Initial Environmental Examination

July 2019

Nauru: Solar Power Development Project

Prepared by the Nauru Utilities Corporation for the Asian Development Bank.

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ABBREVIATIONS

ADB	Asian Development Bank
BESS	Battery Energy Storage System
BOQ	Bill of Quantities
CCP	Communication and consultation plan (for the project)
CEMP	Construction environmental management plan (to be prepared by the EPC contractor)
CITES	Convention on International Trade of Endangered Species
CSC	Construction supervision consultant
DCIE	Department of Commerce, Industry, and Environment
EHSO	Environnent, health and safety officer (of EPC Contractor)
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EPC	engineering, procurement, construction
EU	European Union
GDP	Gross Domestic Product
GRM	Grievance Redress Mechanism
HIES	Household Income and Expenditure Survey report
HIV/AIDS	Human immunodeficiency virus infection and acquired immune deficiency syndrome
IEE	Initial environmental examination
MFAT	Ministry of Foreign Affairs Trade (of New Zealand)
MFSD	Ministry of Finance and Sustainable Development
NIEP	National Integrated Environment Policy
NRC	Nauru Rehabilitation Corporation
NUC	Nauru Utilities Corporation
O&M	Operation and Maintenance
PAD	Planning and Aid Division (within MFSD)
PPE	Personal protective equipment
PV	photovoltaic
RONH	Nauru General Hospital
RONPHOS	Republic of Nauru Phosphate Corporation
RPC	Regional Processing Centre
SCADA	Supervisory Control and Data Acquisition
SEMP	Site-specific environmental management plan (to be prepared NRC for site clearance)
SPREP	Secretariat of the Pacific Regional Environment Program
SPS	Safeguard Policy Statement 2009 (of ADB)
SR1	Safeguard Requirement 1 (environment)
STI	Sexually transmitted infection
UAE	United Arab Emirates
UXO	Unexploded ordnance

WEIGHTS AND MEASURES

CO_2	–	Carbon dioxide
CO_2 e	–	Carbon dioxide equivalent
GWh	–	Gigawatt Hour
ha	–	hectare
km	–	kilometer
km^2	–	square kilometer
kPa	–	kilopascal
kV	–	kilovolt
kW	–	Kilowatt
kWh	–	kilowatt-hour
m	–	meter
m^2	–	square meter
m^3	–	cubic meter
mm	–	millimeter
ML	–	megaliters
MW	–	megawatt
MWh	–	Megawatt-hour
t CO_2 e /year	–	ton CO_2 equivalent per year

NOTES

Unless otherwise stated USD($) is the currency used in the report.
Nauru uses the Australian dollar (AUD) as its currency as at 02 May 2019

AUD 1.00	USD 0.70403
USD 1.00	AUD 1.42011

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EXECUTIVE SUMMARY

1. **Background**. The island of Nauru is reliant on diesel power generation for its energy supply. Under the Nauru Energy Road Map 2014 – 2020, the Government of Nauru (the government) is committed to provide sustainable energy supply to its people by using available renewable resources in the country. In line with this commitment, the government requested support from the Asian Development Bank (ADB) to increase its renewable energy generation capacity to meet the target of 50% in 2020.

2. **The project**. ADB has provided support to prepare a project for a solar power expansion plan and project feasibility study for a solar power generation facility in Nauru. The project is being prepared through the Pacific Renewable Energy Investment Facility, approved by the ADB Board of Directors on 22 June 2017. The project preparatory work aimed to investigate the potential solar power capacity that can be installed in Nauru given the existing and forecasted power demand. The total installed diesel power capacity in Nauru is 21.2 MW, of which only 17.9 MW is operational. Only about 3.3% of power supply in the country is supplied by solar power installations. The use of diesel power generators is not a sustainable source of electricity as it relies on imported fuels. With the implementation of the solar power development project, as described in the project feasibility study report, the project, including a solar photovoltaic (PV) plant and battery energy storage system (BESS), would be able to (i) decrease the cost of electricity by 35-40% from approximately $303 MWh to $191 MWh by increasing renewable solar power penetration, and (ii) substantially reduce greenhouse gas emissions from diesel power generation by about 38% or by 11,155 tonnes CO_2/year. These derived values are based on assumptions included in the project feasibility study.

