Combined Project Information Documents / Integrated Safeguards Datasheet (PID/ISDS)

Appraisal Stage | Date Prepared/Updated: 07-Oct-2017 | Report No: PIDISDSA22039

BASIC INFORMATION

A. Basic Project Data

Country	Project ID	Project Name	Parent Project ID (if any)
Solomon Islands	P162902	Electricity Access and Renewable Energy Expansion Project (Phase II)	
Region	**Estimated Appraisal Date**	**Estimated Board Date**	**Practice Area (Lead)**
EAST ASIA AND PACIFIC	04-Dec-2017	01-Feb-2018	Energy & Extractives
Financing Instrument	**Borrower(s)**	**Implementing Agency**	
Investment Project Financing	Ministry of Finance and Treasury	Solomon Islands Electricity Authority (Solomon Power)	

Proposed Development Objective(s)

The project development objective is to increase access to grid-supplied electricity and increase renewable energy generation in Solomon Islands.

Components

Renewable energy hybrid mini-grids
Connections to low income households
Grid-connected solar power
Enabling environment and project management

Financing (in USD Million)

Financing Source	Amount
Strategic Climate Fund Grant	7.10
Support for Small Island Developing States (SIDS) DOCK Suppo	1.60
Global Environment Facility (GEF)	0.90
IDA Grant	6.50
Total Project Cost	**16.10**

Environmental Assessment Category

B - Partial Assessment

Have the Safeguards oversight and clearance functions been transferred to the Practice Manager? (Will not be disclosed)
Yes

Decision
The review did authorize the preparation to continue

Other Decision (as needed)

B. Introduction and Context

Country Context

1. **An archipelago of 997 islands, Solomon Islands has a total land area of 29,900 km^2 spread over 1.34 million km^2 of ocean.** The population of approximately 616,000 is dispersed across 90 inhabited islands and has among the lowest population densities (20 persons per km2) and urbanization rates (17 percent) in the world.[1] Roughly 80 percent of the population is living in rural areas. The island geography presents formidable and in some cases immutable challenges to service delivery, infrastructure, and economic integration. The difference in access to services between urban and rural areas is particularly stark.

2. **Solomon Islands has one of the lowest levels of gross domestic product (GDP) per capita among the Pacific Island states, at US$2,013 per capita.** The country is still recovering from many years of intermittent political turmoil and civil strife. Locally referred to as the "tension," the conflict during 1998-2003 disrupted the functioning of state and social institutions which resulted in a 40 percent decline of GDP. To support the stabilization of Solomon Islands, neighboring countries led by Australia deployed the Regional Assistance Mission to the Solomon Islands (RAMSI) to restore law and order and other basic state functions. Ever since, peace has generally been maintained, barring major riots in 2006 (which did not trigger further conflict), and political protests in 2011 following a change in prime minister. RAMSI support left Solomon Islands in July 2017 and peace continues to be maintained by the local police and justice services.

3. **The Solomon Islands economy has rebounded since the civil unrest in 2003, but remains vulnerable to external shocks.** Solomon Islands remains a fragile country.[2] The economy recovered relatively strongly based on export of commodities such as logging and mining. However, the global financial crisis in 2009 hit the Solomon Islands hard, resulting in a sharp contraction of the economy, a budget crunch, and a depletion of foreign currency reserves. Solomon Islands Government (SIG) recognized the need for significant reductions in its current spending levels, especially those with significant impact on the balance of payments. The oil price spike of 2008 increased Solomon Islands' vulnerability to oil price volatility, and the country's balance of payments came under severe pressure as fossil fuel makes up a significant portion of all imports. To mitigate the impact of high cost diesel fuel, the SIG took the initiative in considering options for development of domestic

[1] Population data based on Solomon Islands 2012/13 HIES – National Analytical Report [Volume 1], October 2015.
[2] Solomon Islands is on the Harmonized List of Fragile Situations FY18 with a harmonized Country Policy and Institutional Assessment average score of 3.1.

sources of energy, particularly hydro and other renewables. At the same time, while the country had benefited from the Honiara Club Agreement,[3] the arrangement had also placed a moratorium on new loans, which made public financing of larger infrastructure projects very difficult. While this moratorium has since been lifted, it gave an initial impetus to the drive for private sector participation in infrastructure development, financing, and operation - a policy that was later embedded in the Government National Development Strategy (2011-2020).

4. **Income distribution is inequitable across Solomon Islands, particularly geographically, with rural income levels below urban income levels.** The 2012/13 Household Incomes and Expenditure Survey (HIES), released in November 2015, found urban households earn close to three times the average income of rural households, and twice the median and per-capita income. Wages/salaries and business incomes are higher in urban areas accounting for 83 percent of the total cash-income compared with 59 percent in rural areas. As expected, the third highest cash-income of rural households comes from subsistence-based activities (mainly agriculture). In urban and rural areas cash payments for energy is a primary household expenditure. In urban areas, cash-based expenditure primarily consists of rental payments, electricity, water, and gas. Liquid fuels as a source of energy are the largest cash-based expense in rural areas.

5. **Extreme poverty is relatively high in the Solomon Islands and the country's geography and remote location makes the provision of services, including electricity, particularly challenging.** An estimated 25.1 percent of Solomon Islanders live below the global extreme poverty line, on less than US$1.90 per person per day (in 2011 purchasing power parity terms), higher than elsewhere in the Pacific except Papua New Guinea. An estimated 56.7 percent of the population live on less than US$3.10 per person per day. The Solomon Islands is one of the few Pacific countries not achieving any of the eight Millennium Development Goals, in part reflecting the very high cost of providing essential services to such small pockets of people spread widely across a dispersed territory.

The wide distribution of the population and the low densities make the capital costs of connecting consumers very high relative to the revenue generation. As a result, there are few roads on most of the islands, limited commercial shipping between islands, and air transportation is unaffordable for most citizens. Access to essential services such as water, sanitation, or electricity is low: less than 20 percent of the population has access to any electrical power supply. When electricity is available, it is more costly than elsewhere in the world and is often less reliable. Rates of access to an improved water source (primarily piped water), improved sanitation, and grid electricity are significantly higher in urban areas, but the gaps are still substantial and the quality of services for those who have them is variable. Provision of infrastructure such as stable supply of grid-based electricity has the potential to promote economic growth, for example, by refrigeration of fish, pumped irrigation, processing of produce, and development of the tourism industry. Low levels of access to an adequate supply of electricity limit the ability of children to study, add to the burden of household work, and severely constrain economic activity.

