Initial Environmental Examination

Project Number: 49450-004
October 2016

Pacific Renewable Energy Investment Facility (Cook Islands: Rarotonga Battery Energy Storage System)

Prepared by the Ministry of Finance and Economic Management, Government of Cook Islands for the Asian Development Bank.

CURRENCY EQUIVALENTS

(as of 3 October 2016)

Currency Unit = New Zealand Dollar (NZ$)

NZ$1.00 = US$ 0.73

US$1.00 = NZ$ 1.37

ABBREVIATIONS

ADB	-	Asian Development Bank
AP	-	Affected Person
CEMP	-	Construction Environmental Management Plan
CIBD	-	Cook Islands Biodiversity Database
CIIC	-	Cook Islands Investment Corporation
CIREC	-	Cook Islands Renewable Energy Chart
CIRESP	-	Cook Islands Renewable Energy Sector Project
EA	-	Executing Agency
EARF	-	Environment Assessment and Review Framework
EIA	-	Environmental Impact Assessment
EMP	-	Environmental Management Plan
EPA	-	Environmental Protection Authority
ESD	-	Environmental Significance Declaration
GDP	-	Gross Domestic Product
GEF	-	Global Environment Fund
GRM	-	Grievance Redress Mechanism
GWh	-	Gigawatt Hour
HV	-	High Voltage
IA	-	Implementing Agency
IEA	-	Island Environmental Authority
IEE	-	Initial Environmental Examination
IEE	-	International Environmental Expert
IUCN	-	International Union for Conservation of Nature
LV	-	Low Voltage
MFEM	-	Ministry of Finance and Economic Management
MW	-	Megawatt
NES	-	National Environmental Service
OPM	-	Office of the Prime Minister
POE	-	Project Owners Engineer
PPE	-	Personal Protective Equipment
PPTA	-	Project Preparatory Technical Assistance
PSG	-	Project Steering Group
PV	-	Photovoltaic
REDD	-	Renewable Energy Development Division (Office of the Prime Minister)
SPS	-	ADB *Safeguard Policy Statement 2009*
TAU	-	Te Aponga Uira

NOTES

(i) The fiscal year (FY) of the Government of Cook Islands ends on 30 June. FY before a calendar year denotes the year in which the fiscal year ends, e.g., FY2013 ends on 30 June 2013.

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Executive summary

1. **Introduction**: The Cook Islands is heavily reliant on imported fossil fuels for electricity generation. The Government of the Cook Islands is implementing The Cook Islands Renewable Electricity Chart (CIREC) which aims to supply 100% of the Cook Islands electricity generation from renewable sources by 2020. The Project includes installation of a 1 MW, 4 MWh Battery Energy Storage System (BESS) and 3 MW / 12 MWh additional battery storage (R-ESS-2) on Rarotonga. The project is classified as a Category B project in accordance with ADBs *Safeguard Policy Statement 2009* (SPS). The subprojects will comply with the requirements of the Cook Islands *Environment Act 2003*. This Initial Environmental Examination (IEE) is intended to meet the requirements of a Category B project as described in the SPS.

Table 1: Subproject Features

Feature	Rarotonga
Geographical Location	-
Land Area (km^2)	67.2
Island Population[1]	13,095
Households[2]	-
Project Intervention	Installation of a 1MW / 4MWh Battery Energy Storage System (BESS) and connection to the Rarotonga Grid. Installation of additional 3 MW / 12 MWh battery storage system (R-ESS-2).
Ownership of Land to Be Acquired	Government of the Cook Islands
Location of Site for Solar Installation	The TAU owned airport solar PV array located at the Rarotonga Airport in Avarua District just to the SW of the terminal building and inland side of the airport, as well as at the existing TAU owned power station site.
Area to Be Acquired for Solar Site m^2 (ha)	-
Land Use	Used to house TAU's airport solar PV array and the existing TAU power station site.
Vegetation	Cleared and sealed. No vegetation
Threatened species significantly impacted[3]	None
Terrain	Flat, existing hardstand

2. The project is located in modified cleared and sealed hardstand, within a n existing TAU compound. There will be no vegetation clearance as part of the project. Consultation has indicated there are no sites of cultural significance (marae) or historical significance associated with the sites. The sites at Rarotonga is owned by the Government of the Cook Islands and already leased to Te Aponga Uira (TAU).

3. Potential construction environmental impacts, including dust and noise generation, waste management (including hazardous materials), erosion control, clearing, the introduction of invasive species and health and safety management, can be avoided or controlled to

[1] 2011 Census.

[2] Active residential electricity accounts.

[3] Species listed on the International Union for Conservation of Nature Red List or Listed as Endangered on the Cook Islands Biodiversity Database.

acceptable levels with the implementation of the mitigation measures described in the Environmental Management Plan (EMP). There are few potential operational environmental impacts. Batteries and inverters that require replacement during the operational life of the project and/or decommissioning will be recycled or disposed appropriately.

4. **Project Benefits**: The Project will provide a secure, sustainable and environmentally sound source of electricity. The Project will provide a significant contribution toward the Government of the Cook Islands meeting its goal of supplying 100% of the Cook Islands electricity generation from renewable sources by 2020.

5. **Implementation Arrangements**: The Ministry of Finance and Economic Management (MFEM) is the executing agency (EA) and Te Aponga Uira (TAU) and the Renewable Energy Development Division (REDD) is the implementation agency (IA). The IA will be supported by the Project Owners Engineer (POE) for the design, construction and commissioning of the subprojects.

6. **Consultations and Information Disclosure**: Local communities and community leaders were consulted and are aware of and fully support the proposed project. Recommendations and suggestions received during consultations were incorporated in the design of the project and in the project IEE and EMP.

7. **Grievance Redress Mechanism**: A Grievance Redress Mechanism (GRM) is proposed for the Project to receive, evaluate and facilitate the resolution of affected people's concerns, complaints and grievances about the environmental and social performance of the Project. The GRM contains methods to promptly address affected people's concerns and complaints, using an understandable, transparent and culturally appropriate process. The mechanism does not impede access to the Cook Islands' judicial or administrative remedies.

8. **Environmental Management Plan**: An EMP has been prepared for the subprojects and will be updated based on the design work undertaken during project implementation. The IAs (REDD) and POE will be responsible for implementing the EMP at all subproject sites. The EMP identifies potential preconstruction, construction, operation and decommissioning environmental and social impacts associated with the subprojects. The EMP will form part of the construction contract documents and the contractor will be required to prepare a site specific construction environmental management plan (CEMP) based on the approved IEE's EMP. The contractor will submit the CEMP to the POE for approval prior to commencement of works.

1. INTRODUCTION

1.1 Project Background and Rational

1. The Cook Islands is a Pacific island country divided into two island groups—Northern and Southern—with a total resident population of 14,947 people (2011 census). The Northern Group consists of six low-lying, sparsely populated, coral atolls while the Southern Group consists of nine high islands mainly of volcanic origin and several smaller atolls. Approximately 74% of the country's population lives on the largest island, Rarotonga.

2. The Cook Islands is heavily reliant on imported fossil fuels for electricity generation. In 2012 approximately 12.2 million litres of diesel was imported in to the Cook Islands of which approximately 7.2 million litres was used for electricity generation. The cost of imported fuels was $58 million or approximately 28% of the Cook Islands gross domestic product (GDP) and electricity costs are currently amongst the highest in the Pacific. Like other Pacific island countries, the Cook Islands are highly vulnerable to fluctuating oil prices, affecting the affordability of food, goods, electricity, and transportation. Its dependency on imported fossil fuels consequently affects the economic growth of the country.

3. The total installed power generation capacity in the Cook Islands is 11.75 megawatt (MW) with a distribution network comprising 80 kilometres (km) of 11 kilovolt (kV) underground cables and 200 km of 0.415 kV low voltage distribution lines. The power system generated 33.8 gigawatt-hour (GWh) of electricity in 2012. On the major islands of Rarotonga and Aitutaki, nearly 99% of all households are grid connected, 8% had additional domestic solar photovoltaic (PV) systems, and 3% also used small diesel generators. In the outer islands, about 60% of households are grid connected, and 43% have solar PV systems.

4. The Government of the Cook Islands is implementing the Cook Islands Renewable Electricity Chart (CIREC) which aims to supply one hundred per cent of the Cook Islands electricity generation from renewable sources by 2020. The CIREC together with the CIREC Implementation Plan sets out the planned approach to replacing existing electricity generation with renewable sources on each island. Substantial progress towards meeting the plan has already been achieved, with six of the 12 inhabited islands (the Northern Group) having renewable electricity generation systems installed and operating in 2014/15.

