Honiara Grid, primarily through private sector investment (net metering and independent power producers). This will require a larger BESS for shifting solar generation to match demand. A second BESS is under consideration for Honiara Grid pending firming of the generation pipeline, however, this option was not necessary for the current development status.

195. SP identified the preferred sites for Subprojects 1a, 1b and 2. All three subproject sites are located on land owned by SP avoiding the requirement to negotiate land access. Subproject sites 1a and 2 are also located close to existing electricity transmission infrastructure and

Subproject 1b is located at the existing Honiara Power Station / East Honiara Substation allowing connection to the existing electricity grid without the need for significant additional environmental or social disturbance. Subproject sites 1a and 1b are already cleared and there were no significant environmental values identified at the site of Subproject 2.

196. Several other locations for the development of ground mounted solar PV were considered but none were able to meet these attributes, particularly considering the SIREDP focus on lower risk easier to develop projects.

197. Locations for the installation of rooftop solar PV are yet to be determined. Site selection prioritise locations with no or low potential impacts to social or environmental values.

198. A ‘do nothing’ approach was not considered as it would prevent Solomon Islands meeting the aims of its NEP and its international commitments through the Paris Agreement and would also continue the status quo of high electricity costs hampering economic growth.

VII. CONSULTATION AND INFORMATION DISCLOSURE

A. Consultation

199. ADB requires projects to engage in and carefully document meaningful consultation with stakeholders. ADB defines 'meaningful consultation' as a process that:

- begins early in the project preparation stage and is carried out on an ongoing basis throughout the project cycle.
- provides timely disclosure of relevant and adequate information that is understandable and readily accessible to affected people.
- is undertaken in an atmosphere free of intimidation or coercion.
- is gender inclusive and responsive and tailored to the needs of disadvantaged and vulnerable groups.
- enables the incorporation of all relevant views of affected people and other stakeholders into decision making such as project design, mitigation measures, the sharing of development benefits and opportunities, and implementation issues (ADB SPS, p. i).

200. In carrying out the preliminary design and safeguards due diligence stakeholders in Honiara and Ambu have been consulted including:

- Stakeholder Meeting
  - With SP Stakeholders (donor partners and main energy consumers)
- Community meetings with:
  - Communities surrounding Henderson Solar Farm Site
  - Communities surrounding Ambu Solar Farm Site
    - Ambu
    - Ngadaefiu
    - Ngalisagore
- Focus Group Discussions with Women.
  - Women at Henderson
  - Women at Ambu
  - Women at Ngadaefiu
  - Women at Ngalisagore

201. A summary of stakeholder meetings is provided in Table 7-1 whilst a full list of stakeholders and communities that have been consulted as part of this project is provided in ANNEX 3.

Table 7-1: Summary of Stakeholder Meetings

Date / Location	Stakeholders	Number of participants (male / female)

1 June 2023; Honiara Hotel. Honiara	ADB, Solomon Power, Design Consultant, Government agencies, business community representatives	-
2 July 2023; Greenhouse, Y-Rd, Henderson, Honiara.	Henderson community consultation meeting	32 participants - 20 men, 12 women
2 July 2023; Greenhouse, Y-Rd, Henderson, Honiara	Henderson Women's Focused Group Discussion (FGD)	13 women
4 July 2023; Ambu community hall, Malaita	Ambu community consultation meeting	21 participants - 8 men, 13 women
4 July 2023, Ambu community hall, Malaita	Ambu Women Focus Group Discussion (FGD)	13 women
5 July 2023, Ngadaefiu Church Hall, Malaita	Ngadaefiu community consultation meeting	23 participants - 19 men, 4 women
5 July 2023, Ngadaefiu Church Hall, Malaita	Ngadaefiu Women Focus Group Discussion (FGD)	10 women
6 July 2023; community meeting area, Ngalisagore, Malaita	Ngalisadore community consultation meeting	26 participants – 16 men; 10 women
6 July 2023; community meeting area, Ngalisagore, Malaita	Ngalisadore Women Focus Group Discussion (FGD)	10 women

202. ADB requires that stakeholder consultations be well documented. During project implementation SP will ensure that meaningful public consultations will continue to be undertaken. Attendance sheets recording name, gender, and institution should be prepared and filed for all group meetings. For large group meetings, written documentation should be accompanied by one or more photographs to document the meeting, its venue, and its participants.

203. The project's communication and consultation plan (CCP) outlining the main project information, messages and mechanisms throughout the project cycle will guide the information to be provided to stakeholders and affected people and timing, along with general disclosure requirements (see below). The CCP will be updated early in implementation by the supervision consultant. The CCP will be implemented by the SP with support from the supervision consultant. The contractor's CEMP will explain how the contractor will implement the elements of the CCP relevant to construction activities and will include in their monthly reports the consultation and disclosure activities undertaken.

N. Information Disclosure

204. All safeguard documents including the safeguards monitoring reports are subject to public disclosure, and therefore will be made available to the public. Following clearance of the IEE by ADB the document will be posted on government and ADB websites as per the Access to Information Policy (2018). Provided it does not contain any commercially sensitive information, the approved CEMP will also be disclosed.

VIII. GRIEVANCE REDRESS MECHANISM

205. ADB requires that the borrower/client establishes and maintain a grievance redress mechanism (GRM) to receive and facilitate the resolution of affected people's – including workers and community members - concerns and grievances about the borrower's/client's social and environmental performance at project level. The GRM should be scaled to the risks and impacts of the project and should address the affected people's concerns and complaints promptly, using an understandable and transparent process that is gender responsive, culturally appropriate, and readily accessible to all segments of the affected people. Grievance redress will be free of charge to the affected person.

A. Approach to the design of the GRM

206. The proposed GRM for SIREDP anticipates limited complaints related to land ownership and livelihood restoration and other resettlement issues, given the absence of involuntary land acquisition and the 'greenfield' nature of the Henderson and Ambu sites. Consequently, most complaints will likely be associated with construction impacts during the construction phase. At the same time, the Project GRM must anticipate receiving SEAH related complaints and must therefore have in place a mechanism or procedure to receive and address these complaints effectively. For SIREDP, an essential part of this set-up includes involving the Ministry of Women, Youth Children and Families (MWYCF) and establishing links to existing national entities with the capacity to contribute to addressing SEAH related issues. Dealing with SEAH related complaints in the context of SIREDP also requires a streamlined process that will allow complaints to be addressed with urgency, sensitivity and with confidentiality accorded to the handling of information about reported SEAH incidents, and identities of affected people. For the GRM to address these needs effectively, the treatment of SEAH related complaints will be separated from other project-related complaints. The composition of the Grievance Redress Committee will include a female representative of the MWYCF. The management of SEAH risks and incidents is discussed in detail below.

207. To the extent possible, harmonizing with SP existing mechanism(s) for addressing public grievances is important and encouraged to avoid duplication and to optimize the use of SP's limited capacity.

208. **Awareness of the GRM:** The public and in particular local populations around the project sites and project workers, will be informed about the GRM through information dissemination activities to be conducted by the Project Implementing Agency prior to and during project construction. Specific information related to SEAH risks and complaints management will be highlighted in information brochures and in consultation presentations. Community awareness activities prescribed in the Project Gender Action Plan for GBV/SEAH and HIV risks will also highlight links to the GRM as the mechanism for SEAH incidents documentation, reporting and management.

209. Signage and information boards on project compound gates will prominently display information on the GRM, including names and addresses of contact persons (email addresses, mobile phone numbers). All stakeholder consultation to be conducted before and during project implementation will include a presentation on the Project's GRM.

210. **Who can file a complaint:** A complaint may be registered by any stakeholders who may be, directly or indirectly affected by the project. A representative can register a complaint on behalf

of the affected person or group, provided that the representative is identified by the affected person or group and submits evidence of the authority to act on their behalf.