Sectoral and Institutional Context

6. **Solomon Islands is almost entirely dependent on imported, refined petroleum fuels for national energy needs for electricity generation, transport, and lighting.** The Ministry of Mines, Energy and Rural Electrification (MMERE) is the supervising ministry, and its Energy Division bears responsibility for legal and regulatory

[3] Honiara Club Agreement sets agreed principles to support Solomon Island's recovery.

development, institutional strengthening, and supervision of the vertically integrated, state-owned utility, the Solomon Islands Electricity Authority (SIEA), trading as "Solomon Power" since December 2015. Operating under the Electricity Act, Solomon Power is the main supplier of electricity in the country, and responsible for electric power generation, transmission, and distribution to all urban and provincial centers, including Honiara, nine provincial centers (so-called "outstations") and Noro Township in the Western Province. Given the island geography of the country (with population dispersed by many small islands), apart from the Honiara power system, most other service is provided by what can be considered mini-grids[4]. Outside of Solomon Power's existing service areas, there are a small number of community operated grids, standalone diesel generators, or small solar systems for basic lighting and phone charging. Since an independent regulatory authority does not exist in the Solomon Islands, Solomon Power also advises SIG on regulatory instruments, and is given the authority to issue licenses to entities who wish to generate and distribute electricity in areas not supplied by Solomon Power.

7. **Solomon Power supplies electricity to urban centers through diesel generators.** Solomon Power's Honiara power system is almost entirely diesel-based, except for a 50 kilowatt (kW) rooftop photovoltaics (PV) pilot project at Solomon Power's headquarters and a one megawatt (MW) solar farm commissioned in 2016. The total installed capacity of Honiara Electricity System (HES) is 33.6 MW, out of which 32.6 MW are diesel generators and one MW is a solar farm. Peak demand of the HES has increased from 9.3 MW in 2003 to 15.5 MW in 2016 representing a compound annual growth rate (CAGR) four percent. Over the same period, annual electricity generation in HES grew at 4.9 percent CAGR from 45.1 gigawatt-hours (GWh) to 83.9 GWh, with a notable 6.7 percent growth in 2016 alone mainly due to the increased generation capacity realized through the commissioning of four 2.5 MW diesel generators. Total electricity generated in the provincial grids was 6.7 GWh in 2016.

8. **Solomon Power has successfully rebounded from financial crisis in 2001**. The International Development Association (IDA)-funded Solomon Islands Sustainable Energy Project (SISEP), approved in June 2008 with additional financing to scale up the original project approved in November 2014, was instrumental in turning around the financial performance of Solomon Power, which dramatically recovered from making losses until 2010 to a net revenue of SBD 107 million in 2015.[5] Similarly, the SISEP has delivered significant benefits to customers through improved power system reliability and efficiency. The annual total length of time that a customer is without power in Honiara, taking into account all planned and unplanned outages (system average interruption duration index, SAIDI), has fallen from a very high 51,840 minutes (864 hours) in 2007 (prior to the SISEP) to 3,487 minutes (58 hours) in 2016. Over the same period, the number of times in a calendar year that a customer can expect to experience an interruption in power supply (system average interruption frequency index, SAIFI) dropped from 816 times to 46 times. In 2014, Solomon Power appointed a Capital Program Manager. The Capital Program Manager is tasked with strengthening the Solomon Power's project management capability, particularly the execution of its extensive capital works activities, including a new powerhouse for the capital city and generation and network upgrades across the country, and those financed under the SISEP additional

[4] Throughout literature there is not a consistent definition of mini (or micro) grids. In Africa and Asia, mini grids are sized according to MWs, while in the Pacific a 500kW system is considered to be a grid. For the purpose of the project, and in the Pacific context, a mini grid is defined as follows: "AC grids connecting a number of households and businesses with SE4ALL Tier 4 or 5 access to household electricity supply (or intended for Tier 4 or 5 service in the short to medium term). These mini grids will be capable of receiving generation such as from solar pV, mini hydros, biomass, etc. and may be later interconnected into island grids.

[5] According to Solomon Power Annual Report, which also recorded net revenues of SBD 106 million (~US$13.6 million) in 2015 and SBD 91 million (~US$11.7 million) in 2014.

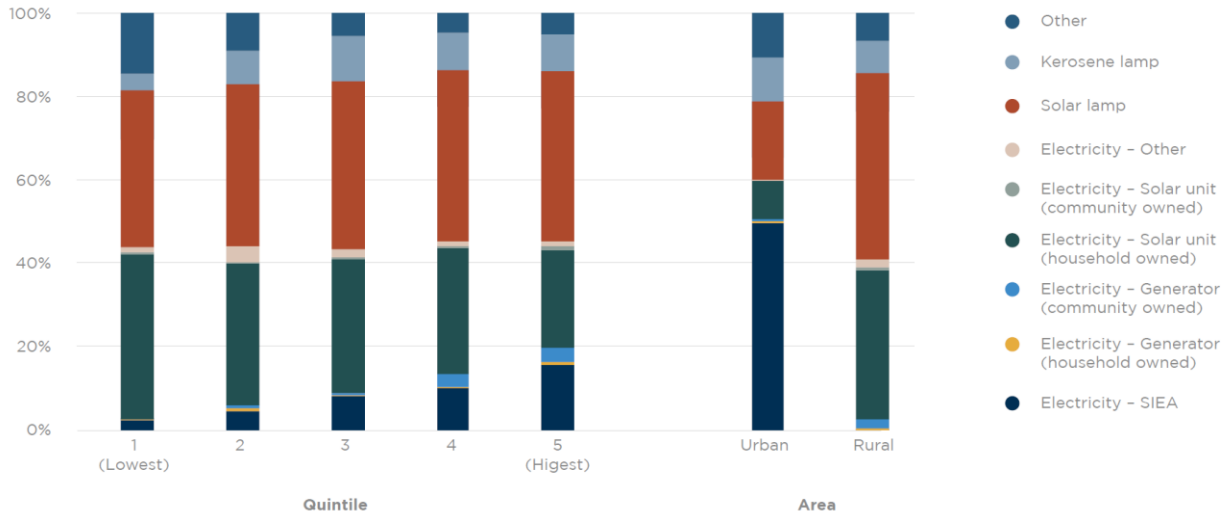
financing. In addition, Solomon Power took further steps to improve their capability to effectively manage its pipeline of capital works projects, including restructuring the organization and appointing three new experienced engineers, including a Planning Manager in addition to the Capital Program Manager.