3. **Institutional and implementation arrangements**. The project will be implemented by the Nauru Utilities Corporation (NUC) and the project's executing agency will be the Ministry of Finance and Sustainable Development (MFSD) through the Planning and Aid Division (PAD), with the support of Department of Commerce, Industry and Environment (DCIE) for both energy and environment related matters. A Steering Committee will be established to oversee the project implementation, monitor project progress, resolve any obstacles or impediments to implementation, and guide the executing agency. The Steering Committee will be chaired by the PAD, with members including the Secretary of the Department of Finance and Economic Planning, Advisor to the Ministry of Finance, Chief Executive Officer of the NUC, the Director of Environment, and the Director of Energy.

4. NUC will lead, manage, and monitor project implementation activities, and ensure compliance with Nauru's laws and regulations and ADB's policy requirements. The NUC will be supported by a construction supervision consultant (CSC). The project will be delivered through an engineer, procurement, construction (EPC) contractor who will confirm the preferred method for footing design, fabrication and panel and array installation.

5. **Policy and legal framework.** Nauru does not have an existing legal framework for environmental protection, resource management or need for assessment of proposed developments/projects against environmental impact assessment guidelines. The National Integrated Environment Policy, while not yet ratified, establishes environmental policy the environmental conservation and preservation goals for the country to increase its resilience to impacts associated with project developments and climate change. The legislation mandating project developments to satisfy necessary environmental approvals is not yet in place. Nauru relies heavily on the support from the Secretariat of the Pacific Regional Environment Program (SPREP) for guidelines for preparing TOR for preparation of and evaluating environmental impact assessments (EIA) and also in review of EIA that are prepared. In response to the request from government, the environment assessment process for the project has been undertaken, and the report prepared, in accordance with the SPREP Regional Environmental Impact Assessment (EIA) Guidelines 2016 with additional elements as required to also ensure compliance with the Safeguards Policy Statement 2009 (SPS) of ADB.

6. In the absence of a regulatory framework on environmental impact assessment, the DCIE will receive the initial environmental examination (IEE) as the appropriate level of assessment of the project and will, with SPREP support, review and comment. After addressing the comments issued by the DCIE, and ADB through the inter-departmental review process, the IEE will be submitted to the Cabinet for approval. The process for review by DCIE and approval by the Cabinet may take up to two months. Once the IEE is approved, the DCIE will issue a letter providing the clearance of the project and will participate in monitoring the implementation of the environmental safeguard requirements.

7. **Screening and categorization.** The project comprises installation of a 6.0 MWh solar PV array combined with a 2.5 MWh/5.0 MW BESS on a 6-hectare (ha) area previously used for phosphate mining. The area is a spent open-pit phosphate mine with limited social or environmental values and no longer used for economic activities. The site is accessible through an existing adjacent road. The screening concluded that the works will be limited to the site, with the exception of haulage of materials and plant from the port to the site, and impacts will be site-specific and largely created during the construction phase and for which mitigation measures and controls from good international industry practice are readily available and can be implemented. The project is categorized as B for environment.

8. **Project description.** The project comprises the installation of a 6.0 MWh solar array combined with a 2.5 MWh/5.0 MW BESS. The project will require the installation of 19,200 solar panels (360 W DC panels), 240 string inverters (25 kW AC), and two separate systems of 2.5 MW (1.25 MWh) capacity BESS. The panels, batteries and inverters will be imported and transported into Nauru by sea. The solar panels and batteries will be placed in containers and will be delivered to the port by ship and will be hauled to the site using trucks. Approximately 30 shipping containers will be hauled using trucks to the site from the port.

9. After a useful life of 25 years, the solar panels will be replaced or the project decommissioned. Batteries will need replacement after 10 years of service life. The panels and batteries will be shipped offshore for appropriate handling, transporting, recycling and disposal. The decommissioning of the solar power facility will be decided on by NUC after serving its full life cycle.

10. The construction of the project involves site clearance and preparation of an area mined for phosphate during the 1970s and 1980s old mine and will include the removal of remaining pinnacles and demolition and removal of an old dilapidated steel structure. The site will be levelled prior to installation of the solar plant and site preparation will include using heavy machinery to break the rock (herein referred to as the rock breaking method), with limited drilling and blasting of the pinnacles. The existing road is sufficient for materials, plant and equipment haulage and will not require upgrading works.