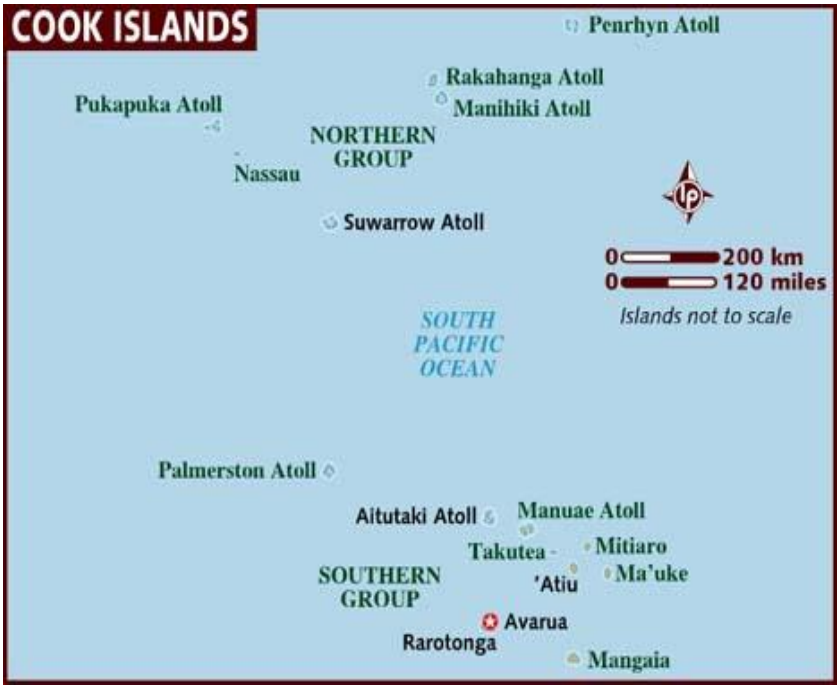

Figure 1.1: Project Location

1.2 Report Purpose and Scope

5. Due diligence has been completed for the Rarotonga battery storage subprojects and the purpose of this IEE is to present the environmental impacts and risks: The objectives of the IEE are to:

(i) Establish the baseline environmental and social values associated with the subproject sites.

(ii) Identify the presence of Critical Habitat (as defined in ADB Safeguard Policy Statement 2009 (SPS)) potentially impacted by the subprojects.

(iii) Assess the potential environmental and social impacts (positive and negative) of the construction and operation of the subprojects.

(iv) Provide avoidance, mitigation and management measures for the identified impacts.

(v) Ensure that all statutory requirements for the project such as applicable legislation and regulations, permits required (if any) and policies have been considered.

(vi) Document stakeholder consultation undertaken for the Project.

6. The IEE adheres to the requirements of the ADB SPS.

1.3 Methods

7. The IEE included:

(i) Literature and database review: a review of existing reports and information available on the sites.

(ii) Stakeholder consultation: stakeholders consulted for the IEE included the Cook Islands NES, Cook Islands Natural Heritage Trust, Island Councils, Island Environmental Officers, Te Aponga Uira (TAU), staff of the existing power stations and landowners.

8. The IEE will be made publically available through the ADBs website and locally at the offices of REDD, TAU and the subproject Island Councils.

1.4 Structure of the Assessment

9. In accordance with the SPS this IEE has the following contents:

- *Executive Summary*: This section briefly describes the critical facts, significant findings, and recommended actions.
- *Introduction*: Describes the overview of the project, environmental requirements, objectives and scope of the study, approach, and methodology.
- *Administrative, Policy and Legal Framework:* Discusses the national and local legal and institutional framework within which the environmental assessment is carried out.
- *Project Description*: Provides an overview of the proposed project, its objectives and major components including maps showing the project's location.
- *Description of the Existing Environment*: Describes the relevant physical, biological, and socioeconomic conditions within the target islands and specific to the project sites.
- *Anticipated Environmental Impacts and Mitigation Measures*: Provides an assessment of the associated environmental impacts and corresponding mitigation measures. The environmental impacts and mitigation measures including the environmental monitoring are summarized in the environmental management plan and environmental monitoring plan.
- *Analysis of Alternatives*: Examines the alternatives to proposed project sites to ensure avoidance of significant adverse environmental impacts.
- *Consultation and Information Disclosure*: Describes the process of engaging stakeholders and information disclosure. This section summarizes the comments and concerns of affected persons.
- *Grievance Redress Mechanism*: This section describes the grievance redress framework and setting out the timeframe and mechanisms for resolving potential complaints and/or issues from affected persons.
- *Environmental Management Plan*: Describes the set of mitigation and management measures to be taken for each identified environmental impact during project design, construction, and operation. This section also includes monitoring and reporting procedure as well as institutional implementation arrangements.
- *Conclusion and Recommendation.*

2. ADMINISTRATIVE, POLICY AND LEGAL FRAMEWORK

2.1 Administrative Framework

10. **Executing and implementing agencies**: The Ministry of Finance and Economic Management (MFEM) is the executing agency (EA) and will be responsible for the overall environmental management of the project including implementation of mitigation measures, environmental reporting and obtaining necessary approvals. MFEM will submit environmental reports to the ADB. TAU and the REDD are the project IAs. A Project Steering Group (PSG) has been established for the CIRESP which is comprised of representatives of ADB, REDD, Office of Prime Minister (OPM), MFEM, TAU, The Cook Islands Investment Corporation (CIIC) and New Zealand High Commission. A Project Management Unit (PMU) has also been established.

11. **Environmental agencies**: The NES or Tu'anga Taporoporo is the principle national environmental agency in the Cook Islands. The role of NES is to protect the environment (including people, communities, land, water, and native species), promote sustainable development, and prevent and control pollution. The Advisory and Compliance Division of the NES is responsible for administering the *Environmental Act 2003* including receiving and assessing environmental impact assessments and issuing permits for development. The subproject Island Environmental Authority's (IEAs) are the determining authority's for permit applications on the subproject islands.

12. **Other agencies**: CIIC provides support to the IAs in project implementation and will be the owner of the assets generated by the project. Importantly for the project the CIIC will be responsible for acquiring land on the subproject sites in accordance with the *Cook Islands Act 1915*.

13. The Ministry of Transport – The Energy Division is responsible for administering the *Energy Regulations 2006* which govern the licensing, technical and safety requirements for power generation, distribution and consumer premise wiring. The project will result in changes to the generation and distribution (except Atiu) of electricity on the subproject islands and will require good coordination with the Energy Division.

14. The Ministry of Infrastructure and Planning is responsible for implementing the Cook Islands National Building Code. It also regulates construction of building and the issuance of building permits. The construction of the project will require consultation with this ministry.

15. **ADB**: As project financing agency ADB will be responsible for approval of project documents. In respect of safeguards, this includes approval of the IEE, and making sure that there are sufficient loan agreements and requirements in the Project Administration Manual covering updating of the IEE, integration of the EMP into bid and contract documents, monitoring undertaken and reported, and disclosure of environmental monitoring reports.

2.2 Legal and Policy Framework

16. The implementation of the Project will be governed by the environmental laws and regulations of the Cook Islands and the safeguard polices of the ADB.

2.2.1 Cook Islands' Environmental Laws and Regulations

17. ***Environment Act 2003***: The *Environment Act 2003* was established to provide for the protection, conservation, and management of the environment in a sustainable manner. It

provides for the establishment of both the NES and the IEAs and establishes their roles and functions.

18. Under the Part 5 of the Act *any activity which is likely to cause significant environmental impacts* shall require a permit issued by the permitting authority and that application for a permit *shall be submitted to the National Environment Service (NES) and include an environmental impact assessment*. Part 5 of the Act also outlines the information expected in the environmental impact assessment, public consultation and the process for the determining the permit application and the appeal of decisions.

2.2.2 Environmental Assessment Process in Cook Islands

19. The environmental assessment process in the Cook Islands includes the following steps:

(i) *Environmental Significance Declaration (ESD):* Any building or development that may have a significant effect on the environment or that is in a specific area of concern is required to submit an ESD to the NES. The ESD is assessed by the NES and Island Environmental Officer (IEO) to determine whether the project can be approved based on the ESD or will require an Engineering report and/or EIA. It is usual for the applicant to have a site meeting with the IEO to discuss the project.

(ii) *EIA Terms of Reference:* Where an EIA is required the NES will notify the applicant in writing and prepare Terms of Reference for the EIA that outlines the information to be provided in the EIA and the key areas of concern.

(iii) *Preparation of the EIA:* The applicant must engage a qualified environmental consultant (register maintained by the NES) to prepare the EIA.