9. **To expand access and to improve reliability, affordability, and sustainability of electricity services**, Solomon Power plans to implement a least-cost expansion plan and expand its network coverage. The least-cost expansion plan requires installation of over 54 MW new capacity in a combination of hydropower, solar and storage, and diesel capacity to meet the demand growth at the least economic cost[6]. The annual demand is projected to grow to over 140 to 250 GWh by 2040 under different scenarios of CAGR. The base case scenario assumes (a) a 2.1 percent CAGR[7] for demand growth; (b) international crude oil price growing from US$64 per barrel in 2017 to US$72 per barrel in 2025, and growing up to US$87 per barrel by 2046 in real terms; (c) solar farm installation price going down from US$2.8 to US$1.6 million per MW from 2017 to 2030 and remaining constant afterwards; and (d) an economic discount rate of three percent pursuant to the Bank's Discounting Costs and Benefits in Economic Analysis of World Bank Projects (May 2016),[8]. The proposed Electricity Access and Renewable Energy Expansion Project (Phase II) will contribute to this target by increasing the annual electricity output from renewable energy, which will reduce reliance on diesel generation and lower the blended cost of generation. Utility scale solar also has benefits in minimizing land issues as it can be installed adjacent to existing distribution lines on leased land. A reduction in the use of diesel fuel will also lower Solomon Power's operation and maintenance costs.

10. **Solomon Power is capable of absorbing the expected output of grid connected solar with no adverse effects on system stability.** With an average load of 75 GWh and generation capacity capable of an output of 84.9GWh[9], no negative impact on the grid is expected. As mentioned above, new generation capacity will be required to meet the growing demand. Increased solar generation will benefit the economy through (a) reduced importation of fossil fuels, (b) lower cost of power generation placing downward pressure on power tariffs thereby supporting private sector and reducing household expenditure, (c) improved energy security, and (d) reduced tariff volatility due to partial conversion of the national grid to renewable energy. Utilization of renewable energy also reduces greenhouse gas (GHG) emissions, which contribute to global warming.

[6] This least-cost expansion plan analysis was prepared in the framework of the preparation for the Tina River Hydropower Project (TRHP).
[7] From the Debt Sustainability Analysis of Solomon Islands carried out by World Bank and International Monetary Fund,
[8] This guidance recommends the use of discount rate of twice the projected rate of GDP per capita in real terms. It is anchored in welfare economics and implies that the net benefits of a project at different points in time should be valued according to their marginal impact on welfare at the time they occur. Higher (lower) growth prospects would normally imply a higher (lower) discount rate for a particular country.
[9] Data projected for 2016 in the Bank's Solomon Islands Cost of Service and Tariff Study: Phase 2: Renewable generation and Network capacity expansion, November 2015.

Figure: Source of energy for lighting by quintile and by urban and rural areas



Source World Bank staff analysis of 2012/13 HIES.

11. **Solomon Islands has one of the lowest rates of electrification in the region.** Dispersed population across an island archipelago and the poor performance of Solomon Power in the past constrained its capacity to expand the grid even in the capital city (Honiara), but it is currently planning a significant program of grid extensions and development of outstations. According to the 2012/13 HIES, while 45 percent of the households are said to have access to electricity, a majority of the households only have small solar panels, typically of 20 watts. The percentage of households supplied by Solomon Power is merely 12 percent nationally. While 64 percent of the population of Honiara is connected, only six percent of the remainder of the country is connected to grid electricity. The access to electricity has been improving in both rural and urban areas, although the type of service is very different. For rural households with sufficient electricity for lighting, the vast majority use solar units owned by the household, or solar lamps. In contrast, however, the major source of electricity for urban households with sufficient electricity for lighting is the grid run by Solomon Power. While a lower-tiered access for households in rural areas and in informal urban settlements may be appropriate initially, when consumption is low, it provides a different level of service (including with respect to continuous supply) and has limited adaptability for scaled-up use for productive purposes. As effective demand increases in progressively more areas of Solomon Islands, higher-grade, scalable, or grid-supplied electricity access will be required.

12. **Solomon Power has a goal of doubling its existing customers by 2021.** Solomon Power has recently started to invest in strengthening and expanding its electricity network. This includes through the installation of an additional 10 MW of diesel generator capacity at Lungga Power Station in Honiara, and Solomon Power's investment plan includes 23 subprojects to expand the Honiara grid, which it plans to finance with its own funds. These areas include the most populated areas around Honiara that can be connected with simple grid extensions, and therefore represent the most cost-effective and least cost option to connect these households. Over time, this will require bringing additional generation onto the Honiara grid as well as financing the customer connections for the households situated in those areas. Solomon Power is also developing two outstations with solar-diesel hybrid systems and hybridizing five others. Its investment plan also lists another 35 potential new

outstations. These investment plans have been prepared by Solomon Power to help it meet its ambitious goal to double the number of customers from 15,500 to 30,000 by 2021 – a goal that MMERE also supports. However, both MMERE and Solomon Power recognize that the high cost of connection is a serious impediment for new customers, especially low-income households, to connect.

13. **A major obstacle in expanding the use of electricity and promoting economic development is the high average retail electricity tariff of approximately US$65 cents/kWh, which is the highest in the Pacific and among the highest in the world.** This is due to its high reliance on expensive diesel generation with costs largely driven by the high transportation costs, inability to harness efficiencies from economies of scale, and exposure to volatility of global oil prices. The retail tariff is nationally uniform and is regulated by MMERE, and there is a cross-subsidy between the HES customers with relatively lower cost of supply and the customers of the outer islands with higher generation costs mainly due to the high cost of transporting fuel (a national uniform tariff is applied across the board for all of Solomon Power customers, including in outstations). The cost of generation has reduced over recent years, from US$35.6 cents/kWh in 2014 to US$ 23.8 cents/kWh in 2016, along with the drop in oil prices. Retail tariffs for grid-supplied electricity, adjusted down from US$93 cents/kWh in 2014 to US$65 cents/kWh as of January 2017. The 2017 reduction was partly due to low oil prices, and partly due to enforcement of a new tariff calculation methodology. The Tariff Regulation mechanism adopted since 2005 linked retail tariffs to fuel cost. However, while the retail tariff increased along with rising oil prices up to mid-2014, the drop in fuel cost that began in late-2014 was largely not translated into lower retail tariffs. In 2014, Solomon Power, with the support of the World Bank, conducted a cost-of-service and tariff review in order to develop recommendations on Solomon Power's future revenue requirements and its electricity tariff. The cost-of-service and tariff review was completed in 2016, resulting in the development and gazetting of the *Tariff Regulation 2016,* which came into effect in January 2017. Through the new tariff methodology, tariff levels are set by determining the Maximum Allowable Revenue for Solomon Power based on Non Fuel Revenue Requirements and a pass-through of Fuel Charges of all fuel costs, including power purchased under power purchase agreements, adjusted for heat rate and losses. However, the retail tariff is still significantly higher than the Pacific regional average of residential retail tariffs, which is approximately US$40 cents/kWh.[10] Although no affordability survey has been conducted, it is understood that the expensive tariff is one of the major factors for the extremely low annual consumption per capita. Having said this, unelectrified households currently spend a significant amount on expensive alternative sources of energy such as kerosene lamps, candles, and charging of batteries and mobile phones at diesel-based charging stations, while grid-supplied electricity, albeit expensive by international standards, is still more economical than the currently available alternatives[11].