11. The site is larger than the area required for the ADB financed solar array and BESS, and a 3ha area which has already been flattened and prepared though previous use as a storage facility by civil engineering company Fulton Hogan will be used for a smaller solar facility financed by Government of New Zealand and European Union. The adjacent area, the 6ha area allocated to the ADB project will require substantial site preparation work to remove the remaining pinnacles made of limestone.

12. **Environmental assessment.** Findings of the baseline environmental assessment suggest there are no threatened, endemic or restricted-range species of fauna or flora within the project area. The habitat of the site comprises vegetation regrowth with majority of species being non-native, exotic or introduced with few indigenous species. There are 34 bird species recorded in Nauru, 25 of which were indigenous. Only seven bird species breed on the island, the remainder are migratory sea and shore birds. There are eight species of reptiles, including three species of ground skink. One of these ground skinks species was reported to be undescribed and therefore maybe endemic to Nauru. There are four species of gecko (one of these is invasive), and one invasive snake species recorded. Neither amphibians nor native land mammals were reported in Nauru.

13. The preparation of the site will result in removal of existing vegetation re-growth within the 6ha area, which could be inhabited by birds, reptiles, and invertebrates. However, based on a literature review, there are no endangered species of flora and fauna found on the project site. Other risks and impacts will be created largely during the construction phase and can be managed and mitigated by good international industry practice. Risks and impacts including blasting, site safety, dust and noise, waste generation, hazardous materials handling and disposal, traffic and haulage, health and safety, presence of workers, and labor issues have been identified along with measures to mitigate listed in the environmental management plan (EMP).

14. **Environmental management plan**. A number of pre-construction requirements will be the responsibility of NUC and Nauru Rehabilitation Corporation (NRC); these include submission of the IEE for clearance by DCIE (government project approval), site clearance and preparation (ensuring appropriate safeguard instruments are in place as well as the physical activities undertaken in compliance with the instruments), and supporting, as required, the EPC contractor who will be responsible for obtaining other permits and clearances related to specific elements of construction activities include biosecurity clearances for imported materials and plant, water use permits and waste discharge and disposal permits.

15. To manage and mitigate the risks and impacts identified in the IEE, the NRC and EPC contractor will be required to meet the technical specifications and performance targets included in the tender documentation. Prior to commencement of any activities on site, the NRC will recruit an environmental specialist to assist with development of the site-specific EMP (SEMP) for site clearance activities. The NUC and ADB will review and clear the SEMP. The government will recruit an independent engineer and environmental specialist to monitor and report on the compliance of NRC with the approved SEMP during the site clearance and preparation activities.

16. Following detailed design developed by the EPC contractor and prior to commencement of any physical activities, the contractor will prepare and submit its construction EMP (CEMP) for review by NUC, CSC and ADB. The CEMP will be developed based on the detailed design information including approach to the works and confirmed details of project delivery and installation and by updating the impacts identified in the IEE through a risk assessment (or similar) approach undertaken by the EPC contractor. The CEMP will include sub-plans and site-specific plans as required: (i) vegetation management plan, (ii) health and safety plan (workers and community), (iii) water resources and wastewater management plan, (iv) noise and vibration impacts and management, (v) dust control, (vi) waste management plan, (vii) hazardous materials management plan, and (viii) labor management.

17. During decommissioning phase, the batteries need to be replaced after 10 years of useful life, and the solar panels after 25 years of useful life. The project's EMP contained in this report includes the aspects for operations and maintenance that will be the responsibility of NUC.

18. Overall compliance with the approved plans during pre-construction, construction, operation, and decommissioning phases will be monitored by NUC and ADB. The DCIE will be encouraged to participate in joint checks and inspections for checking compliance against the conditions of environmental approval for the project.

19. **Implementation**. Financing for site preparation for the project will be requested within the 2019–2020 budget. Disbursement of government counterpart funds is expected to be from July 2019 onwards. The EPC tender process is planned to be completed by November 2019, with detailed designs completed by July 2020. Project commissioning and training is expected by September 2021. Site preparation is anticipated to be completed over one year.