211. **Types of grievance/complaint to be filed:** Any comments, complaints, queries and suggestions pertaining to safeguard compliance - environment, land acquisition, design-related issues, service delivery or any other issues or concerns related to the project. The complaint must contain the name, date, address/contact details of the complainant, and location of the problem area, along with the problem. SEAH related complaints must be handled with sensitivity, with information such as the identities of affected persons (victims and or survivors) and other details to be treated with confidentiality. A sample grievance registration form is provided in Annex 5.

212. **Where and how to file a complaint:** The Contractor's site offices on its locations in Henderson and Ambu will be the primary point for receiving and lodging any complaint during the construction phase. The Solomon Power office in Ranadi where the PMU is located is also expected to be a direct recipient of complaints.

213. Grievances/suggestions/queries from affected persons can be dropped into suggestion boxes or conveyed through phone or e-mails. The Grievance Focal Point (Social Safeguards Officer of the PMU) is responsible for handling grievances and will document/record verbal grievances and those received over the telephone. The complaints received at site offices will be forwarded by the Contractor's Site Manager to the GFP in the PMU. The PMU will serve as Public Information Centre, where information on the project and its social and environmental safeguards will be available.

214. **Documentation:** Documenting the complaints is important and must contain the name of the complainant, date of receipt of the complaint, address/contact details of the person, location of the problem area, and how the problem was resolved. Documenting SEAH related complaints require sensitivity to endure details and identities of affected people are protected. The GFP (Social Safeguards officer) in the PMU will have the overall responsibility for timely registration and documentation of grievances, related disclosure, and communication with the aggrieved party.

215. **GRM Structure:** Grievances will be addressed at three levels. Most grievances are expected to be communicated directly to Site managers or the GFP. Many grievances particularly those related to construction impacts (e.g. noise, other nuisances) can be easily addressed in-situ by the Site Manager. Grievances that cannot be dealt with effectively at site level or by the GFP will be forwarded the Project Manager who will endeavor to resolve them as soon as possible. The Grievance Redress Committee (GRC) is the final arbiter for complaints that are not resolved satisfactorily by the Project Manager. Where aggrieved parties remain dissatisfied with remediation offered by the GRC, they are free to seek redress through the local legal process.

216. The GRC comprises of five (5) members - Grievance Focal Point (GFP), a female representative of the Ministry of Women, Youth, Children and Family (MWYCF), the Contractor's representative, Project Manager and a representative of SP.

B. GRM process during construction

217. The GRM process will follow the procedure described below. This may be further updated based on feedback/comments from stakeholders during the pre-mobilization meeting. The steps to be followed are as follows:

- Complainants are directed to lodge their complaint/grievance with the GFP (Social Safeguards Officer at PMU) at the SP Ranadi Office, or the Site Manager at the project site.
- Where possible, the GFP or Site Manager will resolve the complaint as soon as possible and inform the Complainant.
    - The GFP will document and register the complaint in the Complaints Register, ensuring all details as required are documented. The Site Manager will also provide to the GFP details of complaints received on site that he/she had satisfactorily resolved, for documentation/registration.
- If the GFP and or Site Manager is unable to resolve the complaint within a reasonable time frame (few days), or if the Complainant is dissatisfied with the remediation offered at this level, the GFP will refer the complaint to the Project Manager who will endeavour to resolve it as soon as possible, or within a maximum of 5 working days.
    - The project manager will discuss and endeavour to resolve the complaint in consultation with, as necessary, with the GFP and or Site Manager.
- If the complaint is not resolved within 5 working days, either because it is complex and or the complainant is dissatisfied with any offered resolution, then the Project Manager will refer the complaint to the GRC.
- The GRC will meet as soon as possible to resolve complaints referred to it by the Project Manager.
    - The GRC will endeavour to resolve the complaint within a period of 2 weeks. The proposed remedy will be communicated to the complainant via the GFP or Site Manager.
    - If the complaint is resolved satisfactorily, the GFP will then record the complaint as resolved and indicate it as ‘closed’ in the Social Complaints Register.
- Should the complaint not be resolved satisfactorily through the GRC, the complainant reserves his/her right to seek redress through local legal processes. A decision of the legal process (i.e., Court) on the matter will be final and binding on all parties involved.
- The GFP will keep track of the statuses of all unresolved complaints including those being pursued by complainants through the Court system and will ensure that the GRC is kept informed and the social complaints registered updated timely. The GFP will also make sure this information is available and reported in the project’s quarterly progress and in bi-annual safeguards monitoring reports to ADB.

C. Handling SEAH related complaints

218. The GRM acknowledges that many SEAH risks and incidences emanating from the Project may occur and get addressed completely outside the framework of the Project GRM. Similarly there are multiple entry points through which SEAH incidents and complaints may be communicated to and received by the Project, outside of and by-passing one or more stages of the established GRM. In both cases, the GRM should be adequately flexible to receive, document, and take appropriate actions. As defined by the project’s Gender Action Plan, a Standard Operating Procedure (SOP) for reporting and responding to SEAH incidents will be developed in alignment with the ADB’s Good Practice Note on Addressing SEAH in ADB-Financed Projects

with Civil Works 2023 and communicated prior to commencement of construction during site personnel training and community awareness sessions. This will include requirements for any additional support services.

219. Of the proposed GRM, the GRC has limited capacity to deal with SEAH related complaints. Consequently, all SEAH related grievances, upon receipt by GFP and or Site Manager, will be communicated directly and immediately to the Project Manager who will convene the GRC to discuss the issue as soon as possible. The GRC will review the complaint and will do the following two things (i) refer the issue to the Safenet Referral Network through the MWYCF for appropriate action; and (ii) inform ADB through its designated Project Officer for its information and to request ADB advice and or assistance. Communication with the MWYCF and the Safenet Referral Network will be through the MWYCF representative on the GRC. Communication and coordination with ADB will be handled by the Project Manager

D. During Operation

220. During project operation, following the completion of construction, the management and maintenance of the SIREDP funded facilities will be integrated into SP's regular operation. The GRM needs to be reviewed at this point to ensure its' seamless integration into SP grievance redress processes. The handling of SEAH related complaints will likewise be reviewed taking into account SP's safeguards protocols. It is expected however that SP will work closely with MWYCF in carrying out this review and that the use of established capacities accessible through the Safenet Referral Network will continue to feature prominently in the management of SEAH risks and incidents.

221. **Complaints Register (during and after the SIREDP):** All complaints lodged are to be documented in a register that will be maintained by the SP Safeguards Officer at the SP Headquarters at Ranadi during the post-project period. Details of the complaint will be recorded by date, name, contact address and reason for the complaint. SEAH related complaints should be summarized for the register without identifying details and identities of affected (especially victims and survivors) persons. A duplicate copy of the entry will be given to the affected person for their record at the time of registering the complaint and a summary will be annexed to PMU's quarterly progress and six-monthly Safeguard Monitoring reports.

222. Post-project, the register maintained by the GFP during project implementation will be integrated into SP's complaints register and will be managed by the SP Safeguards Officer, assuming the integration of the Project PMU into SP.