14. **Renewable energy can play a key role in increasing access in a sustainable manner.** In order to reduce the exposure to the volatile global oil prices and to enhance energy security, SIG aims to increase the share of renewable energy to 50 percent of total installed capacity by 2020.[12] Apart from the small solar home systems, development of renewable energy has been slow in the Solomon Islands largely due to the weak financial position

[10] Based on *2016 Pacific Infrastructure Performance Indicators*, Pacific Region Infrastructure Facility (August 2016). Note, however, that some governments subsidize retail tariffs.

[11] Although no affordability survey has been conducted, the economic and financial analysis conducted for the Electricity Access Expansion project (P151618) identified the willingness to pay at US$28/month for rural areas of Solomon Islands. This was done by comparing what communities were spending on alternative sources of power (namely battery charging.). The average consumption per month is 30kwh, which at the current tariff of US$0.65, means that, once connected to the mini-grid, consumers would be paying on average US$19.5/month, thereby saving 30%.

[12] Apart from the cost implications, diesel generation is a major source of GHG as well as local air and noise pollution.

of Solomon Power until mid-2011, and the only prominent renewable energy sources operated by Solomon Power were the mini-hydros supplying Buala town on Isabel Province and Malu'u substation in Malaita. A number of initiatives, however, are under way that will provide additional generation needed to supply new consumers. Support from development partners is further described below.

15. **Potential for solar PV generation is being explored in complement to the Tina River Hydropower Development Project (TRHDP) under development.**[13] It is estimated that the irradiation is in the range of 5.5 to 6.5 kwh/m^2/day, and the daily load profile with maximum demand at mid-day makes PV with coinciding peak output hours a favorable option. In addition, the cost of PV continues to reduce and has an extremely low operating cost, making it an increasingly attractive alternative technology. Having said this, its outputs are intermittent and are only available during the day, and so beyond a particular penetration level, PV projects need to include storage and/or be combined with other type of compensation for the intermittency of the solar resource. Battery technologies, particularly lithium-ion batteries, are becoming an attractive enabling technology to address PV's intermittency and to store energy during the day for night-time consumption. While there is no technical limit to the penetration level, batteries are still relatively expensive in comparison with diesel and hydropower in its function to deliver energy and to provide ancillary services. An independent economic optimization study commissioned by the Bank in the framework of the TRHDP demonstrated that while hydropower and PV may compete depending on the combination of load, river discharge and insolation, hydropower predominantly displaces diesel as baseload electricity and facilitates the integration of PV at least-cost to the system.[14]

16. **The initial connection cost and support is being provided through the Electricity Access Expansion Project (EAEP), funded by the Global Partnership on Output Based Aid (GPOBA).** The initial cost to connect to the power system in Solomon Islands is extremely high. The cost of connection can be divided into (a) the cost of service line and meter to be installed by Solomon Power, and (b) cost of in-house wiring which has to be installed by a licensed electrical contractor. Solomon Power shoulders the cost of the service line for customers whose house is within 20 meters from the nearest distribution pole, but the customer has to pay SBD 800 (~US$100) for the meter and the actual cost of the service line (and auxiliary poles, if required) if the distance exceeds 20 meters. For example, the cost of connection for a house that is 30 meters away from the connection point requiring one auxiliary pole will be about SBD 2,500 (~US$313) excluding the cost shouldered by Solomon Power for the first 20 meters. Given that the monthly income of the lowest quartile in urban areas is SBD 2,000 and only SBD 850 in rural areas of the outer islands, the cost of the service line and meter is difficult to afford. Moreover, it is the exorbitant cost of the in-house wiring which makes access to grid-supplied electricity extremely difficult particularly for the low-income households. In accordance with the Electricity Act, in-house wiring can only be installed by licensed electrical contractors. Licenses are issued by Solomon Power, and Solomon Power also certifies the in-house wiring before it connects the service line to a new customer. While this stringent regulation is commendable, since there are only about 60 active licensed electrical contractors (and limited number of suppliers) – all of which are in Honiara – the cost of the in-house wiring services including the material cost seems to be artificially inflated. Evidence suggests in-house wiring can cost more than SBD 10,000 (US$1,200) for a small house. The Bank has approved the US$2.5million EAEP (P151618), supported by GPOBA, in

[13] Supported by several donors, including the World Bank (see Report No: PAD2258).

[14] This is because, although hydropower outputs can also be variable, the reservoir capacity of the TRHDP, albeit small, can provide the fast-response needed to compensate the PV's intermittency and to regulate the frequency of the power system. Since it can also provide spinning reserves and inject inertia to keep the system strong, the TRHDP can contribute to enabling higher penetration of PV.

July 2016 to provide targeted subsidies[15] to low-income households to help new customers pay the initial connection fee and basic in-house wiring for low-income households, which is a major impediment to increasing the electrification rate. Initial feedback from SIG and beneficiaries is very positive and there would be interest in expanding the program to more beneficiaries.[16]

17. **Solomon Islands is benefiting from the Scaling-Up Renewable Energy in Low-Income Countries Program (SREP)[17].** In June 2014, the SREP sub-committee endorsed an investment plan (SREP IP) submitted by MMERE, for the development of renewable energy opportunities totaling an estimated amount of US$ 40.3 million, including US$ 14 million of SREP funding and co-financing from the private sector, multilateral development banks (WB and ADB) and the private sector. The SREP IP, which aims to support the increased penetration of renewable energy and increased electricity access in the country, identifies renewable energy technologies and projects that would contribute to the sustainable development of Solomon Islands. The proposed Electricity Access and Renewable Energy Expansion Project contributes to the SREP IP's Renewable Energy Access Project. More details regarding the SREP IP and investment criteria are provided in Annex 5.