20. Site clearance and preparation will be undertaken by the NRC and could be completed in advance of project approval. In this case, specific caveats will be agreed between government and ADB including: (i) SPS and good industry practice, in addition to Nauru laws, will apply to the land clearance and preparation activities; (ii) prior to activities commencing the IEE is cleared/approved by ADB and government; (iii) the pre-construction elements of the IEE will be integrated into the government's bid/procurement documents governing the NRC works; (iv) NRC will recruit a suitably qualified and experience specialist to help them prepare their site-specific environmental management plan (SEMP) for the site preparation activities; (v) ADB will have the opportunity to review and comment on the government's bid/procurement documents; (vi) government will engage an independent (not employed by NRC) engineer and environmental specialist, who—along with ADB—will review and clear the SEMP prepared and submitted by NRC; and (vii) the independent engineer and environmental specialist will supervise, monitor and report on the NRC works and implementation in compliance with the approved SEMP.

21. **Information disclosure and stakeholder consultation**. Consultations have been undertaken during the feasibility and due diligence stages of project preparation and will continue during project implementation as guided by the project's communication and consultation plan. Meetings were held with 12 landowners in October 2018 and 77 landowners in April 2019 during the feasibility study stage. At least one representative from each of the nine land lots within the project site attended both meetings. An outline of the project and preliminary designs were presented, as well as anticipated social and environmental impacts. Following this, an open session was held where landowners were engaged to ask questions about the proposed project. The issues and concerns raised were around rental rates, employment opportunities, ownership and operations of the solar facility, sufficiency of solar power energy supply, extent of environmental impacts on areas where the batteries, diesel generators, and substations will be placed. NUC explained the process of addressing these issues and the ongoing investigations consultants are carrying out to develop the management plans that will be closely monitored by the government.

22. **Grievance redress mechanism.** A grievance redress mechanism (GRM) will be established, as early as possible, for the project. The GRM aims to address any complaints or issues about the project overall and also that may arise from communities and workers to be deployed for the project. Typical complaints that arise during construction relate to land lease rates and payments, employment opportunities, public safety, and nuisances caused by construction activities. The grievance redress procedures provide the process of recording and addressing such complaints during construction and operation phases of project development. NUC will supervise the implementation of the project and shall implement an appropriate GRM for the project and the EPC contractor will be responsible for implementing relevant elements of the GRM. The GRM does not preclude complainants from seeking resolution through the court system if they are not satisfied through the GRM process.

23. **Conclusion and recommendations**. The project activities will be conducted within a small project area including the 6ha site at Topside and the transportation and haulage rotes to and from the site. The most significant activities will be associated with site clearance and preparation which will result in potential disturbance of the nearby Regional Processing Centre approximately 300m from the site, due to elevated noise levels from rock breaking and limited blasting activities, and increased dust generation during site preparation and truck movement; all of which will be carefully implemented and monitored. T