223. The SIREDP GRM process flow is presented in Figure 8.1.

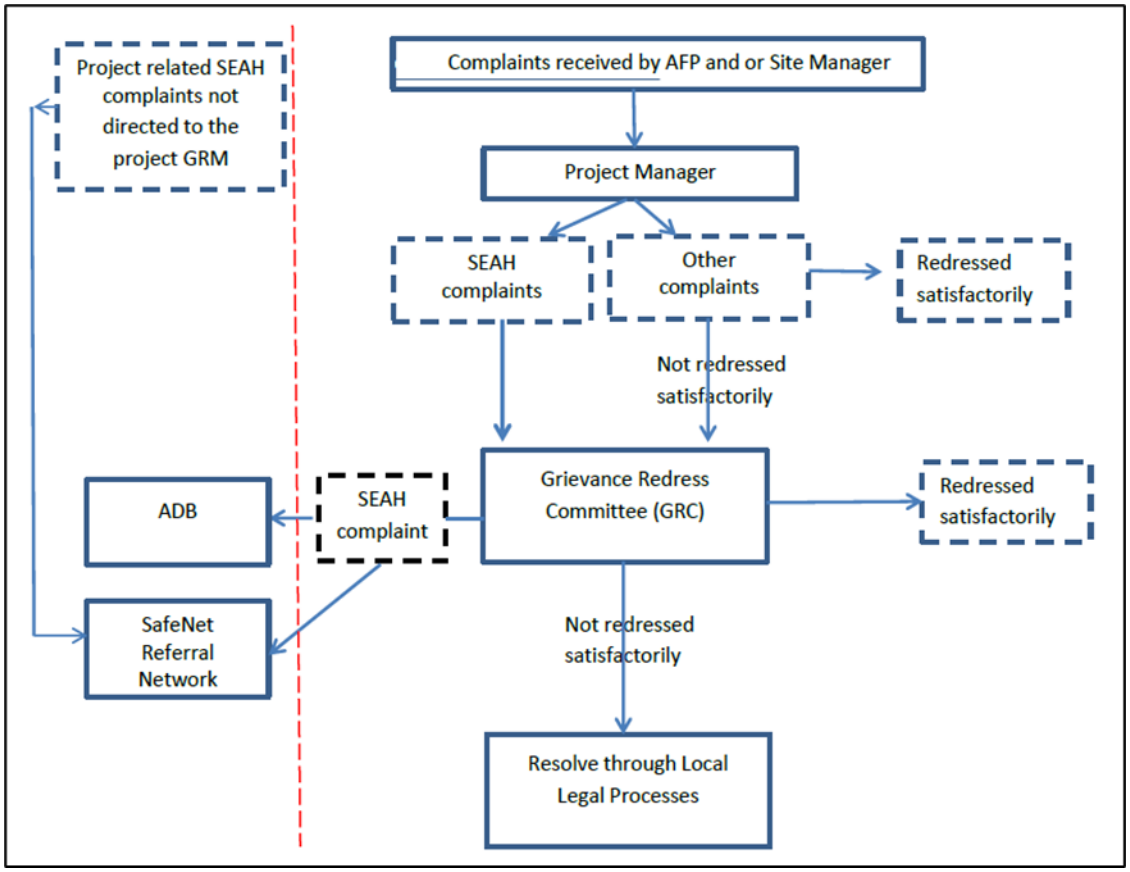

Figure 8.1: GRM Process Flow

IX. ENVIRONMENTAL MANAGEMENT PLAN

A. Introduction

224. This EMP is intended to cover all phases of the Solomon Islands Sustainable Solar Energy Development Program (SIREDP the project) implementation including design, construction, commissioning, operation and decommissioning. The EMP complies with ADB's SPS and includes the following information:

- Implementation arrangements including institutional roles and responsibilities for the EMP implementation throughout all phases of the project.
- Environmental management matrices including:
  - Potential environmental impacts at each stage of the project
  - Proposed mitigation measures to address each potential impact.
  - Institutional responsibility for implementing proposed mitigation measures.
  - Schedule of implementation of mitigation measures.
- Environmental monitoring plan including:
  - Aspects to be monitored to ensure mitigation measures have been implemented effectively.
  - Schedule and frequency of monitoring
  - Responsibility for implementing and supervising monitoring.

O. Implementation arrangement and responsibilities

225. The Ministry of Finance and Treasury (MoFT) will be the executing agency for the project and Solomon Power (SP) will be the implementing agency. A Project Management Unit (PMU) will be established under the direction of SP and will report to the MoFT. A Project Implementation Consultant (PIC) will also be appointed.

226. The MoFT will have overall responsibility for the project whilst SP, through its PMU supported by a PIC, will be responsible for day-to-day implementation and management of the project including the project's compliance with environmental safeguard requirements. SP will be responsible for implementing all environmental safeguards as per the SPS and country safeguard system. Organisational responsibilities for environmental management are summarised in Table 9.1.

Table 9.1: Organisational environmental responsibilities

Project Implementation Organisations	Environmental Management Roles and Responsibilities
Executing Agency (Ministry of Finance and Treasury)	● General project oversight ● Ensure overall compliance with the project grant agreement and covenants. Overall delivery of the project and reporting to Government ● Ensure compliance with grant agreement covenants. ● Ensure the compilation and presentation of all reporting requirements under the project.

Implementing Agency (Solomon Power)	● Submission of environmental documentation to Solomon Islands ECD as required under the *Environment Act 2008* and *Environment Regulation 2008*. ● Responsible for the overall implementation of the project. ● Ensure compliance with the provisions of the Grant and Project Agreements and government policies and guidelines. ● Responsible for procurement and services for the project. ● Issue contract change orders as appropriate. ● Establish and implement project monitoring.
Project Management Unit / Project Implementation Consultant	● Responsible for oversight of the implementation of the project, under the direction of SP, to ensure compliance of contractors with contracts, specifications and management plans. ● Update the IEE including its EMP, when detailed design is complete. ● Assist SP prepare and submit the development approval application. ● Update the IEE including its EMP, to include any conditions od development approval. ● Provide inputs to the bid evaluation in respect of contractor's response to the EMP requirements. ● Prepare reports and supporting information for the EA, IA as required. ● Ensure readiness of all project sites for contractor including any required permits and secured lease agreements (if required). ● Recruit PMU Project Implementation Consultant. ● Depending on the experience of the contractor, provide support in preparation of contractor's CEMP. ● Review and approve selected contractor(s) project specific CEMP and other plans as required by the EMP. ● Prepare semi-annual safeguards monitoring reports to be submitted to EA and ADB. All safeguards monitoring reports to be disclosed as per ADB policies. ● Ensure contractors are aware of any development application or other permit conditions and the implications for the implementation of the project. ● Supervise, monitor and report on contractor's implementation of approved CEMP and all other environmental contractual obligations. ● Review environmental aspects of contractors reporting.
Solomon Islands Environment and Conservation Division (ECD)	● Ensure compliance with government requirements. ● Review complicated issues, if any, arising from the project. ● Participate in monitoring.

Construction contractor	● Prepare project CEMP, addressing all requirements of the IEE, and other plans as required prior to the commencement of any on site works. ● Submit CEMP to PMU and PIC for review and approval (revising as necessary if required). ● Prepare the Code of Conduct to be implemented and complied with by all workers. ● Identify materials and equipment sources and arrange necessary permits, consents and compliance certificates. ● Provide inductions prior to commencement of construction. ● Provide ongoing training, awareness and "toolbox" sessions for workers. ● Implement CEMP. ● Implement relevant aspects of GRM and CCP. ● Include sections and updates on CEMP, CCP and GRM implementation in the reporting. ● Implementation of corrective actions as requested by the PMU.
ADB	● Review all feasibility study documentation (incl. IEE). ● Prepare documents package for Board review (incl. requirements and TOR in PAM and covenants in grant agreement). ● Board approval of project. ● Undertake regular review missions. ● Review monitoring reports. ● Disclose project information as required.

EA = Executing Agency, IA = Implementing Agency, ADB = Asian Development Bank, MoFT = Ministry of Finance and Treasury, SP = Solomon Power, PIC = Project Implementation Consultant, ECD = Solomon Islands Environment and Conservation Division

P. Mitigation Measures

227. Environmental mitigation measures have been designed to avoid potential impacts where possible and to mitigate impacts that cannot be avoided. Implementation of this EMP and mitigation measures will ensure compliance with obligations under Solomon Island Acts and Regulations, principally the *Environment Act 2008* and *Environment Regulation 2008*. The EMP will also ensure ADB safeguard standards are met.