18. **Solomon Islands also receives support from the Small Islands Development States Initiative (SIDS-DOCK) Multi-donor Trust Fund[18] and the Global Environment Facility (GEF).** SIDS-DOCK provides grants to recipients with focus on two outcomes: (a) creating an enabling regulatory and institutional environment to remove barriers on the implementation of renewable energy and energy efficiency policy reforms, based on international best practices; and (b) implementation of renewable and energy efficiency projects that demonstrate the potential for scale-up through climate finance and other sources of funding. To achieve its outcomes, SIDS-DOCK supports analytical and advisory activities as well as some investments for renewable energy and energy efficiency initiatives. This project is in line with SIDS-DOCK outcomes. GEF has funded 40 projects in Solomon Islands in the areas of biodiversity, land degradation, and climate change, valued at over US$260 million in grant funding and US$900 million in additional co-financing.

Several development partners provide support to Solomon Islands in the energy sector. The Energy Programme of the Secretariat of the Pacific Community's Economic Development Division provides technical assistance to MMERE, including on development of the Solomon Islands National Energy Policy in 2014. In 2014, a 50 kW demonstration grid-connected solar installation on the rooftop of Solomon Power's head office parking lot was commissioned, with

[15] This includes funds a client executed grant of US$2.23million along with Bank executed funds for supervision in the amount of US$0.27million). A subsidy of US$794 is paid under the program for connections in Honiara, and US$994 for connections in outstations.
[16] A willingness to pay analysis was also conducted during preparation of EAEP to determine household's willingness to pay once they received an electricity connection. The economic analysis considered only the consumers' surplus of switching from the supply provided by charging and using car batteries to grid electricity supply. The surplus is based on the cost savings from charging batteries and replacing them every two years, to using grid electricity (30 kWh per month in Honiara, charging batteries cost approximately SBD 45 per charge, and the battery can last around a week, for a limited use of two energy efficient lamps, and phone charging). Thus, it is assumed that the willingness to pay of consumers is at least the amount they currently pay of US$24 a month. Also, switching to grid electricity avoids the need of replacing the battery, usually after two years, with a cost of US$100 per battery. Using the revised electricity tariff for the lowest residential tier below 50 kWh a month of US$0.70/kWh, the monthly bill would be US$21, lower than the current cost of charging batteries, but providing much more electricity than before.
[17] SREP is part of the Strategic Climate Fund, with the objective to pilot and demonstrate the economic, social, and environmental viability of low carbon development pathways in the energy sector by creating new economic opportunities and increasing energy access through the use of renewable energy
[18] SIDS-DOCK is a partnership of the Energy Sector Management Assistance Program, the United Nations Development Program, Alliance of Small Island States, the Government of Denmark, and the Government of Japan, established 2011.

financing from the Japan International Cooperation Agency. Solomon Power has commissioned a one MW grid-connected solar farm connecting to the Honiara grid, which was grant-funded by the Governments of the United Arab Emirates and New Zealand. Also, ADB is implementing the Solar Power Development Project, which aims to hybridize existing diesel-based outstations with solar and battery units. Also with ADB financing, Solomon Power is implementing 500 kW Fiu River Hydropower Project to connect to the Auki grid on the island of Malaita. The World Bank, the International Finance Corporation (IFC), ADB, Australia, Green Climate Fund (GCF), and other partners are supporting SIG to develop the 15 MW TRHDP, which will feed into the Honiara grid. TRHDP will increase generation capacity of baseload electricity and integration capacity of renewables into the grid. In addition, the previously mentioned SISEP aims to improve the operational efficiency, system reliability, and financial sustainability of Solomon Power. Increases in transmission capacity within the grid, improved efficiency of power supply, and tariff reforms are expected to lay the ground for increasing access to grid-based energy. As described above, the EAEP supports access to energy for the poor by addressing the ability of poor households to pay the up-front connection cost and the cost of in-house wiring. The proposed project complements these ongoing interventions.

C. Proposed Development Objective(s)

Development Objective(s) (From PAD)

The project development objective is to increase access to grid-supplied electricity and increase renewable energy generation in Solomon Islands.

Key Results

19. Progress will be measured against the following PDO level results indicators:

- People provided with new or improved electricity service (number); and
- Annual electricity output from renewable energy as a result of the renewable energy constructed under the project. (GWh).

D. Project Description

20. The proposed project has an estimated cost of US$16.1 million, but with the possibility of being scaled up if additional resources become available. It will include the components outlined below. More details are provided in Annex 1

21. **Component 1 — Renewable Energy Hybrid Mini-grids (US$8 million).** Component 1 would finance new hybrid mini-grids throughout Solomon Islands. Solomon Power has identified a long list of 35 potential locations suitable for mini-grids taking into account population density (number of households), public facilities such as hospitals and schools, ‘anchor’ loads such as tourism facilities, food processing or other commercial operations, and potential sources of renewable energy sources (mainly solar PV). These ‘candidate’ mini-grids are located in Central Province, Choisuel, Guadalcanal, Isabel, Makira, Renbul, Temotu, and Western Province. Solomon Power has established a process of prioritizing those mini-grids based mostly on the average cost per

connection, accessibility and safeguards considerations, namely land availability[19]. Additional feasibility studies will be conducted by Solomon Power in the priority sites to determine their suitability.

22. **Component 2 — Connections to Low-income Households (US$1.5 million).** Component 2 would finance household connections to low income households, through an output based aid (OBA) mechanism, building on the EAEP. This component would provide one-off OBA subsidies to eligible low-income households to cover a portion of the upfront cost of electricity service connections in the Honiara grid (existing service area and planned expansion areas) and in the outstations, including those being developed through Component 1, and possibly others. Eligibility criteria will be based on the geographic location, and then self-selection. Consumers will apply for a service connection per current processes.[20]

23. **Component 3: Grid-connected Solar Power (US$5 million).** Component 3 would finance the supply and installation for one or more grid-connected solar facilities in Solomon Islands, and associated technical assistance. This facility(ies) would be developed on the basis of an EPC contract, and with an option for a maintenance contract for an initial period of 3-5 years. Ownership and future operation will remain with Solomon Power. The displacement of fossil fueled generation is expected to improve energy affordability, relative to the present, and contribute to further improvements in financial performance of Solomon Power.