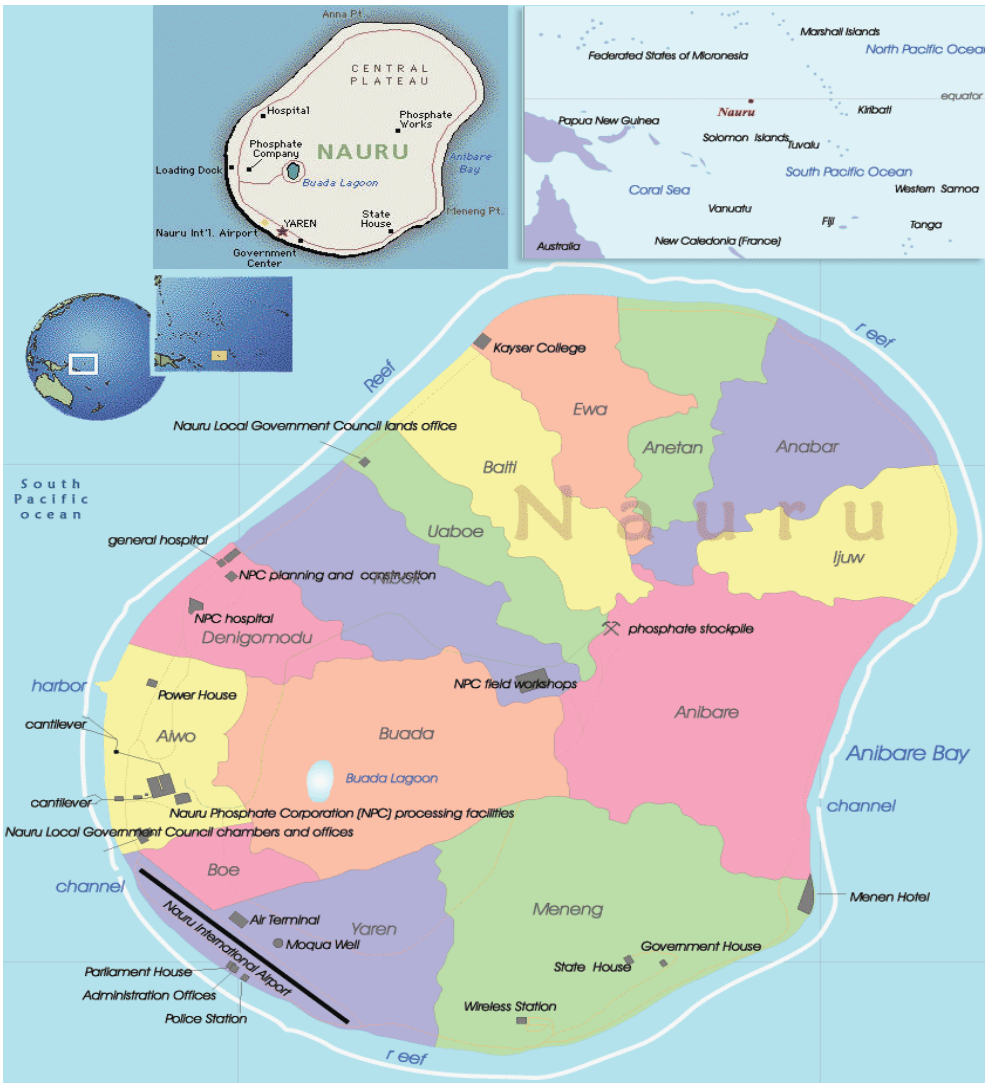
24. he remaining project installation activities will create impacts that will be localized and which may be readily managed and mitigated. There will be minor traffic and movement of trucks during delivery of the construction materials and equipment during the day. During operation phase, the project is not expected to generate any environmental and social negative impacts and is expected to benefit the people of Nauru by providing lower levelized cost of electricity by approximately 35-40%; and long-term benefit to the environment by substantially reducing carbon emissions by about 38%.

1. INTRODUCTION

A. Project Location

1. **Location**. The small Micronesian island state of Nauru (Figure 1.1) is located in the dry belt of the equatorial oceanic zone and is boarded by the Republic of Kiribati in the east, the Republic of the Marshall Islands in the northeast (700 km), the Federated States of Micronesia in the northwest (700 km), Papua New Guinea in the west (1600 km), the Solomon Island in the south west (1200 km), Vanuatu in the south (1300 km) and Fiji (2600 km) to the south east. Nauru is an independent republic with a population in the order of 10,000 (Census 2011). Nauru imports over 95% of its goods by sea transport and is a vital link for the country's current and potential exports (phosphate, dolomite aggregate and fish).

Figure 1.1: Location of Nauru



2. Nauru is one of the smallest independent nations in the world; it comprises only one island which is 21 km^2 in area, roughly 6 km long by 4 km wide with a coastline of 24 km, possesses an exclusive economic zone of 309,888 km^2 and lies just 41 km south of the equator. The island is divided into 14 districts of varying sizes and number of inhabitants.