(iv) *Public consultation:* The completed EIA is submitted to the NES who make the EIA publically available for a period of 30 days. Anyone may make a written submission for or against the EIA during the consultation period. All submissions are provided to the applicant who, if necessary, responds by amending the EIA.

(v) *NES assessment:* The NES assesses the amended EIA and public submissions and prepares a Memorandum or Information Paper that includes the NES recommendation as to whether the EIA should be approved.

(vi) *EIA approval:* The Memorandum or Information Paper is submitted to the IEA who determine whether the EIA is approved, deferred (the applicant must submit modifications) or refused.

2.2.3 Cook Islands Environmental and Energy Policy

20. **The National Sustainable Development Plan 2011 to 2015**: The National Sustainable Development Plan was developed as a pathway for sustainable development in the Cook Islands. The plan contains two priority areas of particular relevance to the project: Priority Area 3: Energy Security and Priority Area 6 Ecological Sustainability.

- Priority Area 3: Energy Security sets out the goal of *renewable energy for energy security to enhance our economic and social development and environmental integrity.* It outlines key objectives to establish secure and reliable energy services and to foster investment in renewable energy development.

- Priority Area 6: Ecological Sustainability establishes a goal of a *Cook Islands where we sustain our ecosystems and use natural resources efficiently.* It documents key objectives and measures to achieve these objectives including improving the sustainable use of land and better protecting native ecosystems.

21. **Cook Islands Renewable Energy Chart (CIREC)**: The CIREC sets out the Government of the Cook Islands goal of transforming the energy sector from one based on imported fossil fuels to an independent, vibrant sector dominated by the efficient use of renewable energy. From an original baseline where all electricity was generated from fossil fuels (diesel), this chart sets a target of 100% of islands to be powered by renewable energy by 2020 (and 50% by 2015). The principles behind the chart are to; protect the environment by meeting climate change obligations and using environmentally friendly technologies, improve energy security by improving energy independence and reliability and increase economic growth by improving energy affordability and promoting a clean green image. The CIREC is backed by the CIREC Implementation Plan which sets out the means of achieving the CIREC goals. Substantial progress towards meeting the policy has been achieved already, with 6 of 12 inhabited islands (the Northern Group) having renewable electricity generation systems installed and operating in 2014/15. The next stage of implementation is planned for the Southern Group which is to be addressed through the Project.

22. Besides these laws and regulations, the Government of the Cook Islands is in the process of formulating the Environment (Permits & Consents) Regulation, which is yet to be approved by the Cabinet.

2.2.4 ADB's Environmental Safeguard Requirements

23. This environmental assessment is carried out in compliance with safeguard requirement 1 of ADB's SPS so as to ensure that potential adverse environmental impacts are identified and avoided, and where impacts cannot be avoided, a suitable plan is prepared for them to be mitigated and managed.

24. The SPS has the objectives to (i) avoid adverse impacts of projects on the environment and affected people; (ii) where possible; minimize, mitigate, and/or compensate for adverse project impacts on the environment and affected people when avoidance is not possible; and (iii) help borrowers/clients to strengthen their safeguard systems and develop the capacity to manage environmental and social risks. To help achieve the desired outcomes, ADB adopts eleven policy principles for guiding the assessment of projects that trigger environmental risks and impacts.

25. ADB categorizes projects into categories A, B, C, and FI according to the significance of likely impacts. Project categorization is carried out using a rapid environmental assessment checklist. A rapid environmental assessment (REA) checklist was completed for the three subprojects considered as part of the PPTA and a separate REA has been prepared for Atiu. The Project was classified as a category B. Category B projects are judged to have some adverse impacts, but of lesser degree and/or significance than category A, the impacts are site-specific and can be managed or mitigated to satisfactory levels. Category B projects require an initial environmental examination (IEE), the assessment concludes whether or not there will likely be significant environmental impacts warranting an EIA. If an EIA is not needed, the IEE is regarded as the final environmental assessment report. Accordingly, this assessment also constitutes an IEE and meets the requirements of the SPS.

3. DESCRIPTION OF THE PROJECT

3.1 Project Location

26. The subprojects will be located in Rarotonga (Figure 1.1). The subproject site is located at the Rarotonga Airport in Avarua District adjacent to the existing solar array just to the south west of the terminal building. The existing airport solar PV array site is approximately 1.4 Ha however, the area required for the BESS is less than 0.02 Ha. The second stage additional battery storage system (R-ESS-2) is to be sited at two other locations; (i) inland side of the airport; and (ii) at the existing TAU power station site. All land is owned by the Government of the Cook Islands and leased to TAU.

3.2 Project Scope

27. The project will install a 1MW BESS with additional 3 MWh battery storage system on Rarotonga. Installation of a 1 MW/4 MWh BESS co-located at the site of the Rarotonga Airport solar PV array; the BESS subproject is at the tendering stage now. An additional 1 MW / 4 MWh energy storage at the existing TAU power station, and 2 MW / 8 MWh energy storage will be installed at the airport site.

28. The second stage additional energy storage subproject (R-ESS-2) will have 2 components which are both inside-the-fence on developed sites:

(i) 1 MW / 4 MWh for grid stability, to be installed at the diesel power station; and

(ii) 2 MW / 8 MWh for load shifting capability, to be installed at the airport.

29. This additional storage capacity will enable an additional 6 MW of solar PV capacity to be connected to the grid, after which electricity supply on Rarotonga will be approximately 50% renewable energy. Based on the analysis of alternatives conducted for this study, battery storage is expected to be the preferred solution for this subproject, but the specific type of battery system is not being proposed at this point due to rapid evolution in various technologies with declining costs. The proposed design and detailed specifications including technology selection will be finalized going forward.

3.3 Project Construction, Operation and Decommissioning

30. The follow provides a general description of the proposed construction, operation and decommissioning of all subprojects.

31. ***Construction*****:** Construction of the BESS and R-ESS-2 on Rarotonga will include installation of containerised units (likely four 40ft ISO shipping containers), connection to the electricity grid and commissioning.

32. ***Operation:*** The Rarotonga subproject will install a BESS into the Rarotonga grid enabling more renewable energy generation to be installed and better utilising it once installed. Installing renewable energy generation in to the Rarotonga grid enables reduction in use of the diesel power station.

33. ***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 and solar PV modules, batteries, inverters and other electronics and metal will be collected for recycling in the Cook Islands (where facilities exist) or in Australia and/or New Zealand.

3.4 Project Benefits and Justification

34. The implementation of the Rarotonga energy storage subprojects will result in the displacement of diesel generation by enabling greater solar PV output and utilization in two stages. The 1 MW BESS will result in approximately 4.05 GWh of diesel generated electricity per year which equates to a reduction in annual diesel usage of approximately 1.26 million litres, with avoided emissions of approximately 2,793 tons of carbon dioxide equivalents per year (tCO_2e/y)[4]. The R-ESS-2 subproject will displace an estimated 7.8 GWh per year, reducing diesel consumption by about 1.5 million litres per year, with avoided emissions of about 6,370 tCO_2e/y.

35. In addition, a key element of the Project will be capacity building including training of local power stations operators in the operation and maintenance of solar-diesel hybrid energy systems. The Project will also have a positive contribution by reducing emissions (including CO_2) from running of existing diesel generators; a reduction in noise from diesel generator operation and a reduction in land and ground water contaminations caused by spill of oil from diesel generator sets. Overall, at a local level, the project will improve socio-economic conditions of the local communities and at a national level will help improve the national gross domestic product (GDP).

4. DESCRIPTION OF THE ENVIRONMENT (BASELINE)

4.1 Physical Environment

4.1.1 Physiography

36. The Cook Islands is a Pacific island country comprising 15 islands scattered between Tonga to the west and New Zealand to the northeast. The islands are located between 8.0 and 23.0 south latitude and 156.0 and 167.0 west longitude and are geographically divided into two groups, commonly referred to as the Northern and Southern Group islands. The Northern Group consists of six low-lying, sparsely populated, coral atolls, while the Southern Group consists of nine raised atolls and volcanic islands.

37. The subproject islands are all volcanic islands that that have central volcanic hills surrounded by makatea (coralline limestone). This structure has resulted from the subsidence of the volcanic hills followed by uplift forming the raised makatea. Rarotonga is the largest of the Cook Islands with a land area of 67.05 km^2. It is a volcanic island and remnants of the original volcano can be seen in the steep interior landscape. The tallest peak, Te Manga, rises to 658 m above sea level. The sub project site is located on an existing hardstand.