228. To ensure mitigation measures contained in the EMP are successfully implemented:

- The EMP will be updated based on detailed design and with any conditions of the project approval issued by the ECD.
- The contractor(s) shall prepare a site-specific construction EMP (CEMP) describing the project and measures that will be implemented to comply with the EMP. It is expected that the contractors CEMP will address specific environmental issues associated with the construction methods they propose and the subproject sites.

- The contractor(s) will submit its CEMP for each site to SP/PMU for approval prior to the commencement of any construction (including site preparation, clearing and grubbing activities).
- SP will ensure there are sufficient resources to oversee the implementation of the approved CEMP at each project site.
- The IEE including EMP, CCP and GRM will be disclosed to the public in accordance with Access to Information Policy 2018.

229. An EMP describing the potential impacts and proposed mitigation measures and responsible agency has been prepared in a matrix form and presented in Table 9.2.

230. The EMP matrix (Table 9.2) provides an operational reference and a tool for environmental management during construction activities. It describes in general terms how the contractor will meet the specified contractual, regulatory and statutory requirements. The contractor will provide detailed management measures in its CEMP which will set out method statements and site-specific plans as required.

231. This project, and all project activities to be financed by ADB and government, will be subject to ADB's SPS. The project is classified as Category B for environment.

Q. Monitoring and reporting

232. **Monitoring**: Environmental monitoring will be carried out through all phases of the project to ensure that the environmental mitigation measures are effective and that actual environmental impacts accord with predicted impacts and are in compliance with *Environment Act 2008* and ADB SPS.

233. SP, through its PMU/PIC, will ensure appropriate monitoring is undertaken during construction in accordance with project progress.

234. Complaints received will be monitored and resolved in accordance with Grievance Redress Mechanism. If required, addition monitoring inspections will be undertaken.

235. An environmental monitoring plan is presented in Table 9.2 and outlines the parameters, frequency and responsibility for monitoring.

236. **Reporting**: Throughout implementation of the project, ADB will monitor the implementation progress and impacts of the Project. Overall, the EMP will be implemented by the IA through project implementation. In consultation with the EA and ADB, the IA will establish a system for preparing quarterly reports on safeguards performance monitoring, issues resolution, and corrective action plans.

237. The EA will submit semi-annual environmental monitoring reports on EMP implementation for ADB's review. Semi-annual reports will be disclosed by the ADB.

238. The EMP will be part of overall project monitoring and supervision and will be implemented by the PMU with oversight from SP. Progress on the implementation of an EMP will be included in the periodic project progress reports. Specific monitoring activities defined in the IEE and EMP

will be carried out by the contractor and supervised and monitored by SP. The EA will submit semi-annual environmental monitoring reports on EMP implementation for ADB's review.

239. Contractors will prepare monthly reports which will describe the implementation of the CEMP including any non-compliances and corrective actions. The report will be reviewed and approved by SP.

240. In general, the overall extent of monitoring activities, including their scope and periodicity, should be commensurate with the project's risks and impacts.

Table 9.2: Environmental Management and Monitoring Plan

Project activity	Potential impact	Management and mitigation			Monitoring			
		Proposed mitigation measure	Institutional responsibility	Estimated cost ($USD)	Parameters	Frequency & verification	Institutional responsibility	Estimated cost ($USD)
Design and pre-construction phase								
Adaptation for climate change	Damage to subproject components due to inappropriate siting or design specification.	● The subprojects will be designed to withstand extreme winds (e.g., cyclones) and temperatures. ● Subprojects 1a and 2 will be designed and installed to withstand inundation. ● Equipment installed for Subproject 1b and Subproject 3 will be at least 0.5 m above historic flood levels and to avoid flooding impact. ● Subproject 3 site screening will include consideration for climate impacts including: o check of building structural strength o local flood history o land slope and landslide risk o building environs, such as shading and soiling ● Subprojects will be designed and sited to withstand flooding. ● Components will meet international standards (e.g. IEC 61730 Photovoltaic (PV) module safety qualification).	Contractor	Included in construction contract	Detailed design	Once, visual inspection of detailed design	Project Management Unit (PMU)	Included in PMU/PIC costs
	Premature failure of components	● All components procured for the subprojects will be suitable for tropical marine and coastal environments, preferably be preassembled and will be as resistant to corrosion as practicable (e.g., stainless or galvanized steel mounting systems).	Contractor	Included in construction contract	Detailed design	Once, visual inspection of detailed design	PMU/PIC	Included in PMU/PIC costs

Project activity	Potential impact	Management and mitigation			Monitoring			
		Proposed mitigation measure	Institutional responsibility	Estimated cost ($USD)	Parameters	Frequency & verification	Institutional responsibility	Estimated cost ($USD)
Fire	Loss of environmental and social values resulting from a fire caused or spread by the subprojects	• BESS shall be subject to a site-specific risk assessment in accordance with IEC 62933-5.2 (Electrical energy storage (EES) systems - Part 5-2: Safety requirements for grid-integrated EES systems - Electrochemical-based systems). This standard provides a comprehensive and up-to-date coverage of the hazards associated with BESS (electrical, mechanical, chemical, fire, explosion), relevant standards or practices that should be complied with in each, and testing and validation that should be demonstrated prior to deployment including: ○ BESS must be subject to fire safety testing in accordance with a standard such as UL9450A, and can only be installed in accordance with the findings of such tests so as to eliminate risk of propagation of any fire from cell to cell; module to module; or beyond the BESS enclosure. ○ Minimum stand-off distances from combustible surfaces (including existing infrastructure and neighbouring properties) of 3 m (or OEM recommendations) will be specified. ○ The control system must action appropriate safe and emergency shutdown procedures as relevant under abnormal events, including loss of communications. ○ Training for both system operators and local emergency services is required, emphasising the specific requirements and action for management of BESS fire.	Contractor	Included in construction contract	Detailed design	Once, visual inspection of risk assessment, detailed design, training plan and training records	PMU/PIC	Included in PMU/PIC costs

Project activity	Potential impact	Management and mitigation			Monitoring			
		Proposed mitigation measure	Institutional responsibility	Estimated cost ($USD)	Parameters	Frequency & verification	Institutional responsibility	Estimated cost ($USD)
Pathogens and invasive species	Introduction and/or spread of pathogens and invasive species to and within Solomon Islands or the subproject island	● The contractor must obtain all required biosecurity and phyto-sanitary clearances (e.g. permits) for any material or equipment imported onto Solomon Islands. ● The contractor will comply with all measures stipulated in the *Bio-Security Act 2013* and obtain all permits and clearances for import of any materials and equipment to be used for the project as required by Biosecurity Solomon Islands. ● Materials will be inspected, and any equipment imported for project purposes will be steam-cleaned and certified under biosecurity and phyto-sanitary procedures in Honiara prior to mobilization. ● Immediately following clearing and construction, the subproject sites will be planted with low growing ground cover to help stabilise the site and minimise the establishment of weeds at each location. ● Weed hygiene measures will be implemented to prevent introduction or spread of invasive species, including cleaning machinery before it enters and leaves the subproject sites.	Contractor	Included in construction contract	Pathogen and invasive species free status of all materials and equipment.	Visual inspection of phyto-sanitary certificate for each shipment	PMU/PIC	Included in PMU/PIC costs
UXO	Injury or fatality to worker due to detonation of unexploded ordnance.	● A survey for UXO will be undertaken and clearance issued for the site prior to any ground disturbing activities.	Contractor	Included in construction contract	Verification of clearance documentation.	Once, visual inspection of clearance.	PMU/PIC	Included in PMU/PIC costs