3. Nauru is surrounded by a fringing coral reef ranging from 120 m to 300 m wide, which drops away sharply on the seaward edge to a depth of approximately 3 km. The coastal plain is a zone of sandy or rocky beach on the seaward edge, and a beach ridge or fore-dune, behind which is either relatively flat ground or, in some places, low-lying depressions or small lagoons filled by brackish water (e.g. Buada lagoon) where the surface level is below the water table (freshwater lens). The raised central plateau (Topside) generally lies between 20-45 m above sea level with occasional elevations of up to 50-70 m. The central plateau comprises a matrix of coral-limestone pinnacles and limestone outcrops, between which lie extensive deposits of soil and high-grade phosphate rock covering approximately 1600 ha (over 80% of the island). This area has been extensively mined with the ecosystem drastically altered (SPC, 2005 and Fenner, 2013).

B. Project Rationale and Objectives

1. Moving towards renewable energy

4. Nauru primarily sources its energy from diesel-powered generators. This type of power generation heavily relies on imported diesel fuel being shipped to Nauru. The Government of Nauru (the government) is committed to reducing its greenhouse gas emissions by replacing diesel power generation with renewable sources such as the solar power generation. Through the Nauru Utilities Corporation (NUC), the government is working towards achieving the country's 50% renewable energy targets by 2020 as committed to in the Republic of Nauru Energy Road Map 2014-2020. Nauru currently has 807 kW installed capacity of solar power. About 3% of its current energy demand is sourced from renewable energy all of which is provided through solar photovoltaic (PV) installations.

5. The country has a total population of approximately 13,300 (ADB, 2017), with a recorded resident population of 11,614 (Home Affairs Unit, 2018). The average monthly power demand recorded from July 2017 to June 2018 was 2.34 GWh. Total recorded demand during this period was 28 GWh. Highest demand was recorded in June 2018 at 2.69 GWh. The least demand was recorded in April 2017 at 2.12 GWh. This equates to a per capita average power demand of 2,110 kWh per year. The forecasted annual power demand by 2020 is calculated to be 47.5 GWh and 46.4 GWh by 2025.

7. The government aims to increase renewable energy penetration from 3% to the desired target of 50%. The NUC, with the support from the Asian Development Bank (ADB), is developing a plan for optimal solar penetration by 2025, as reflected in the decision at the 14 September 2018 Cabinet Meeting.

8. Project preparation has included—in view of solar power as the least cost option for power supply within Nauru—development of the Solar Power Expansion Plan which has been approved by the Cabinet. A key element of that plan is development of a solar facility at the proposed site. A feasibility study has been prepared which includes economic and safeguards due diligence including this initial environmental examination (IEE) documenting the environmental assessment of the proposed Solar Power Development Project (the project) based largely on information provided in the feasibility study reports.[1]

2. Objectives of the Project

9. The project aims to increase the supply of reliable, cleaner electricity for Nauru. This will be achieved through installation of new solar power assets within Nauru. In addition to installing solar panels, the project includes the installation of a BESS, and solar power plant facilities such as the substation, inverters, cables, and supervisory control and data acquisition (SCADA) control system, to provide stable supply of power throughout its operational life.

10. The project is in line with ADB's country operations business plan for Nauru 2019–2021 and the Pacific Approach 2016-2020 which serves as the operational framework and country partnership strategy for eleven countries including Nauru. The Pacific Approach promotes job creation, inclusive economic growth and human development through a three-pronged strategy focusing on reducing costs, managing risks and enabling value creation.

11. The project is aligned with the following targets: 50% of grid electricity supplied from renewable energy sources—Nauru Energy Road Map 2014-2020—and viable power generating capacity including alternative renewable energy sources as per the Long-term Milestone 2025 and National Sustainable Development Strategy 2005-2025.

[1] GHD. 2019. Nauru Solar Power Development Project Feasibility Study Report (through TA 9242-REG Pacific Renewable Energy Facility).

3. Institutional and implementation arrangements

12. The project will be implemented by the NUC and the project's executing agency will be the Ministry of Finance and Sustainable Development (MFSD) through the Planning and Aid Division (PAD), with the support of Department of Commerce, Industry and Environment (DCIE) for both energy and environment related matters. A Steering Committee will be established to oversee the project implementation, monitor project progress, resolve any obstacles or impediments to implementation, and guide the executing agency. The Steering Committee will be chaired by the PAD, with members including the Secretary—Department of Finance and Economic Planning, Advisor—Ministry of Finance, Chief Executive Officer—NUC, the Director of Environment, and the Director of Energy.