24. **Component 4 — Enabling Environment and Project Management (US$1.6 million).** Component 4 would finance specific areas of technical assistance and project management costs.

E. Implementation

Institutional and Implementation Arrangements

25. The Ministry of Finance and Treasury (MoFT) will be the recipient for the various grants and will enter into the Financing/Grant Agreements with the World Bank. Overall responsibility for oversight and implementation of the project will lie with Solomon Power. Solomon Power will be the implementing agency for the project, and will sign a Project Agreement with the World Bank, as well as a Subsidiary Grant Agreement with the MoFT, passing on the grants.

26. A project coordinator with experience and qualifications acceptable to the Bank will be appointed or recruited by Solomon Power [by effectiveness] and will be responsible for the coordination and day to day implementation of all project activities, along with other involved Solomon Power staff. A procurement specialist will also be recruited or appointed to work with the project coordinator on this project. Solomon Power is currently recruiting a procurement specialist under the SISEP, and the same expert may be utilized as a shared resource for this and other projects.[21] This specialist (or its successor) will be responsible for conducting or

[19] When calculating the average cost per connection will mostly depend of the total costs and population to be covered, but a number of factors comes into play, such as the costs linked to accessibility and logistics, environmental considerations and gender – currently under discussion.

[20] Under the current program and in order to qualify, consumers will fall into the following criteria: (i) beneficiaries fall under the prepaid residential category; (ii) beneficiaries do not have a previous connection under their name; (iii) service connection is capped to 10 A for a period of 12 months; and (iv) service connections are individual, and cannot be shared with other households.

[21] SISEP will initially be financing this expert, but the contract may then be rolled over as needed into the current project. If the SISEP-financed procurement specialist is not available, then Solomon Power shall recruited or appoint a procurement specialist

supporting all procurement activities for the project. Depending on the workload of current Solomon Power staff there may also be need to finance a Project Accountant. Project accounts for SIESP and GPOBA are currently maintained using Solomon Power staff, but the additional work load required for this project may lead to Solomon Power requesting additional FM resources to be financed through this project. These experts will also be responsible for training Solomon Power's staff as necessary.

27. Implementation of Component 2 will follow the implementation arrangements defined under the EAEP. The OBA program manager will coordinate implementation of this component with the project coordinator. The OBA Independent Verification Agent will work the project coordinator to verify connections under component 2. If needed, the OBA program manager could also be financed by the project.

28. Solomon Power's finance department will be responsible for financial management of the project, in coordination with the project coordinator. The project coordinator will liaise and coordinate with the MMERE and other agencies as the case may be for coordination regarding the sector studies requiring their involvement (notably the sector studies planned under Component 4).

29. Solomon Power has been implementing Bank-financed projects for several years and has experience with World Bank project implementation, including with fiduciary and safeguard policies. Solomon Power is currently implementing two World Bank projects: SISEP (P100311) and EAEP (P151618).

30. Adequate technical assistance for project implementation will be critical. The project will provide support for the recruitment of an owner's engineer to assist with detailed design and preparation of bidding documents as well as with supervision of the contractors as needed.

F. Project location and Salient physical characteristics relevant to the safeguard analysis (if known)

Component 1 of the project consists of construction of hybrid mini grids in rural areas of the Solomon Islands. Solomon Power has identified 35 potential locations for the mini grids, from which approximately four sites hve been chosen at Lambi and Visale (Guadalcanal Province) and Namugha and Santa Ana (Makira Province). Each location has a 1 ha site where the solar PV array and equipment will be built, currently consisting of anthropogenically altered land that is either cleared or has native grasses, brush and second growth trees. The four villages are located on the coast, with a mixture of cleared and vegetated land in their vicinity. Location of sites in Component 2 will be in Honiara, existing outstations in other provinces, and for the mini grids developed as part of Component 1. All locations will be existing villages or urban areas in Honiara. Construction at each site will consist of a new line connecting the low voltage distribution line to an entry box on the dwelling or building, with auxillary poles needed in some instances. In some cases the auxillary pole may require removal or trimming of individual trees. Component 3 will be located in one or multiple shortlisted sites in Honiara and/or Auki. The potential sites are at the East Honiara substation (~2.24 ha), Henderson-Fighter 1 near Honiara airport (~4.51 ha), Auki outstation (~1.15 ha) or Tanagai (3.07 ha) near Kakabona community. The sites are in the vicinity of the urban areas in Honiara and Auki and are

for this project within three months of effectiveness.

either cleared grassland (Henderson-Fighter 1, parts of Auki), have overgrown gardens (East Honiara) or secondary growth vegetation (parts of Auki). The project's subprojects will be carried out in urban or peri-urban areas where land clearing has occurred and anthropogenic ecosystems that do not contain critical natural habitats. Sites may be in the vicinity of watercourses and the ESMF proposes management activities to mitigate impacts during construction, and relatively minimal excavation and construction is required. There is also a possibility of unexploded ordinance in locations where munitions were stockpiled or fighting occurred during World War II (provisions of ESMF also address this issue).

G. Environmental and Social Safeguards Specialists on the Team

Ross James Butler, Social Safeguards Specialist
Felix Peter Taaffe, Environmental Safeguards Specialist

SAFEGUARD POLICIES THAT MIGHT APPLY

Safeguard Policies	Triggered?	Explanation (Optional)
Environmental Assessment OP/BP 4.01	Yes	This safeguard policy is triggered. The project will involve various physical investments, including construction of solar/battery/diesel hybrid systems, construction of distribution lines on land identified and provided by the communities (based on willing buyer-willing seller, negotiated lease/license or other agreed and documented arrangement), line drop extensions from existing grids, and one or more large new solar plants. The potential environmental and social impact of the works under components 1, 2 and 3 have been assessed as minimal. The majority of construction will involve solar PV arrays on 1 ha sites (component 1) or cleared land near Honiara or Auki (component 3). Use of customary land may be required for Components 1 and 2. For Component 2, there is an ongoing issue in supplying connections to households without current leases. The Government is developing a process to manage this which will need to be verified via due diligence work during project delivery.