4.1.2 Climate

38. The climate of the Cook Islands is sub-tropical and tropical oceanic, moderated by trade winds. It has two distinct seasons. The average rainfall is between 2,000 and 3,000 mm per year. The mean annual temperature is 24^0C with little seasonal variation. Temperatures ranges between 18ºC and 28ºC in the southern winter, which is May to October, and between 21ºC and

[4] http://www.epa.gov/cleanenergy/energy-resources/calculator.html

29ºC in the summer, which spans from November to April. The wet season is normally January to early May.

39. Seasonal temperatures differ between the northern and southern Cook Islands. The Northern Cook Islands' position so close to the equator results in fairly constant temperatures throughout the year, while in the Southern Cook Islands, temperatures cool during the southern winter. Changes in temperatures are strongly tied to changes in the surrounding ocean temperature. The annual average temperature at Penrhyn in the Northern Group is 28°C and at Rarotonga in the Southern Group is 24.5°C.

40. Rainfall in the Cook Islands is strongly influenced by the South Pacific Convergence Zone. This band of heavy rainfall is caused by air rising over warm waters where winds converge, resulting in thunderstorm activity. It extends across the South Pacific Ocean from the Solomon Islands to east of the Cook Islands. It is centred close to or over the Southern Group from November to May. From November to March, the South Pacific Convergence Zone is wide and strong enough for the Northern Group to also receive significant rainfall. The driest months of the year in the Cook Islands are from June to October.

41. The Cook Islands' climate varies considerably from year to year due to the El Niño-Southern Oscillation. This is a natural climate pattern that occurs across the tropical Pacific Ocean and affects weather around the world. There are two extreme phases of the El Niño-Southern Oscillation: El Niño and La Niña. There is also a neutral phase. The El Niño-Southern Oscillation has opposite effects on the Northern and Southern Groups. In Rarotonga, in the south El Niño events tend to bring drier and cooler conditions than normal, while in the north, El Niño usually brings wetter conditions. Ocean temperatures are warmer in the north during an El Niño event and consequently air temperatures also warm.

42. Tropical cyclones affect the Cook Islands between November and April. In the 41-year period between 1969 and 2010, 47 tropical cyclones passed within 400 km of Rarotonga, an average of just over one cyclone per season. The number of cyclones varies widely from year to year, with none in some seasons but up to six in others. Over the period 1969 to 2010, cyclones occurred more frequently in El Niño years.

4.1.3 Water Resources

43. The water resources of the islands consist of rainwater (collected from roofs and stored in tanks), groundwater (fresh and brackish), surface water lakes (brackish) and swamps (fresh and brackish). Many of the community buildings have rainwater collection systems and there are also some at private houses.

4.2 Biological Environment

4.2.1 Ecology

44. The Cook Islands' flora and fauna is limited in diversity. The estimated plant and animal biodiversity is about 7,000 species, divided almost equally between marine and terrestrial species. There are few terrestrial endemic species. The vegetation of subproject islands is sharply divided, dependent on substrate of either volcanic hills or makatea. The volcanic hills have been intensively cultivated and little native vegetation remains. The 'Au (*Hibiscus tiliaceus*) and Toa (*Casuarina equisetifolia*) are the only native tree species which remain common. On makatea the vegetation is less disturbed and becomes more diverse away from the coast. The makatea vegetation is similar across all islands and contains many native species. At the

junction of the makatae and volcanic hill substrates wet, marshy areas often occur. These have been almost entirely used for wetland taro cultivation.

45. The fauna of the Cook Islands is generally common in the region and few species are considered threatened. There are eight species of range restricted birds of which two the Atiu swiftlet (*Aerodramus sawtelli*) and Mangaia kingfisher (*Todiramphus ruficollaris*) are endemic to those islands. Both these species are listed as Vulnerable on the IUCN Red List.

46. None of the subproject sites are located within or near any conservation areas and there is no vegetation clearance required at either site.

4.3 Socio-Economic Environment

4.3.1 Demography

47. The population of the Cook Islands is approximately 17,794 people (Census 2011, as enumerated on 1 December 2011) consisting of 8,815 men and 8,979 women. The 2011 census reflects a decrease of 1,315 people compared to the 2006 Census (19,342). There has been a declining population trend since the early 70's, with the population declining quite dramatically, between 1971 and 1976, as a result of the opening of the Rarotonga International Airport in 1974, when many people took the opportunity to migrate to New Zealand.

48. The distribution of the total population varied considerably by region. About 74% (13,095) lived in Rarotonga, 20% (3,586) lived in the Southern Group islands, and 6% (1,113) in the Northern Group islands. The population density varied widely by island. While there were about 347 people per square kilometre in Pukapuka, in Mitiaro Island, there are only eight people per square kilometre. The population density of Rarotonga was 195 people per square kilometre. The average household size is four persons per household. Table 4.1 presents the demographic features of each subproject island.

Table 4.1: Subproject Demographic Features

Feature		
	Cook Islands	**Rarotonga**
Area (km^2)	236.7	67.2
Population	17,794	13,095
Male	8,815	6,460
Female	8,979	6,635
Pop. density (person/km^2)	75.18	194.86
Sex ratio	1.02	1.03

49. Cook Island Maori made up the bulk of the resident population with 12,930 persons (84%), 1,045 persons (7%) were part Cook Island Maori, and 1,349 persons (9%) were of foreign descent. The largest single group of foreigners were New Zealand European (458 people) and Australian (311).

50. The Cook Islands Christian Church (CICC) continues to be the dominant religious denomination of the resident population; however, affiliation with this church has declined

from 55% in 2001 to 53%. The next largest group is the Roman Catholic Church with 2,599 members (17%), followed by the Seventh Day Adventist Church (SDA) with 1,154 members (8%). All other religious denominations account for 6% of the resident population and people with no religion comprised of 4% of the resident population.

4.3.2 Economy and Infrastructure

51. Tourism is vital to the Cook Islands economy and is estimated to account for around 60% of GDP, with tourist arrivals ranging from 100,000-120,000 each year. The Cook Island's economic prospects are largely reliant on its capacity to grow and continually improve its tourism product. Tourism is currently is focused on Rarotonga and Aitutaki.

52. The per capita Gross Domestic Product (GDP) of Cook Islands at current price is NZD 17,799 (Cook Islands Statistics Office, 2011/2012). GDP per capita is high compared to other economies in the region.

53. Subproject economic and labour data are presented in Table 4.2.

Table 4.2: Subproject Economic Activities

Feature		
	Cook Islands	**Rarotonga**
Average annual Household income (NZ$)	15,028	17,695
Employed population	6,938	5,411
Economically active pop.	7,554	5,774

4.3.3 Land Use

54. **Rarotonga**: The BESS and one R-ESS-2 subproject site contains the airport solar PV array owned and operated by TAU. This subproject site is surrounded by the Rarotonga Airport. The second R-ESS-2 site is inland directly from the airport and on the existing TAU power station, both sites leased by TAU from the Government of the Cook Islands.

4.3.4 Land Ownership

55. The subproject site for the BESS is owned by the Government of the Cook Islands and is managed by the Airport Authority. TAU has leased the subproject site from the Airport Authority. For the R-ESS-2, two sites have been identified by TAU leased from the Government of the Cook Islands. However, as both the Airport Authority and TAU are administered and managed by CIIC all parties to the leases are bodies of the national government.

4.3.5 Cultural and Heritage

56. The subproject sites on Rarotonga are previously disturbed and there is no potential to disturb sites of cultural or heritage significance. Letters were received from each subproject island confirming that there are no marae or historical sites associated with the project sites.

5. ENVIRONMENTAL IMPACTS AND MITIGATION MEAURES

5.1 Impacts and Mitigation Measures Included in Design and/or Pre-construction

5.1.1 Physical Environment

57. **Climate Change Adaptation**: A climate risk profile for Cook Islands indicates that the main impacts of climate change are expected to be high sea levels, extreme winds, and extreme high air and water temperatures. Best estimates of long-term, systematic changes in the average climate for Cook Islands indicate that sea level is likely to have increased by 4 to 15 cm and the frequency of severe short sea level rise resulting from storm surge (2.2 m above mean sea level) will increase from a one in 580-year event to a one in 5-year event by 2050.

58. Although Rarotonga is located relatively close to the coast it is not located in a mapped coastal hazard zone. 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). Components will meet international standards (*e.g. IEC 61730 Photovoltaic (PV) module safety qualification*). The subprojects have been designed to withstand extreme winds (e.g. cyclones) and temperatures.

59. The subprojects on Rarotonga do not include the installation of new diesel generators or any other sources of significant noise or air emissions.