Project activity	Potential impact	Management and mitigation			Monitoring			
		Proposed mitigation measure	Institutional responsibility	Estimated cost ($USD)	Parameters	Frequency & verification	Institutional responsibility	Estimated cost ($USD)
Visual impact	The subprojects create an unacceptable visual impact on the existing landscape.	• Antireflective panels or coatings will be used to ensure reflected light from PV surfaces does not create a nuisance to any nearby residents.	Contractor	Included in construction contract	Antireflective panels included in detailed design	Once, visual inspection of detailed design	PMU	Included in PMU/PIC costs
Noise	Noise emissions from Subproject 1b have an unacceptable impact to nearby residences.	• To mitigate potential noise impacts from the Subproject 1b BESS's inverters will be located centrally and contained within a noise wall.	Contractor	Included in construction contract	Central inverter location and noise wall included in detailed design	Once, visual inspection of detailed design	PMU/PIC	Included in PMU/PIC costs
Contaminated soils	Construction of Subproject 1b results in disturbance of contaminated soils.	• If the final design of the BESS's foundations requires soil disturbance, prior to the commencement of construction, the contractor will arrange for a preliminary site investigation of the disturbance footprint. The preliminary site investigation will include a detailed site history review to assess the risk of contamination and, if required, soil sampling and analysis where a contamination risk is identified. If soil analysis identifies the presence of contamination the contractor shall include a contaminated soil management and disposal plan in their CEMP.	Contractor	Included in construction contract	Completion of preliminary site investigation and contaminated management plan (if required)	Once visual inspection of preliminary site investigation and contaminated management plan (if required)	PMU/PIC	Included in PMU/PIC costs
Hazardous materials management	Disturbance of asbestos containing materials	• A pre-construction survey for asbestos will be undertaken on all material likely to be disturbed by the installation of rooftop solar for Subproject 3. If found an appropriately qualified contractor, approved by the PIC Environmental Safeguards Expert, will be	Contractor	Included in construction contract	Asbestos survey report	Once, visual inspection of survey report	PMU	Included in PMU/PIC costs

Project activity	Potential impact	Management and mitigation			Monitoring			
		Proposed mitigation measure	Institutional responsibility	Estimated cost ($USD)	Parameters	Frequency & verification	Institutional responsibility	Estimated cost ($USD)
		engaged to remove and dispose of asbestos containing material.						
National approval requirements	Failure to obtain approval under the Solomon Islands *Environmental Protection Act 2008*.	• Prepare and submit environmental documentation to Solomon Islands ECD as required under the *Environment Act 2008* and *Environment Regulation 2008*.	SP, Project Preparation Consultant (PPC)	Preparation included in PPC costs $1,500 (ECD fees)	Environmental approval	Once, visual inspection of development approval	SP, PMU/PIC	Included in PMU/PIC costs
Construction environmental management	Environmental harm from construction activities	• The contractor shall prepare a site-specific construction EMP (CEMP) describing the project and measures that will be implemented to comply with the EMP. It is expected that the contractors CEMP will address specific environmental issues associated with the construction methods they propose and the subproject sites. • The contractor's CEMP will be approved by SP prior to the commencement of any construction (including site preparation, clearing and grubbing activities).	Contractor	Included in construction contract	CEMP	Once review and approval of CEMP	PMU/PIC	Included I PMU/PIC costs
EMP update	Failure to identify and mitigate environmental risks, breach of national legal obligations.	• IEE updated based on detailed design.	PMU/PIC	Included I PMU/PIC costs	Updated IEE	Once, visual inspection of updated IEE.	PMU/PIC	Included in PMU/PIC costs

Project activity	Potential impact	Management and mitigation			Monitoring			
		Proposed mitigation measure	Institutional responsibility	Estimated cost ($USD)	Parameters	Frequency & verification	Institutional responsibility	Estimated cost ($USD)
Construction phase – physical resources								

Erosion and sedimentation control	Erosion of subproject sites and sedimentation of surrounding environment	Erosion control works and measures will be installed to control surface water runoff and prevent the export of sediments from the site by ensuring: discharge of storm water is to stable preferably vegetated land; and erosion control measures closely follow land contours to reduce runoff velocity from exposed soils. All land disturbances will be confined to the minimum practicable working area to ensure that the minimum area of land is exposed to erosion for the shortest possible time. Existing drainage lines will be protected, and diversion of drainage lines avoided. Sediment traps (e.g., silt fences) will be constructed across all drainage lines and erosion controls from site that are likely to receive runoff from exposed or disturbed soils. Sediment and erosion control measures will be monitored regularly to ensure their continued correct functioning. Cable trenches will remain open for the shortest duration possible to reduce erosion and where possible will not be open during periods of heavy rain or forecast weather events that may inundate the trench. Spoil from excavated trenches will be stored on the uphill side of the trench such that any sediment from the spoil is deposited in the trench. A shade tolerant low groundcover (e.g. native grass) will be established as soon as practicable after site clearance at Subprojects 1a and 2. The species selected will not shade the PV modules.	Contractor	Included in construction contract	Erosion on subproject site and sedimentation of adjacent land or water bodies. Site drainage, erosion and runoff controls in place and functioning correctly. Inspection records.	Daily, visual inspection of subproject sites during construction (contractor). Regular visual inspection of sites for 6 months post construction. Regular inspection of records during construction	Contractor, PMU/PIC	Included construction contract and in PMU/PIC costs

Project activity	Potential impact	Management and mitigation			Monitoring			
		Proposed mitigation measure	Institutional responsibility	Estimated cost ($USD)	Parameters	Frequency & verification	Institutional responsibility	Estimated cost ($USD)
Water resources and quality	Overuse of subproject island water resources impacting local fresh and potable water supplies	• Water required for construction (e.g. concrete mixing) will be sourced with the agreement of the PIC Environmental Safeguards Expert.	Contractor, PIC	Included in construction contract	Agree water sources	As required, water source(s) agreed with PIC	PMU/ PIC	Included in PMU/PIC costs
	Alteration of surface water flow across the subproject sites leading to sedimentation of adjacent environments	• Where feasible construction techniques will be specified that minimise the need to alter the topography (e.g. mass concrete blocks for ground mounted solar arrays) and hence surface water drainage on the site.	Contractor	Included in construction contract	Agree construction techniques	Once, construction technique agreed with PMU	PMU	Included in PMU/PIC costs
Use of local materials	Environmental or social impacts of sourcing local materials (e.g. fill).	• Local materials will be sourced with the agreement of the PIC Environmental Safeguards Expert.	Contractor	Included in construction contract	Agree sources of local materials with PIC	Once, materials source agreed with PIC	PMU/PIC	Included in PMU/PIC costs
Hazardous materials	Spills of hazardous material with subsequent impacts to marine, aquatic, groundwater and terrestrial environments	• The contractor(s) will prepare a hazardous materials management plan that shall, at a minimum, include: ○ The type and quantity of hazardous materials that will be present on site. ○ Safety Data Sheets for all hazardous materials. ○ A spill response plan, including training, for staff in the use of spill kits. ○ Details of planned transport, storage and disposal of hazardous materials (including compliance with commitments contained within this IEE).	Contractor	Included in construction contract	Hazardous materials management plan in place and implemented.	Once, visual inspection of hazardous materials plan, as required visual inspection of controls and mitigations during	PMU/PIC	Included in PMU/PIC costs

Project activity	Potential impact	Management and mitigation			Monitoring			
		Proposed mitigation measure	Institutional responsibility	Estimated cost ($USD)	Parameters	Frequency & verification	Institutional responsibility	Estimated cost ($USD)
		• The transport of hazardous materials will be undertaken by an appropriately qualified, experienced and equipped contractor; • Hazardous materials storage areas will be located at least 50 m from water, including the drainage lines, and will consider contamination pathways (e.g. proximity to ground water receivers, risk of inundation). • Hazardous materials will be stored in appropriate containers that are in good condition with adequate labelling. • Hazardous materials (including fuel and oils) storage will be appropriately bunded (e.g. selfbunded containers or a bund with a minimum of 110% capacity of the largest container). • Refuelling will take place in a designated area and drip trays or containment devices will be used when refuelling equipment and machinery. • Spill kits and containment devices appropriate for the type and volume of hazardous materials on site will be located at the storage area(s), on site and on vehicles carrying hazardous materials. • All personnel involved in the handling of hazardous materials will be trained in the handling, emergency procedures and storage requirements for the materials they are handling.				construction.		