		An ESMF has been prepared by Solomon Power that identifies the range of potential impacts, and sets out processes for the management of environmental and social issues. An ESIA is required for each Component 3 subproject, while ESMPs will be used for Component 1.
Natural Habitats OP/BP 4.04	No	The potential sites for the project, in particular the sites required for solar PV arrays and ancillary equipment in components 1 and 3, have been found to contain no critical natural habitats. Sites are close to urban areas and villages and have been anthropogenically altered. However, the policy has been triggered in case other subproject locations are considered. Specifically, if other villages or solar array sites are considered for Component 1, natural habitats may be impacted.
Forests OP/BP 4.36	No	The project activities are not expected to create or induce deforestation and their environmental impact is not expected to compromise the integrity and health of forested areas. Some minor clearings of trees, shrubs and undergrowth within urban areas may be necessary under the physical investments.
Pest Management OP 4.09	No	The Project will not involve use of pesticides or herbicides.
Physical Cultural Resources OP/BP 4.11	Yes	It is possible that physical cultural resources may be encountered in excavations during the construction phase of components 1 and 3. For most works this is considered unlikely as there is relatively minor excavation; however, larger earthmoving may be required under component 3. A chance find protocol in the ESMF will ensure appropriate steps are taken.
Indigenous Peoples OP/BP 4.10	Yes	This safeguard policy will be triggered by the project, as Components 1 and 2 provides for activities in rural areas, which on a national level, are inhabited primarily by indigenous peoples. On this basis and given that indigenous peoples are also the principal beneficiaries of Component 1, a separate Indigenous Peoples Development Plan is not proposed to be prepared. Instead, elements of an Indigenous Peoples Plan, such as informed consultations, stakeholder participation and social assessment, will be incorporated into project design consistent with guidance provided in Environmental and Social Safeguard Instruments for the Pacific Island Countries (ESSIP). The prepared ESMF is based on

		limited social assessments, and describes the subsequent social assessment (including consultation) required for each of the components as subprojects are chosen.
Involuntary Resettlement OP/BP 4.12	Yes	Land required for sub-projects will not require resettlement of people; however, the policy has been triggered in order to manage any issues on the project relating to land tenure. Possible sites for solar PV arrays on components 1 will be secured for use by the project, with the process depending on whether the site is provincial, customary, perpetual estate or government land. Solomon Power will seek to obtain the land on a long-term basis using a "willing buyer-willing seller", negotiated lease/license or other agreed and documented arrangement. Solomon Power have no intention of using eminent domain to acquire the land. For Component 3, Solomon Power already owns the sites being considered for development, except for one which it is in the process of buying from the current owners. Components 1 and 2 involve placement of power poles along the roadway that may require small (1 m2) sections of community owned land, or require removal of existing trees. For the use of land, agreement will be sought from the customary land holders, followed by obtaining consent from the Ministry of Lands, Housing and Survey. Compensation will be paid for affected assets. An ESMF has been prepared that describes the land-related issues and the process for their management. The ESMF contains an RPF which describes in detail the types of land acquisition for the project, and the requirements as per OP/BP 4.12. Environmental and Social Management Plans prepared for subprojects under Components 1 and 3 will include due diligence reports on the land ownership and any recent acquisitions.
Safety of Dams OP/BP 4.37	No	No dams will be affected by the Project.
Projects on International Waterways OP/BP 7.50	No	No project activities will take place on international waterways.
Projects in Disputed Areas OP/BP 7.60	No	There are no known disputed areas in the project areas of influence.

KEY SAFEGUARD POLICY ISSUES AND THEIR MANAGEMENT

A. Summary of Key Safeguard Issues

1. Describe any safeguard issues and impacts associated with the proposed project. Identify and describe any potential large scale, significant and/or irreversible impacts:

The project's three components are expected to have minimal social and environmental impacts, however, there are potential impacts related to land tenure, land clearing, excavation and construction of energy infrastructure. Any safeguards issues and impacts are expected to be limited to the planning and construction phases of the project. No project activities involve large scale changes to the existing environmental or social characteristics of the project's locations.

Component 1 has potential impacts related to small-scale removal of vegetation, improper construction practices, and use of community owned land. The mini-grid facilities have four possible locations, each of which contains anthropogenically altered land where the solar PV site would be built. The sites (approximately 1 ha in area) are vegetated with native grasses, brush and in some cases second growth trees, which would be removed for construction. Similarly, removal of individual trees or bushes may be necessary along the roadways for placement of power poles. Construction will involve installing foundations for solar arrays, storage batteries (if included), diesel generators or other ancillary equipment. Some construction related impacts are possible, including dust and emissions, poor waste management, and sedimentation of water courses, but overall the scale of construction is small. The installed facilities will use land that is either government owned or where it is customary held, will use a "willing buyer-willing seller", negotiated lease/license or other agreed and documented arrangement, and avoid any economic or physical displacement. Power pole installations may require community owned land but have small footprints (<1 m2) and will gain consent and give compensation for any privately-owned trees that require removal.

Component 2 has minimal environmental issues and does not require acquiring land; however, there is the potential for low income households to be denied connection due to their lease status. Currently Solomon Power is unable to connect households that have a lapsed Temporary License to Occupy or Fixed Term Estate, which can occur in low-income households when they fail to pay the required fee. This may lead to unintentionally favouring those areas or households that are relatively wealthy. It is noted that Solomon Power are currently seeking a solution to this issue, which will be included in the ESMP(s) for the component. Beyond the new wiring at each household, the component will involve minimal construction, limited to installation of auxiliary power poles for low-voltage wires.

Component 3 has potential impacts related to vegetation removal and construction of the solar PV array. The five shortlisted sites are in or near urban areas and consist of mostly cleared land with some secondary growth. Construction will involve excavation for power poles and foundations, and installation of the array and ancillary equipment. Potential construction impacts include dust generation, drainage issues, disposal of soil and construction waste and health and safety. As with component 1, environmental and construction related impacts are expected to be minor in magnitude. Issues related to disputed ownership or use of the potential sites have been considered in site selection, with all potential sites already owned by Solomon Power, except for one site which they are in the process of buying. It is noted that the land process for the three components, which will primarily be based on 'willing buyer-willing seller' process, is the same as that used on several other World Bank-supported projects being undertaken by Solomon Power, and they have reasonable capacity to oversee the process.

2. Describe any potential indirect and/or long term impacts due to anticipated future activities in the project area:
The project is not expected to cause any significant long term or indirect impacts due to anticipated future activities. The project will cause minimal changes to the exist land use, with all constructed infrastructure in or adjacent to urban areas and villages, on land that has been anthropogenically altered. Areas to be supplied with electricity are in Auki or Honiara, which already have significant urban development, and in more remote villages. The provision of reliable electricity supply to households may marginally increase the utility of the area. The operation of the solar plants and mini-grids is not labor-intensive. For Component 1, use of batteries and diesel generators increases the potential for environmental impacts during the operation phase, but this can be managed through project design.