5.1.2 Biological Environment

60. There is no vegetation clearance required at the battery storage sites. All sites are readily accessible via existing roads and tracks and will not require the clearing of additional vegetation.

5.1.3 Social Environment

5.2 Impacts and Mitigation Measures Due to Construction Activities

5.2.1 Physical Environment

61. **Air Quality and Dust**: The construction of the subprojects has the potential to generate excessive dust through construction activities such as earth moving, by the movement of vehicles and machinery and by exposed soil on the cleared sites or in soil stockpiles. Implementation of good practice construction measures will reduce the impacts to air quality.

62. Mitigation measures include:

- Vehicles carrying soil, sand, crushed aggregate or other fine materials to or from the project site will be covered.
- The project site, material stockpiles and access roads, including those from the wharf, and material stockpile areas, will be wetted or stabilised if dust is generated.

- Earth moving equipment will be cleaned prior to leaving site to prevent the tracking of soil on nearby roads.

63. **Waste Management**: Management of waste during construction of the subprojects is important to prevent pollution of surrounding water 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.

64. Mitigation measures include:

- Vegetation cleared from the subproject sites will be disposed of in consultation with the POE and IEO (e.g. chipped and made available to local residents as mulch). A significant amount of vegetation will be required to be disposed of on Atiu and options are being investigated to determine an environmentally appropriate solution.
- The construction contractor will consult with the POE and IEO to identify opportunities to avoid and reduce the generation of waste and to recycle or re-use waste generated.
- Construction wastes that cannot be re-used or recycled on the subproject island will be transported off site for reuse, recycling or disposal.
- 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.

65. **Noise and Vibration**: The construction of the subprojects will generate noise through the operation of machinery on the site and movement of vehicle and machinery transporting equipment and materials to site. Construction noise impacts will be sporadic and are expected to be minor. Implementation of good practice construction measures will reduce noise impacts.

66. Mitigation measures will include:

- Wherever possible working hours will be between 8am and 5pm Monday to Friday. Where safety or technical reasons require work to be completed outside of these hours, noise levels will be kept to a minimum and the Island Council together with nearby residents will be informed.
- Noise generating activities e.g. site clearance will be carried out in the least sensitive time periods to be determined in consultation with the Island Council.
- 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.

67. **Water Resources and Quality**: The construction of the subprojects has the potential to interfere with local water resources (ground or surface water) through inappropriate abstraction for construction, alteration of surface water flow across the site leading to sedimentation of adjacent environments (refer Erosion Control below) and pollution of water resources through accidental spillage of hazardous materials (refer Hazardous Materials below)

68. Mitigation measures will include:

- Where feasible construction techniques will be specified that minimise the need to alter the topography (e.g. piling) and hence surface water drainage on the site.

- Water required for construction (e.g. concrete mixing) will be sourced with the agreement of the Island Council, IEO and POE.

69. **Hazards materials**: Hazardous materials will be required for the construction of the subproject. Hazardous materials (e.g. fuels and oils) will be appropriately managed during construction to prevent pollution of surrounding land and water.

70. Mitigation measures will include:

- Contractor(s) will prepare a hazardous materials management plan that shall, at a minimum, include:
    - The type and quantity of hazardous materials the 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 done by an appropriately experienced and equipped contractor.
- 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.
- 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 the site and on vehicles carrying hazardous materials.
- Hazardous materials will not be disposed of on the subproject island but will be transported offsite and disposed of at a facility approved by the NES.

71. **Erosion Control**: Erosion has the potential to occur when the sites have been cleared of vegetation but have not yet been stabilized or from stockpiles of materials. In particular, Atiu is susceptible to erosion due to its soil type and sloping topography. Erosion can lead to instability of the project site and surrounds causing damage to vegetation and sedimentation of surrounding streams and lakes.

72. Mitigation measures will include:

- All land disturbances will be confined to the minimum practicable working area to ensure that the minimum land area is exposed to erosion for the shortest possible time.
- Existing drainage lines will be protected and diversion of drainage lines avoided.
- Surface water will be diverted around the construction footprint using structures such as catch drains, silt fences or bunds. Surface water will not be diverted across erosion prone slopes.
- 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
    - erosion control measures closely follow land contours to reduce runoff velocity from exposed soils.

- 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 basis will be installed where required.
- The site will be covered with geotextile fabric immediately after clearing to prevent the loss of top soil (Atiu and if deemed necessary by the POE and Island Environmental Officer for remaining subprojects).
- A shade tolerant low groundcover (e.g. grass) will be established across the site as soon as practicable after site clearance. The species of groundcover used will be selected in consultation with the IEO and will not shade the PV modules.
- 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.
- 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.

5.2.2 Social Environment

73. **Social**: Social impacts during construction of the project may include increased work opportunities for local contractors, increase in traffic, including heavy haulage at wharfs and on roads and health and safety risks to contractors, power station operators and the general public. The subprojects are likely to require foreign contractors and technical specialists for the duration of construction (six to eight weeks) which can lead to conflict between foreign workers and local communities.

74. Mitigation measures will include:

- A list of relevant local contractors available on each subproject island will be provided in tender documentation to facilitate the engagement of local industry by the selected construction contractor.
- Opportunities will be made available by the contractor for local contractors and businesses to be engaged during construction and commissioning of the power station.
- As far as is practicable works will be timed to avoid disruption to local events.
- Fencing shall be installed on all areas of excavation greater than 1m deep whether temporary or permanent.
- The contractor(s) will be required to develop an occupational health and safety plan prior to the commencement of any works on site.
- Workers shall be provided (before they start work) with appropriate personnel protective equipment (PPE).
- Adequate sanitation and potable water will be supplied by the contractor.
- A Grievance Redress Mechanism (GRM) (refer Section 8) will be established prior to the commencement of construction works.

75. **Cultural and Heritage Resources**: No marae or historical sites or artefacts are known to be associated with any of the subproject sites. Nonetheless, in the unlikely event of an

artefact being uncovered during construction work will cease immediately and the Island Council and POE notified. Work will not recommence until authorised by the POE.

5.3 Impacts and Mitigation Measures from Operation

5.3.1 Physical Environment

76. **Waste and Hazardous Materials**: the operation of the subprojects will generate waste, including hazardous waste (e.g. inverters and batteries will require replacement after approximately 10 years), which must be appropriately managed to prevent contamination of surrounding land and water.

77. Mitigation measures will include:

- Inverters and batteries that have been replaced during the operating lifetime of the power station will be removed, transported and disposed of by an appropriately experienced and equipped contractor.
- Where possible batteries and inverters will be recycled. If recycling is not possible they will be disposal will be at a facility approved by the NES.
- Waste oil and other hydrocarbons from generators will be stored in a bunded hydrocarbon storage area.
- No hazardous waste (e.g. used oils, batteries or inverters) will be disposed of on the subproject Island (except Rarotonga). Waste will be sent for disposal at regular intervals and not allowed to accumulate at the power station.
- All infrastructure containing hazardous materials (e.g. batteries, transformers, generators) will be inspected regularly to ensure it is functioning correctly and no hazardous materials are being discharged.
- Screening vegetation will be established between the PV array and the road to minimise dust from the road settling on the panels.

78. **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 Island Council and IEO.

79. **Erosion Control**: If localised erosion is detected during operation of the subproject 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.

5.3.2 Biological Environment

80. No significant impacts to the biological environment are anticipated.

5.3.3 Social Environment

81. Training will be provided for power station employees in the operation and maintenance of the new battery systems.

82. The POE 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.

5.4 Impacts and Mitigation due to Decommissioning

83. The BESS installed on Rarotonga an additional battery storage system proposed for phase 3 are expected to have an economic life of between 10 and 20 years dependent on the battery type selected. All equipment will be removed from the subproject sites (e.g. PV modules, batteries, invertors) and will be reused or recycled where possible. Equipment that cannot be reused or recycled will disposed of at a facility approved by the NES.

84. The decommissioning contractor will be required to develop a hazardous materials management plan prior to the commencement of any works on site. If the site is not reused it will be replanted with species appropriate to the future land use of the site.

6. ANALYSIS OF ALTERNATIVES

85. An assessment of alternatives was completed with and without the proposed project. The results of the assessment found that Rarotonga would continue to pay a high price for diesel imports for electricity generation which affects the economic development of the island and the Cook Islands as a whole. Further, reliance on diesel imports risks security of supply, and price spikes or transport delays can significantly affect the local economy. Implementation of the project will bring positive economic, social, and environmental benefits. Economic benefits will be from the reduction in import of diesel for power generation, and increased security of supply. Social benefits include a sustainable electricity supply to the consumers and environmental benefits will be from reduction in emissions and reduced transport and storage of hazardous fuels.