Project activity	Potential impact	Management and mitigation			Monitoring			
		Proposed mitigation measure	Institutional responsibility	Estimated cost ($USD)	Parameters	Frequency & verification	Institutional responsibility	Estimated cost ($USD)
Waste management	Inappropriate storage, transport or disposal of waste resulting in contamination of surrounding water, groundwater and land	● Hazardous waste (if generated) will be disposed of in accordance with the manufacturers requirements at a facility licenced to accept the type and quantity of waste (or approved by the PIC Environmental Safeguards Expert). If no such facility exists in Solomon Islands hazardous waste will be shipped to an appropriately licenced facility. ● Vegetation cleared from the Subproject 2 site will be temporarily stockpiled on site and disposed of at a location agreed with the PIC Environmental Safeguards Expert. Stockpiled vegetation will not be burnt unless no viable alternative can be identified in consultation with PIC Environmental Safeguards Expert. ● The construction contractor will consult with the PIC Environmental Safeguards Expert to identify opportunities to avoid and reduce the generation of waste and to recycle or re-use waste generated. ● If excess spoil is generated during site preparation it will be stored at an existing stockpile site for re-use. ● Bins for recycling and general rubbish will be provided at the project site and materials laydown area for the disposal of construction wastes and will be removed off-island at end of construction period.	Contractor, PIC	Included in construction contract	All hazardous waste appropriately managed	Daily visual check of waste disposal bins during construction, inspection of waste disposal documentation (PMU/PIC).	Contractor, PMU/PIC	Included in PMU/PIC costs

Project activity	Potential impact	Management and mitigation			Monitoring			
		Proposed mitigation measure	Institutional responsibility	Estimated cost ($USD)	Parameters	Frequency & verification	Institutional responsibility	Estimated cost ($USD)
Construction phase - biological resources								
Removal of vegetation	Over clearing of subproject locations resulting in loss of vegetation.	• The subproject site boundary will be clearing marked on a plan and approved by the Engineer/supervision consultant prior to the commencement of clearing. Only vegetation identified on the plan will be removed. • Ensure vegetation clearance is restricted to within the subproject site boundary and is the minimum practically required for the proposed works, including allowance for shading. The proposed site boundary will be approved by SP and the PIC prior to the commencement of clearing. • Cleared vegetation will be removed from the subproject site and disposed of at a location approved of by PIC Environmental Safeguards Expert (noting cleared vegetation includes weeds and potentially weed seeds). Vegetation will not be permanently stockpiled on site or pushed into existing vegetation adjacent to the site. • Where possible machinery storage and materials lay down areas will be established in previously disturbed areas to avoid increasing the footprint of the project site. • As far as is practicable, existing stockpiles of fill material will be used. If new fill material is required it will be sourced from locations approved by the PIC Environmental Safeguards Expert.	Contractor, PIC.	Included in construction contract	No vegetation clearance outside subproject site boundary, no stockpiles of vegetation	As required during construction, at least verification of site boundary prior to clearance and verification of clearance during construction.	PMU, PIC	Included in PMU/PIC costs
Construction phase – socio economic impacts								

Project activity	Potential impact	Management and mitigation			Monitoring			
		Proposed mitigation measure	Institutional responsibility	Estimated cost ($USD)	Parameters	Frequency & verification	Institutional responsibility	Estimated cost ($USD)
Cultural heritage	Unexpected discovery of artefact(s) of cultural heritage significance	If an artefact is discovered during site clearance that is suspected of being of cultural heritage significance work will cease immediately and the PMU notified. The contractor shall include an unexpected discovery protocol (UDP) as part of their CEMP.	Contractor, PMU	UDP included in construction contract	Unexpected find protocol	Once visual inspection of protocol	PMU	Included in PMU/PIC costs
Noise and vibration	Noise and vibration impacts on local communities	● Working hours will be between 8am and 5pm Monday to Friday unless otherwise agreed between the contractor, and PMU (or operators of buildings for Subproject 3). Where safety or technical reasons require work to be completed outside of these hours, noise levels will be kept to a minimum and nearby residents will be kept informed. ● Noise generating activities will be carried out in the least sensitive time periods (to be determined in consultation with building managers for Subproject 3). Wherever possible works will be scheduled to avoid disruption to the normal use of buildings. ● Equipment and plant will be maintained in good order. Noise reduction components (e.g. mufflers) will be inspected prior to the commencement of works to ensure they are fully functional. Noise emissions from construction equipment will not exceed 75 dBA.	Contractor	Included in construction contract	Work carried out between agreed times, equipment in good order with appropriate noise reduction components	As required, daily visual inspection of all equipment, inspection of monitoring records by PMU/PIC	Contractor, PMU/PIC	Included in PMU/PIC costs
Air quality and dust	Creation of dust and air emissions by vehicles and machinery	● Vehicles and machinery will be maintained in good order. ● Vehicles will not be left idling when not in use.	Contractor	Included in construction contract	Dust generated, complaints received via GRM	Visual inspection as required, inspection of	Contractor, PMU/PIC	Included in PMU/PIC costs

Project activity	Potential impact	Management and mitigation			Monitoring			
		Proposed mitigation measure	Institutional responsibility	Estimated cost ($USD)	Parameters	Frequency & verification	Institutional responsibility	Estimated cost ($USD)
		• Vehicles carrying soil, sand, crushed aggregate or other fine materials to or from the subproject sites will be covered.				monitoring records by PMU/PIC		
	Excessive dust from project sites, stockpiles and access roads	• The subproject sites, material stockpiles and access roads, including those from the wharf and material stockpile areas, will be wetted or stabilised if dust is generated.	Contractor	Included in construction contract	Dust generated, application mitigation measures, inspection records, complaints received via GRM	Daily visual inspection of subproject sites during construction, inspection of monitoring records by PMU/PIC	Contractor, PMU/PIC	Included in PMU/PIC costs
Influx of labour – impacts of foreigners and non-local workers	Presence of foreign workers caused conflict, social disruption and/or diseases in community	• A code of conduct will be agreed between the PMU and the contractor which will govern the conduct of all workers for the period they are working at each site. The protocols will govern workers' conduct while at work and in communities, behaviour around women and children, restrictions on alcohol consumption, prohibitions (with sanctions for non-compliance) on workers hunting or fishing, implementation of awareness programs, implementation of the GRM and handling of complaints, hiring of local labor, and implementation of the health and safety plan. • All non-local workers will receive an induction that outlines the social and cultural expectations when working in Solomon	Contractor	Included in construction contract	Code of conduct agreed, inductions carried out, GRM in place	As required, visual inspection of agreement and GRM as well as records of induction.	PMU/PIC	Included in PMU/PIC costs