3. Describe any project alternatives (if relevant) considered to help avoid or minimize adverse impacts.
In regards to the overall project design, the choice of solar PV arrays over other energy sources is considered to have relatively low impact with regards to safeguards issues, as does grid densification. The infrastructure required is minimal and can be integrated with existing urban areas. The use of decentralized mini-grids in rural areas was chosen over larger, centralized networks that would have much larger construction, environmental and land-tenure related impacts. For individual subprojects, site selection was made in consideration of site accessibility and land tenure arrangements, and where cleared sites were available for Component 3.

4. Describe measures taken by the borrower to address safeguard policy issues. Provide an assessment of borrower capacity to plan and implement the measures described.
Solomon Power has considered safeguard policy issues in their choice of energy infrastructure, project locations and project preparation. Solar PV as an energy source has been chosen as it is cost-effective, but also as it reduces the reliance on importing diesel, thereby reducing greenhouse gas emissions, while not requiring significant land or resource extraction, which are associated with environmental and social impacts. As described, sub-project locations have been chosen in consideration of Solomon Island's customary land title arrangements, to avoid impacts associated with land acquisition and resettlement. The proposed subprojects make minimal use of community owned land and avoid environmentally sensitive areas. Overall, project design has involved close collaboration with the World Bank task team, including safeguards specialists.

The implementing agency has prepared an ESMF which describes safeguard-related issues and stipulates measures for their management. The ESMF, prepared in June 2017, considers all World Bank safeguards policies and their application to each component and subproject. The document establishes processes for the management of safeguards, including preparation of an ESIA for any component 3 sub-project, and ESMPs for components 1 and 2. It assigns responsibilities for the assessment and monitoring of subprojects, and gives guidance on required mitigation measures to be included in subsequent documents.

The Solomon Islands Electricity Authority (SIEA) - currently trading as Solomon Power (SP), the Implementing Agency, has some experience with World Bank Safeguard policies. SP is currently implementing two World Bank projects; (i) the Solomon Islands Sustainable Energy Project, and (ii) the Electricity Access Expansion Project. SP has prepared necessary safeguards documents for the implementation of the investment projects, and recently prepared an ESMF for the current project. Solomon Power currently does not have in-house environmental and social specialists; however, it has engaged international consultants for these services in the past and is taking steps to develop its in-house capacity. Overall, they are familiar with safeguard policies and have experience in their implementation, but will likely require support from the task team in this regard throughout the project.

5. Identify the key stakeholders and describe the mechanisms for consultation and disclosure on safeguard policies, with an emphasis on potentially affected people.

The key stakeholders are various Solomon Islands government ministries, provincial governments involved in the project, households, businesses and public services in the planned areas of electricity provision, and those affected by the construction of the project. Government entities relevant to the project include the Ministry of Mines, Energy and Rural Electrification, Solomon Islands Electricity Authority (Solomon Power), Ministry of Environment, Climate Change, Disaster Management and Meteorology, Ministry of Lands, Housing and Survey and the provincial government of the chosen location of components 1 and 3 subprojects. Potentially affected people are primarily those who will receive electricity under the project, but also include those affected by small-scale construction impacts.

Stakeholder consultation, include grievance redress, will be managed by Solomon Power's Customer Service Department. It will undertake targeted consultations and an awareness campaign to inform potentially affected people of the objectives and structure of the project. A consultation program has been planned for each component, including consulting with affected people as the subproject details and timing become available. The ESMF describes the program in detail, including how free, prior and informed consultation will be carried out, in accordance with OP 4.10.

B. Disclosure Requirements (N.B. The sections below appear only if corresponding safeguard policy is triggered)

Environmental Assessment/Audit/Management Plan/Other

Date of receipt by the Bank	Date of submission for disclosure	For category A projects, date of distributing the Executive Summary of the EA to the Executive Directors

"In country" Disclosure

Resettlement Action Plan/Framework/Policy Process

Date of receipt by the Bank	Date of submission for disclosure

"In country" Disclosure

Indigenous Peoples Development Plan/Framework

Date of receipt by the Bank	Date of submission for disclosure

"In country" Disclosure

C. Compliance Monitoring Indicators at the Corporate Level (to be filled in when the ISDS is finalized by the project decision meeting) (N.B. The sections below appear only if corresponding safeguard policy is triggered)

OP/BP/GP 4.01 - Environment Assessment

Does the project require a stand-alone EA (including EMP) report?

If yes, then did the Regional Environment Unit or Practice Manager (PM) review and approve the EA report?

Are the cost and the accountabilities for the EMP incorporated in the credit/loan?

OP/BP 4.11 - Physical Cultural Resources

Does the EA include adequate measures related to cultural property?

Does the credit/loan incorporate mechanisms to mitigate the potential adverse impacts on cultural property?

OP/BP 4.10 - Indigenous Peoples

Has a separate Indigenous Peoples Plan/Planning Framework (as appropriate) been prepared in consultation with affected Indigenous Peoples?

If yes, then did the Regional unit responsible for safeguards or Practice Manager review the plan?

If the whole project is designed to benefit IP, has the design been reviewed and approved by the Regional Social Development Unit or Practice Manager?

OP/BP 4.12 - Involuntary Resettlement

Has a resettlement plan/abbreviated plan/policy framework/process framework (as appropriate) been prepared?

If yes, then did the Regional unit responsible for safeguards or Practice Manager review the plan?

Is physical displacement/relocation expected?

Is economic displacement expected? (loss of assets or access to assets that leads to loss of income sources or other means of livelihoods)

The World Bank Policy on Disclosure of Information

Have relevant safeguard policies documents been sent to the World Bank for disclosure?

Have relevant documents been disclosed in-country in a public place in a form and language that are understandable and accessible to project-affected groups and local NGOs?

All Safeguard Policies

Have satisfactory calendar, budget and clear institutional responsibilities been prepared for the implementation of measures related to safeguard policies?

Have costs related to safeguard policy measures been included in the project cost?

Does the Monitoring and Evaluation system of the project include the monitoring of safeguard impacts and measures related to safeguard policies?

Have satisfactory implementation arrangements been agreed with the borrower and the same been adequately reflected in the project legal documents?

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