86. Alternative storage systems were assessed and battery storage was considered the optimal (refer feasibility study). Alternative sites were considered however, the selected subproject sites were considered the most suitable sites froma technical, and social impact perspective.

7. CONSULTATION AND INFORMATION DISCLOSURE

7.1 Stakeholders and Community Consultations

87. Stakeholder consultations were carried out by holding meetings at offices of the respective agencies in Rarotonga. Personal discussion, focus group discussions and questionnaire surveys were used for community/public consultations.

88. In total eight stakeholder meetings involving 31 officials from various agencies, i.e., the REDD, TAU, NES, Island Environment Authorities, Statistics and Economics, Utilities from targeted islands, women groups, etc., were consulted during the fact-finding visits.

89. The consultations included both discussions with stakeholders and discussions with community/island level authorities including project affected people, landowners and women groups. Consultation will continue at next stages, i.e., after finalization of detailed design and before start of the civil works construction, as well as at implementation stage.

90. Recommendations and suggestions from stakeholders and the public were incorporated in the design of the project and in the project IEE and EMP.

7.2 Information Disclosure

91. All environmental documents are subject to public disclosure, and therefore will be made available to the public. The IEE will be disclosed on ADB's website upon receipt as per ADB's Public Communications Policy (PCP) 2011.

92. The EMP includes a grievance redress mechanism (GRM) so that any concerns raised during construction or operation of the subprojects can be addressed.

8. GRIEVANCE REDRESS MECHANISM

93. A Grievance Redress Mechanism (GRM) is proposed for the project to receive and facilitate the resolution of affected peoples' concerns, complaints, and grievances about the project's environmental and social safeguards performance. When and where the need arises, this mechanism will be used for addressing any complaints that may arise during the construction and operation of the project. The grievance mechanism is scaled to the risks and adverse impacts of the project. It addresses 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 at no costs and without retribution. The mechanism does not impede access to the Cook Islands' judicial or administrative remedies. EA through IAs will appropriately inform the affected people about the mechanism before commencement of any works.

8.1 Proposed GRM Mechanism

94. The key functions of the GRM are to: (i) record, categorize and prioritize the grievances; (ii) resolve the grievances in consultation with complainant(s) and other stakeholders; (iii) inform the aggrieved parties about the solutions; and (iv) forward unresolved cases to higher authorities for resolution.

95. The PMU, supported by PMU staff and consultants, will be the grievance focal point to receive, record, review, and address project related concerns in coordination with government authorities. Affected persons (APs) have been and will be made fully aware of their rights during consultations about land requirements. APs and other stakeholders are all familiar with the REDD office, and the PMU will likely be located in the REDD office once established.

96. Any complaint will be recorded and investigated by the PMU working with relevant staff of the individual subproject. The PMU will inform or update the relevant IA immediately of any complaints. A complaints register will be maintained that will record the date, details, and nature of each complaint, who makes the complaint, and the date and actions taken as a result of the resulting investigation. The register will also cross reference any non-compliance report and/or corrective action report or other relevant documentation.

97. When subproject implementation starts, a sign will be erected at all sites providing the public with updated project information and summarizing the grievance redress mechanism process including contact details of relevant persons at the PMU. All corrective actions and complaint responses carried out on site will be reported back to the

PMU. The PMU will include the complaints register and corrective actions/responses in its progress reports to the ADB.

98. In the GRM process, relevant Cook Islands national agencies will always be available to review public complaints and advice on the PMU's performance for grievance redress.

99. Any APs, village chiefs, or elected officials can take a grievance to the PMU or to the site office. On receipt of a complaint in any form (in person, telephone, written), the PMU focal officer for the respective site or subproject will log the details in a complaints register. PMU will review and find a solution to the problem within two weeks in consultation with village or traditional chief and relevant local agencies. Then PMU will report back the outcome of the review to the village/traditional chief and affected persons within a week's time. If the complainant is dissatisfied with the outcome at the PMU level or has received no advice in the allotted time period, he or she can take the grievance through the Island Council to relevant national agencies (CICC, REDD, etc.). The relevant national agency then reviews and reports back to the Island Council/AP/village or traditional chief about the outcome. If unresolved, or at any time complainants is not satisfied, the complainant can take the matter to the appropriate court. Both successfully addressed complaints and non-responsive issues will be reported to the ADB by the PMU.

100. Table 8.1 presents the steps and corresponding time frame for proposed grievance redress mechanism.

Table 8.1: Grievance Redress Process

Stage	Process	Duration
1	Affected Person (AP), island elected or traditional chief, or other concerned party takes grievance to PMU.	Any time
2	PMU reviews and finds solution to the problem in consultation with island elected or traditional chief and relevant agencies.	2 weeks
3	PMU reports back an outcome to people who submitted the grievance.	1 week
If unresolved or not satisfied with the outcome at PMU level		
4	Concerned party takes grievance through Island Council to relevant national agency (CIIC, REED, etc.).	Within 2 weeks of receipt of decision in step 3
5	National agency reviews and finds a solution which may include recommendation of dispute resolution, including an appropriate body to oversee'.	4 weeks
6	National agency reports back to the people who made the complaint.	1 week
If unresolved or at any stage if AP is not satisfied		
Concerned party can take the matter to appropriate court.		As per judicial system

9. ENVIRONMENTAL MANAGEMENT PLAN

9.1 Introduction

101. This EMP is intended to cover all phases of the subproject implementation including design, construction, commissioning, operation and decommissioning. The EMP complies with ADBs 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
    - Costs associated with implementation of the mitigation measure
    - 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
    - Costs associated with monitoring
    - Responsibility for implementing and supervising monitoring.

9.2 Mitigation Measures

102. 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 the Cook Islands *Environment Act 2003* and ADB safeguard standards.

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

- The EMP will be included in tender documentation
- The contractor(s) shall prepare a construction EMP (CEMP) describing the subproject and site specific measures that will be implemented to comply with the EMP
- The contractor(s) will submit its CEMP to the POE and IA for approval prior to the commencement of construction.
- The POE will ensure there are sufficient resources to oversee the implementation of the EMP at all subproject sites
- The EMP and GRM will be disclosed to the public in accordance with the Section 7 of this EMP.

104. An environmental management plan describing the potential impacts and proposed mitigation measures and responsible agency has been prepared in a matrix form and presented in Table 9.1.

9.3 Implementation Arrangements and Responsibilities

105. **Implementation of the EMP**: MFEM as the EA has overall responsibility for all aspects of the project. TAU and REDD as the IAs will be responsible for the overall implementation of the project. The PMU and PSC have been set up to support the implementation of the project. REDD will be responsible for ensuring the EMP is implemented for each of the four subprojects and at for stages of development. This includes ensuring compliance with all Government of the Cook Islands and ADB safeguard requirements. The NES and IEOs will also be involved in environmental management activities.

106. Whilst the ultimate responsibility for the subproject implementation resides with REDD, the PMU (with support from the POE) will be responsible for the day to day implementation of the EMP during the design, construction and commissioning phases of the subprojects.

107. **MFEM Environmental Responsibilities**: MFEM as the EA, with support from the POE International Environmental Expert (IEE), will be responsible for submitting environmental documentation to the NES as required under the *Environmental Act 2003* and ensuring that the environmental management and monitoring budgets are available and utilized as necessary for timely implementation of EMP.

108. **REDD and PMU (POE) Environmental Responsibilities**: The PMU, predominately via the POE IEE and National Environmental Expert (NEE), will support REDD in the following:

- Preparation of tender documents including integration of the approved EMP and support REDD in tender evaluation with respect to contractors' environmental management capability and proposed CEMP provisions.
- Prepare Environmental Significance Declarations (ESD) and Environmental Impact Assessments (EIAs) in accordance with the *Environment Act 2003* and the subproject specific terms for reference prepared by the NES to obtain project consent.
- Ensure REDD and Contractors are aware of any consent conditions and the implications for the implementation of the subprojects.
- Review and approve selected Contractor(s) subproject specific CEMP, Emergency Plan and Health and Safety Plan.
- Ensure pre-construction environmental mitigation measures are incorporated into the project design.
- Supervise the on ground implementation of the EMP at all subproject sites including monitoring of compliance with the approved CEMP.
- Work with the project International Social Specialist to ensure the GRM is implemented.
- Provide training to IA and contractor staff on managing the environmental issued associated with project.
- Review of contractors monthly reports on safeguard application.
- Include results of contractors monthly reporting and POE audits and checks in quarterly progress reports.
- Prepare semi-annual safeguards monitoring reports to be submitted to EA, PSC, NES, and ADB. All safeguards monitoring reports will be disclosed as per ADB policies.