Project activity	Potential impact	Management and mitigation			Monitoring			
		Proposed mitigation measure	Institutional responsibility	Estimated cost ($USD)	Parameters	Frequency & verification	Institutional responsibility	Estimated cost ($USD)
		Islands (on Guadalcanal and Malaita) and the code of conduct they must adhere to. Any worker not complying with the code of conduct will be expelled from the Solomon Islands and repatriated at the contractor's expense. ● A grievance redress mechanism (GRM) has been established for the project and will be communicated through the engagement programme and by prominent display of the GRM process at the subproject sites prior to the commencement of onsite works.						
Health and safety – workers	Health and safety of workers inadequately managed leading to injury of fatality.	● The contractor shall prepare a Health and Safety Management Plan that will at a minimum: ○ Include measures and equipment required to protect workers and link to the emergency response plan and other plans as necessary. ○ Identify responsibilities and authorities within the contractor's staff for adhering to occupational health and safety (OHS) requirements. ○ Identify and provide required personal protection equipment (PPE) for staff and sub-contractors (before they start work). ○ Install fencing on all areas of excavation greater than 1 m deep whether temporary or permanent. ○ Define appropriate emergency and medical process including evacuation procedures. ○ Prepare appropriate work method statements for each construction activity.	Contractor	Included in construction contract	Health and Safety Management Plan in place, training completed	As required, visual inspection of Health and Safety Management Plan, health and safety controls, records of training and induction.	PMU/PIC	Included in PMU/PIC costs

Project activity	Potential impact	Management and mitigation			Monitoring			
		Proposed mitigation measure	Institutional responsibility	Estimated cost ($USD)	Parameters	Frequency & verification	Institutional responsibility	Estimated cost ($USD)
		○ Provide daily hazard identification checklists and risk assessments. ○ Identify mandatory meeting requirements including toolbox sessions, to ensure all personnel understand the task before commencing work for the day. ○ Set procedures for safe handling of toxic materials and other hazardous substances. ○ Provide for installation of lights and cautionary signs in hazardous areas. ○ Ensure operators of vehicles and equipment are properly licensed and trained. ○ Ensure safety and inspection procedures are implemented, setting schedules for regular checking. ○ Ensure movements of heavy vehicles is managed so as to minimise impacts to existing traffic and the wider community. ● Provide for the provision of adequate sanitation and potable water for staff and contractors for the duration of construction works.						
Health and safety – community	Health and safety of workers inadequately managed leading to injury of fatality.	● The contractor shall prepare a Health and Safety Management Plan that will at a minimum: ○ Before construction commences the contractor/s will conduct training for all workers on environmental safety, environmental hygiene and the code of conduct. ○ Child and/or trafficked labour will be strictly prohibited for any activities associated with the project.	Contractor	Included in construction contract	Health and Safety Management Plan in place, training completed	As required, visual inspection of Health and Safety Management Plan, health and safety controls, records of	PMU/PIC	Included in PMU/PIC costs

Project activity	Potential impact	Management and mitigation			Monitoring			
		Proposed mitigation measure	Institutional responsibility	Estimated cost ($USD)	Parameters	Frequency & verification	Institutional responsibility	Estimated cost ($USD)
		○ Children will be prohibited from entering the sites (including worker's accommodation, works area/construction zone) and prohibited from playing on any equipment or machinery. ○ Access will be controlled to subproject sites for the duration of construction to prevent public access e.g. through the use of security fencing or restricting access to roof tops. ○ Advisory signage warning of the dangers of unauthorised access will be placed where clearly visible on security fencing. ● All advisory and warning signage will be clear, secured on fences, gates and signboards and be posted in Pidgin, the language of the main nationality of workers and repeated in English.				training and induction.		
Unexpected environmental impacts	Unanticipated environmental impacts during construction	● If unanticipated environmental impacts occur during construction phase, the PMU will update the IEE/EMP and the Contractor will update the CEMP. The environmental protection measures will be designed to address the impacts.	Contractor, PMU	Included in PMU/PIC costs	Update of IEE / EMP and CEMP as required	As required, visual inspection of updated IEE / EMP and CEMP	PMU	Included in PMU/PIC costs
Operation phase								
Waste and hazardous materials	Inappropriate storage, transport or disposal of waste resulting in contamination	● Where possible batteries and inverters will be recycled. If recycling is not possible, they will be disposed of at a facility approved by the relevant regulatory agency or, if no facility is available, transported to an appropriately licenced facility outside of Solomon Islands (refer to Decommissioning Waste Management).	SP	$150,000	Appropriate disposal of wastes	As required, visual inspection of waste disposal certificates, operation of	SP	$0

Project activity	Potential impact	Management and mitigation			Monitoring			
		Proposed mitigation measure	Institutional responsibility	Estimated cost ($USD)	Parameters	Frequency & verification	Institutional responsibility	Estimated cost ($USD)
		• Hazardous waste (e.g. batteries or inverters) will be sent for disposal at regular intervals and not allowed to accumulate at the subproject sites. • Inverters and batteries that are replaced during the operating lifetime of the power station will be removed, transported and disposed of by an appropriately experienced and equipped contractor. • Washing of solar PV panels will only be undertaken on an 'as needs' basis to minimise the generation of wastewater. • All infrastructure containing hazardous materials (e.g. batteries, transformers) will be inspected regularly to ensure they function correctly and no hazardous materials are being discharged.				infrastructure containing hazardous materials		
Water resources	Overuse of water impacting fresh and potable water supplies	• A source of water will be agreed with the relevant regulatory agency prior to the commencement of operation.	SP	$0	Agreed water source	As required, visual inspection of agreement.	SP	$0
Erosion control	Erosion of project sites	• If localised erosion is detected during operation of the project effective mitigation measures such as application of mulch, covering with open weave jute matting and reseeding with ground cover, protection with geotextile fabric or localised flow dispersal and diversion structures will be installed.	SP	$20,000	Effective control of erosion	As required, visual inspection of erosion mitigation	SP	$0

Project activity	Potential impact	Management and mitigation			Monitoring			
		Proposed mitigation measure	Institutional responsibility	Estimated cost ($USD)	Parameters	Frequency & verification	Institutional responsibility	Estimated cost ($USD)
Employment	Staff unable to operate new power systems	• Training to be provided for SP employees in the operation and maintenance of the new infrastructure and power systems.	SP	Included in construction contract	Provision of training	As required, evidence of training completed	SP	$0
Emergency Response	Emergency on site	• SP will prepare an operational emergency response plan. The plan will be included in the training provided to employees and be implemented during the operation of the solar power system.	SP	$5,000	Emergency response plan prepared and training completed	As required, visual inspection of plan and training records	SP	$0
Decommissioning phase								
Decommissioning of solar PV array, and batteries facility	Inappropriate disposal of waste	• All recyclable equipment will be removed from the subproject sites (e.g., PV modules, batteries, inverters) and will be reused or recycled. • Equipment that cannot be reused or recycled will disposed of at a facility approved by the relevant regulatory agency or, if no facility is available, transported to an appropriately licenced facility outside Solomon Islands	SP	$200,000	Appropriate disposal of waste	As required, visual inspection of waste disposal during commissioning	SP	$0
Hazardous materials	Release of hazardous materials to the surrounding environment	• The decommissioning contractor will be required to develop a hazardous materials management plan prior to the commencement of any works on the subproject site.	Decommissioning contractor	Included in decommissioning contract	Decommissioning plan completed	Once, visual inspection of plan prior to decommissioning	SP	$10,000

Project activity	Potential impact	Management and mitigation			Monitoring			
		Proposed mitigation measure	Institutional responsibility	Estimated cost ($USD)	Parameters	Frequency & verification	Institutional responsibility	Estimated cost ($USD)
Revegetation	Erosion of project sites	• If the subproject site is not reused it will be revegetated with species appropriate to the future land use of the site.	SP	$30,000	Completion of revegetation	As required, ongoing visual inspection of revegetation.	SP	$15,000

X. CONCLUSIONS

241. To meet the goals of its NEP as well as its obligations under the Paris Agreement as outlined in the 2021 NDC plan Solomon Islands must transition its electricity generation from fossil fuel-based sources to renewable energy-based sources. The feasibility assessment undertaken as part of the SIREDP has identified 4 subprojects that can feasibly be developed and will assist Solomon Islands meet its short-term generation and access to electricity targets.