109. **Contractor Environmental Responsibilities**: The contractor will be required to have one staff with experience in environmental management. This staff will be responsible for preparing plans such as emergency preparedness plan; occupational health and safety plan, and energy day-to-day implementation of EMP. Contractors will report on construction progress on a monthly basis. The monthly reports will include a section on implementation of the EMP and other Health and Safety provisions as required.

9.4 Monitoring and Reporting

110. **Monitoring**: Environmental monitoring will be carried out through all phases of the subproject development to ensure that the environmental mitigation measures are effective and that actual environmental impacts accord with predicted impacts and are in compliance with the Environment Act 2003 and ADB safeguard standards.

111. The POE will ensure appropriate monitoring is undertaken during construction in accordance with subproject progress.

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

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

114. **Reporting**: In consultation with EA and ADB, the IA will establish a system for preparing quarterly reports on safeguards performance monitoring, issues resolution, and corrective action plans. The quarterly report will include a summary of the contractors monthly report and monitoring undertaken by the IA including the POE.

115. The EA will submit biannual environmental monitoring reports on EMP implementation for ADB's review.

116. Contractors will prepare monthly reports which will describe the implementation of the CEMP including any non-compliances and corrective actions. The report will be submitted to the IA and reviewed and approved by the POE.

Table 9.1: Environmental Management Plan

Project activity/ stage	Potential impact	Proposed mitigation measure	Mitigation Cost	Institutional responsibility	Implementation schedule
Pre-construction					
Statutory clearances/ permits	Obtain Environmental Permit and other statutory permits from the NES.	Undertake an environmental impact assessment, including preparation of an EIA report, in accordance with the *Environment Act 2003*. Ensure EIA is approved and Environmental Permit received prior to the commencement of onsite works.	Project Cost	EA, IAs through PMU	Prior to commencement of onsite work
Climate Change	Increased severe weather events and/or rise in sea level as a result of climate change.	Locate project sites inland and above predicted sea level rises. Ensure components procured are suitable for tropical marine and coastal environments and meet relevant international standards. Design subproject to withstand extreme weather events (e.g. cyclones).	Project Cost	EA, IAs through PMU	Detailed design
Site selection	Visual impacts	Careful selection of site away from inhabited areas.	Project Cost	EA, IAs through PMU	Detailed design
	Selected sites contain heritage values and/or are located in protected areas	The Island Councils from each subproject island were consulted and confirmed that there are no marae or historical significance associated with any of the subproject sites.	Project Cost	EA, IAs through PMU	Detailed design
	Selected sites are unacceptable to landowners or stakeholders.	Consultation has been undertaken with the local community. Landowners at all subproject sites agree, in principle, to transfer use of the site to the government for the project purpose subject to agreement of a formal land use agreement.	Project Cost	EA, IAs through PMU	Detailed design
Drainage and erosion	Development of the subprojects results in erosion at project sites.	The civil works design will include appropriate drainage structures that adequately control surface water flow and prevent erosion of surrounding land (particularly Atiu).	Project Cost	EA, IAs through PMU	Detailed design
Access	Impacts due to construction of new access roads and	Proposed sites are accessible by existing wharf and road network. Therefore there is no requirement to construct new	Project Cost	EA, IAs through PMU	Detailed design

Project activity/ stage	Potential impact	Proposed mitigation measure	Mitigation Cost	Institutional responsibility	Implementation schedule
	wharfs	access roads or wharfs.			
Project administration	Contractor unaware of environmental mitigation measures	Ensure that EMP is included in the bidding documents.	Project cost	EA, IAs through PMU	Tendering process
	Updating EMP	Mitigation measures defined in this EMP have been updated and incorporated into the detailed design to minimize adverse impacts.	Project cost	EA, IAs through PMU	Detailed design
	Updated EMP incorporated into bid and contract documents	Prepare environmental contract clauses for contractors, namely the special conditions (e.g. reference EMP and monitoring table).	Project cost	EA, IAs through PMU	Tendering process
Equipment design and selection	Release of toxic chemicals and gases in receptors (air, water, land)	PCBs should not be used in transformers and other project facilities or equipment.	Project Cost	EA, IAs through PMU	Tendering process
Equipment design and selection	Noise and air emissions	Undertake desktop noise modelling to ensure selected generators meet or exceed IFC EHS Guidelines – Noise. New diesel generators will comply with relevant American emission standards.	Project Cost	EA, IAs through PMU	Tendering Process
	Hazardous materials	PCBs will not be used in transformers and other project facilities or equipment.	Project Cost	EA, IAs through PMU	Tendering process
Resettlement (land acquisition)	Social inequities	Affected people will be compensated as per entitlement matrix proposed in the project Resettlement Plan	Project Cost	EA, IAs through PMU	Prior to start of onsite work
Construction					
Air quality and dust	Generation of excessive dust through project construction activities.	Vehicles carrying soil, sand, crushed aggregate or other fine materials to or from the project site will be covered The project site, material stockpiles and access roads, including those from the wharf and material stockpile areas, will be wetted or stabilised if dust is generated. Earth moving equipment will be cleaned prior to leaving site to prevent the tracking of soil on nearby roads.	To be included in Contractor cost.	Contractor (preparation and implementation) PMU (approval)	During civil work and construction
Waste management	Inappropriate storage and disposal of waste	Waste management during the subprojects will seek to reduce, reuse and recycle waste as far as possible and	To be included in Contractor	Contractor (preparation	During all onsite works

Project activity/ stage	Potential impact	Proposed mitigation measure	Mitigation Cost	Institutional responsibility	Implementation schedule
		dispose of waste in an appropriate way. No hazardous wastes will be disposed of on any of the subproject islands. Vegetation cleared from the site will be disposed of in consultation with the POE and Island Environmental Officer (e.g. chipped and made available to local residents as mulch). A significant amount of vegetation will be required to be disposed of on Atiu and options are being investigated to determine an environmentally appropriate solution. The construction contractor will consult with the POE and Island Environmental Officer to identify opportunities to avoid and reduce the generation of waste and to recycle or re-use waste generated. Construction wastes that cannot be re-used or recycled on the island will be transported off site for reuse, recycling or disposal. If excess spoil is generated during site preparation it will be stored at an established stockpile site (e.g. airport) for re-use. Hazardous waste (if generated) will be transported off the subproject island and disposed of in accordance with manufactures requirements at a facility approved by the NES. Concrete waste (including water) will be captured and taken off the subproject island for disposal. Bins for recycling and general rubbish will be provided at the project site and materials laydown area for the disposal of construction wastes.	cost.	and implementation) PMU (approval)	
Noise and vibration	Disturbance to local community and project staff through noise and vibration	Wherever possible working hours will be between 8am and 5pm Monday to Friday. Where safety or technical reasons require work to be completed outside of these hours noise levels will be minimised as much as possible and the Island Council together with nearby residents will be informed.	To be included in Contractor cost.	EA, IAs through PMU	During civil work and construction

Project activity/ stage	Potential impact	Proposed mitigation measure	Mitigation Cost	Institutional responsibility	Implementation schedule
		Work will not be undertaken on Sundays and holy days. Noisy activities e.g. site clearance will be carried out in the least sensitive time periods to be determined in consultation with the Island Council. 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 level not to exceed 85 dB(A) (over 8 hr period).			
Water resources and quality	Depletion or contamination of local water resources	Where feasible construction techniques will be specifies (e.g. piling) that minimise the need to alter the topography (e.g. levelling) and hence surface water drainage on the site. Water required for construction (e.g. concrete mixing) will be sourced with the agreement of the Island Council, Island Environmental Officer and POE.	To be included in Contractor cost.	Contractor PMU (approval)	During civil work and construction
Hazardous materials	Release of hazardous materials to the surrounding environment	The Contractor(s) will prepare a hazardous materials management plan that shall at a minimum include: • The type and quantity of hazardous materials the 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). Transport of hazardous materials will be by an appropriately experienced and equipped contractor. 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.	To be included in Contractor cost.	Contractor (preparation and implementation) PMU (approval)	During all onsite works

Project activity/ stage	Potential impact	Proposed mitigation measure	Mitigation Cost	Institutional responsibility	Implementation schedule
		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 the site and on vehicles carrying hazardous materials. Hazardous materials will not be disposed of on the subproject island but will be transported offsite and disposed of at a facility approved by the NES.			
Erosion control	Erosion of project site and surrounds.	All land disturbances will be confined to the minimum practicable working area to ensure that the minimum land area is exposed to erosion for the shortest possible time. Existing drainage lines will be protected and diversion of drainage lines avoided. Surface water will be diverted around the construction footprint using structures such as catch drains, silt fences or bunds. Surface water will not be diverted across erosion prone slopes. 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. • Erosion control measures closely follow land contours to reduce runoff velocity from exposed soils. 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 basins will be installed where required. The site will be covered with geotextile fabric immediately after clearing to prevent the loss of top soil (Atiu and if deemed necessary by the POE and Island Environmental Officer for remaining subprojects). A shade tolerant groundcover will be established across the site as soon as practicable after site clearance. The species	To be included in Contractor cost.	Contractor (preparation and implementation) PMU (approval)	During all onsite works

Project activity/ stage	Potential impact	Proposed mitigation measure	Mitigation Cost	Institutional responsibility	Implementation schedule
		of groundcover used will be selected in consultation with the Island Environmental Officer. Sediment and erosion control measures will be monitored regularly to ensure their continued correct functioning. Cabling trenches will remain open for the shortest duration possible to reduce erosion and where possible will not be open during periods of heavy rain. 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.			
Social	Disturbance to local community Increased opportunity for local businesses and contractors	A list of relevant local contractors available on Atiu will be provided in tender documentation to facilitate the engagement of local industry by the selected construction contractor. Opportunities will be made available by the contractor for local contractors and businesses to be engaged during construction and commissioning of the power station. The Atiu Island Council, Visitors Centre, landowners, local residents and stakeholders will be kept informed of the project via monthly meetings during construction including details of: • the progress of the works and expected completion date • scheduled delivery of materials and equipment • any disruptions to the use of the wharf or site access roads • upcoming works that are likely to be noisy. As far as is practicable works will be timed to avoid disruption to local events. Fencing shall be installed on all areas of excavation greater than 1m deep. The contractor(s) will be required to develop an occupational health and safety plan prior to the commencement of any works on site.	To be included in Contractor cost.	Contractor (preparation and implementation) PMU (approval)	During all onsite works

Project activity/ stage	Potential impact	Proposed mitigation measure	Mitigation Cost	Institutional responsibility	Implementation schedule
		Workers shall be provided (before they start work) with appropriate personnel protective equipment (PPE). Adequate sanitation, potable water and first aid facilities will be supplied by the contractor.			
Heritage	Unexpected discovery of an artefact	In the event of an artefact being uncovered during construction work will cease immediately and the Island Council and POE notified. Work will not recommence until authorised by the POE	To be included in Contractor cost.	EA, IAs through PMU	During civil work construction
Construction activities	Unexpected environmental impacts	If unexpected environmental impacts occur during construction phase, the POE will update the EMP, and the environmental protection measures will be designed to address the impacts.	Project cist	EA, PMU	During construction
Operation and Maintenance					
Waste and hazardous materials	Inappropriate disposal of waste	Inverters and batteries that have been replaced during the operating lifetime of the power station will be removed, transported and disposed of by an appropriately experienced and equipped contractor. Where possible batteries and inverters will be recycled. If recycling is not possible they will be disposal will be at a facility approved by the NES. Waste oil and other hydrocarbons from the generator will be stored in a bunded hydrocarbon storage area. No hazardous waste (e.g. used oils, batteries or inverters) will be disposed of on the subproject Island. Waste will be sent for disposal at regular intervals and not allowed to accumulate at the power station. Washing of panels would only be undertaken on an “as needs” basis to minimise the generation of waste water. Disposal of waste water will be agreed with the Island Environmental Officer. All infrastructure containing hazardous materials (e.g. batteries, transformers, generators) will be inspected regularly to ensure it is functioning correctly and no	O&M cost.	IAs	During operation

Project activity/ stage	Potential impact	Proposed mitigation measure	Mitigation Cost	Institutional responsibility	Implementation schedule
		hazardous materials are being discharged. Screening vegetation will be established between the PV array and the road to minimise dust from the road settling on the panels.			
Water resources	Depletion of local water resources	A source of water for washing panels will be agreed with the Island Council and Island Environmental Officer.	O&M cost.	IAs	During operation
Erosion control	Erosion of project sites	If localised erosion is detected during operation of the subproject 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.	O&M cost.	IAs	During operation
Weeds	Spread of weeds and invasive species	Weed monitoring will be carried out at the subproject site regularly and on-going weed control will take place to prevent the establishment and spread of invasive species.	O&M cost.	IAs	During operation
Social	Solar power station operators	It is expected that existing employees will be retained to operate the new solar power systems. Training will be provided for power station employees in the operation and maintenance of the new solar power system.	O&M cost.	IAs	During operation
Emergency Plan	Emergency response	The solar power station will be monitored remotely and any faults rectified by onsite maintenance staff reducing the risk of a health and safety incident (e.g. fire) occurring. The POE will prepare an operational emergency response plan. The plan will be include in the training provided to employees and be implemented during the operation of the solar power system.	O&M cost.	IAs	During operation
Operation of project facilities	Unexpected environmental impacts	If unexpected environmental impacts occur during project operation phase, the IA will update the EMP, and the environmental protection measures will be designed and resources will be utilized to cope with these impacts.	O&M Cost	IAs	During operation

Project activity/ stage	Potential impact	Proposed mitigation measure	Mitigation Cost	Institutional responsibility	Implementation schedule
Decommissioning					
Disposal of battery systems	Disposal of batteries	The disposal of the battery systems will be contracted to a specialist supplier. All equipment will be removed from the project site (e.g. batteries, invertors) will be reused or recycled where possible. Equipment that cannot be reused or recycled will disposed of at a facility approved by the NES. The decommissioning contractor will be required to develop a hazardous materials management plan prior to the commencement of any works on site.	Maintenance cost	EA	Post operation
	Rehabilitation of subproject site	If the site is not reused it will be replanted with species appropriate to the future land use of the site.	Maintenance cost	EA	Post operation

Table 9.2: Environmental Management Plan

Environmental Features	Aspect to be Monitored	Time and Frequency of Monitoring	Location	Monitoring Cost	Responsible party (Implementation/ Supervision)
Construction stage					
Dust and air quality	Dust emissions	POE - At least twice during civil works (visual check). Contractor – daily visual checks during civil works	Project site and access roads from wharf and laydown areas and stockpile sites	Project cost	Contractor / POE
Waste management	Waste collection, storage and disposal.	POE – once every two weeks. Contractor – daily visual checks of storage locations and records of all waste disposed (i.e. volume, location, contractor etc)	Project site, storage areas and disposal facility (if required)	Project cost	Contractor / POE
Noise	Noise levels in dB(A)	At least twice during construction period at times of predicted high noise (e.g. site clearance).	Project site boundary closest to nearest occupied residence	3000*2 =6000	Contractor / POE
Hazardous materials	Storage and disposal of hazards materials	POE – once every two weeks. Contractor – daily visual checks of storage locations and records of all waste disposed (i.e. volume, location, contractor etc)	Project site, storage areas and disposal facility (if required)	Project cost	Contractor / POE
Erosion control	Correct functioning of erosion control measures.	POE – once every two weeks. Contractor - daily visual checks of erosion control measures when rain has fallen in the previous 24hrs.	Project site	Project cost	Contractor / POE
Site clearance	Scope of clearing	POE representative to be present during site clearing	Project site	Project cost	POE
Stakeholder consultation	Records of consultation	POE – once every two weeks	Island Council	Project cost	POE
Occupational Health and Safety	As specified in project health and safety plan prepared by Contractor	Once every two weeks	Project Site	Project cost	Contractor & POE
Operation Stage					
Hazardous waste	Disposal of hazardous waste	Quarterly	Power station and hazardous materials	O&M cost	IAs

Environmental Features	Aspect to be Monitored	Time and Frequency of Monitoring	Location	Monitoring Cost	Responsible party (Implementation/ Supervision)
			storage areas		
Weed control	Control of weeds and invasive species	Quarterly	Project site	O&M cost	IAs
Occupational Health and Safety	As specified in project OHS plan prepared by Contractor	Weekly	Project Site	O&M cost	IAs

Note: This monitoring plan is prepared for one subproject site. The same plan will be implemented at all subproject sites.

10. Conclusion and Recommendation

117. It is recommended that the project be considered environmentally feasible, and that this environmental assessment is adequate to justify the environmental feasibility of the project.

118. The EMP identifies potential environmental impacts arising from the project along with a corresponding schedule of mitigation measures to ensure potential impacts are maintained at insignificant levels. It also includes the institutional arrangements for implementing the EMP to ensure its effectiveness.

119. This IEE, including the EMP is considered sufficient to meet ADB's environmental safeguard requirements. No further or additional impact assessment is considered necessary at this stage.