242. Environmental assessments have not identified any significant negative environmental impacts associated with the construction or operation of any of the proposed subprojects. Subproject 1a and 1b are located on land that is already cleared and Subproject 3 is located on existing rooftops. Vegetation clearing is required for Subproject 2 however, ecological assessments have not identified any significant environmental values associated with the site. Potential construction impacts are considered to be readily managed. The subprojects will not result in any operational environmental impacts (e.g. air or noise emissions). Decommissioning will generate waste including solar panels and lithium-ion batteries that cannot currently be recycled in Solomon Islands. Unless a recycling facility is developed prior to decommissioning solar panels and batteries will be transported to Australia for recycling.

243. The subprojects are not expected to have a negative impact on any species listed as threatened on the IUCN Red List. There were no species recorded or that could potentially occur that listed on the IUCN Red List at the sites of Subprojects 1a or 1b. Two species; The Solomons cockatoo (*Cacatua ducorpsi*) and chestnut bellied imperial pigeon (*Ducula brenchleyi*) listed as Least Concern and near-threatened respectively may occur on the Subproject 2 site however, neither will be significantly impacted by the loss of vegetation from the site.

244. The subprojects are not expected to have any negative impacts on local communities, but instead are expected to provide employment opportunities for local contractors.

245. The subprojects are still subject to detailed design and this IEE and EMP will be updated as the subprojects are further defined.

246. Provided the mitigation measure outlined in this IEE and EMP are appropriately implemented then the project is not expected to have any widespread, irreversible or significant or long-term environmental impacts. As such, it is considered that a Category B level of assessment as per the ADB's SPS is appropriate to the scale and nature of the project.

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ANNEX 1: HONIARA BESS RELOCATION CHECKLIST

Requirement	Response	Evidence[#]
Is the land that the BESS is proposed to be installed on owned by Solomon Power?		
Can a consent letter from the landowner, plus identification matching land registration be obtained; OR If the land is tribally owned can a consent letter from 50% of the tribal land owners be obtained?		
Can the BESS be installed in compliance with IEC 62933-5.2 (Electrical energy storage (EES) systems - Part 5-2: Safety requirements for grid-integrated EES systems - Electrochemical-based systems)?		
Can the BESS be designed and installed at least 0.5m above historic flood levels of proposed site (mitigate against predicted climate change impacts).		
Can the BESS be installed (including access roads and grid connection) without impacting any flora, or habitat for any fauna, listed as critically endangered, endangered or vulnerable under the International Union for Conservation of Nature (IUCN) Red List?		
Can the battery be installed (including access roads and grid connection) without impact to any critical habitat as defined under the ADB's *Safeguard Policy Statement 2009*?		
Is the proposed site free of UXO's (verified by UXO survey)?		
Can the BESS be installed without disturbing any cultural values or artefacts?		
Is the BESS located such that there are no significant visual impacts to nearby residences?		
Is the BESS located such that noise will not impact nearby houses or other sensitive places (e.g. schools, churches etc)?		

for example, verification letter from independent engineer, authorisation from PIC or other independent local environmental monitoring specialist, survey report from specialist contractor

ANNEX 2: FLORA AND FAUNA ECOLOGICAL ASSESSMENT SUBPROJECT SITE 1a (HENDERSON)

ANNEX 3: FLORA AND FAUNA ECOLOGICAL ASSESSMENT SUBPROJECT SITE 2 (AMBU)

ANNEX 4: TERRESTRIAL PROTECTED AREAS IN GUADALCANAL AND MALAITA

Province	Protected Area	Size	Flora Biodiversity	Fauna Biodiversity
Guadalcanal	Lauvi Lake	200 ha	Floating meadows include three species of Cyperaceae. Extensive areas of pandanus, beach side dominated with fu'u Barringtonia asiatica. Other species are also common in the community e.g. *Hibiscus tiliaceus*. Thus, there are also many other species growing around the areas (Less, 1990).	Outstanding habitat for crocodiles. Wetland birds and the Australian dabchick which was a new record for the Solomon Islands. About 40 bird sp. are found, 9 are endemic to the Solomon islands(Less, 1990).
	Itina Popomanaseu	30,000 ha	6 species (sp) of pioneer trees located on gravel beds of braided river sites e.g. salu; *Casuarina equisetifolia*. On slightly higher ground, 5 sp. of trees are common e.g. Akwa. Evident at the ultra-basics are mudi; (*Dillenia crennata*). Common in montane forest are trees of non-flowering plant family, Podocarpaceae including 3 sp and 5 sp of the Myrtle family. The four epiphytic rhododendrons that are unqiue to Solomon islands are all found on peaks of the proposed protected area and the endemic mountain shrub, Vaccinium (Less, 1990)	Habitat for many animals including four bird species endemic to Gaudalcanal and the Gaudalcanal endemic giant rat (*Uromys imperator*). 1990 mammal survey of Mt Makarakomburu found a new sp. of bat along with nine other bat sp, four frog and eight reptile sp. Thirteen bird sp. were recorded including rare Guadalcanal honeyeater *Guadalcanaria inexpectata*. Mt Popomanaseu is only place in the Solomon Islands where terrestrial mollusc have generated endemic montane species. Restricted to these mountains include arboreal *Placostyllus selleersi* and undescribed sp. Helixarion and Trochomorpha. Birds of the Itina River proposal area recorded 44 bird sp., 13 are known to be endemic sp. in the Solomon islands (Less, 1990).
Malaita	Central Highlands	12,500 ha	Common in the lowland forests are 4 sp. of trees eg akwa, rosswood and vasa. On lower riverine terraces 3 sp. are alsocommon e.g., lamilami, liki and akwa (Less, 1990).	57 bird sp are recorded, 9 endemic to Solomon islands, 13 endemic to Malaita (Less, 1990).
	Maramasike Ar'are	150,000 ha	Large figs and 11 tree sp e.g. akwa are common at the end of the maramasike passage. The hill forest behind both Maramasike and Are'are commonly features 7 of the species mention above together with 5 other sp e.g. *Cryptocarya sp*. (Less, 1990).	Excellent habitat for crocodiles. About 60 bird sp. are recorded, 7 endemic to Solomon islands and 10 endemic to Malaita (Less, 1990).

ANNEX 5: SAMPLE GREVIENCE REGISTRATION FORM

The _____Project welcomes complaints, suggestions, queries and comments regarding project implementation. We encourage persons with grievance to provide their name and contact information to enable us to get in touch with you for clarification and feedback. Should you choose to include your personal details but want that information to remain confidential, please inform us by writing/typing *(CONFIDENTIAL)* above your name. Thank you.

Date	Place of registration				
Contact Information/Personal Details					
Name		Gender	* Male *Female	Age	
Home Address					
Place					
Phone no.					
E-mail					
Complaint/Suggestion/Comment/Question Please provide the details (who, what, where and how) of your grievance below: If included as attachment/note/letter, please tick here:					
How do you want us to reach you for feedback or update on your comment/grievance?					

FOR OFFICIAL USE ONLY

Registered by: (Name of Official registering grievance)	
Mode of communication: Note/Letter E-mail Verbal/Telephonic	
Reviewed by: (Names/Positions of Official(s) reviewing grievance)	
Action Taken:	
Whether Action Taken Disclosed:	Yes No
Means of Disclosure:	