13. NUC will lead, manage, and monitor project implementation activities, and ensure compliance with Nauru's laws and regulations and ADB's policy requirements. The NUC will be supported by a construction supervision consultant (CSC). The NUC will submit the IEE to the DCIE and Director of Environment, as the appropriate level of assessment of the project and will, with SPREP support, review and comment. After addressing the comments issued by DCIE, and ADB through the inter-departmental review process, the IEE will be submitted to the Cabinet for approval. The process for review by DCIE and approval by the Cabinet may take up to two months. Once the project and IEE is approved, the DCIE will issue a letter providing the clearance of the project and will participate in monitoring the implementation of the environmental safeguard requirements. Any conditions of the project approval will be integrated into the tender documents.

14. The Nauru Rehabilitation Corporation (NRC) will undertake site clearance and preparation activities during the pre-construction phase. The NRC will recruit an experienced environmental specialist to develop its site-specific environmental management plan (SEMP). The NUC and ADB will review and clear the SEMP prior to any activities being undertaken at the site. The government will recruit, using retroactive financing made available through the project, an independent engineer and environmental specialist to monitor and report on compliance with the approved SEMP throughout the activities.

15. The detailed design and construction of the project will be delivered through an engineer, procurement, construction (EPC) arrangement which means the EPC contractor will be responsible for a number of matters usually completed by others in a typical civil works contract, this will include: (i) meeting the outline technical specifications and performance targets included in the tender documentation; (ii) detailed design including confirming the preferred method for footing design and fabrication; (iii) following detailed design reviewed by NUC, CSC and ADB, the ensure the IEE including its environmental management plan (EMP) is updated accordingly; (iv) once the design is approved, and prior to commencement of any physical activities, develop their construction EMP (CEMP); and (v) being responsible for obtaining other permits and clearances related to specific elements of construction activities include biosecurity clearances for imported materials and plant, water use permits and waste discharge and disposal permits.

2. POLICY AND LEGAL FRAMEWORK

16. The project will be governed by the applicable laws and regulations of Nauru and the Safeguards Policy Statement 2009 (SPS) of the ADB.

A. Nauru Country System

1. National policy

17. The National Sustainable Development Strategy 2005-2025 (revised 2009) includes goals in the areas of energy security, water security, food security, a healthy environment, a healthy people and productive, secure land resources. The project contributes specifically towards the long-term milestone of viable power generating capacity including alternative (renewable) energy sources.

18. The National Integrated Environment Policy establishes environmental policy the environmental conservation and preservation goals for the country to increase its resilience to impacts associated with project developments and climate change. The policy is approved by Cabinet but requires the Department of Justice to create legislation to mandate implementation of the policy.

19. The National Environment Management Strategy for Nauru has identified the inadequacy or non-enforcement of environmental legislation, and the need for the integration of existing legislation for environmental management and protection is a major constraint to the promotion of environmentally sustainable development in Nauru. There are other policy documents which provide broad guidance for project considerations and these include:

- National Biodiversity Conservation Strategy 1999
- National Water, Sanitation and Hygiene Policy
- National Biodiversity Strategy and Action Plan 2010
- National Action Programme 2012 in support to UN Convention to Combat Desertification
- Nauru's Fifth National Report to the Convention on Biological Diversity 2014

2. Legal and regulatory framework

20. **Environment**. In terms of environmental protection and management, Nauru does not have laws or regulations regarding either the review of proposed projects or developments or requirement for environmental impact assessment (EIA) of proposed projects or developments.

21. Until environmental legislation is passed, the DCIE relies heavily on support from the Secretariat of the Pacific Regional Environment Program (SPREP). This includes using the Strengthening EIA in the Pacific: Guidelines for Practitioners (2016) for preparing TOR for preparation of EIA and also in review and evaluation of EIA that are prepared. In response to the request from government, the environment assessment process for the project has been undertaken, and the report prepared, in accordance with the EIA Guidelines 2016 with additional elements as required to also ensure compliance with the Safeguards Policy Statement 2009 (SPS) of ADB.

22. Despite the lack of EIA legislation in place, DCIE does review environmental assessments prepared on behalf of government for projects financed by multi-lateral or bi-lateral development partners. According to the Director of Environment, the review and approval of an environmental assessment report may take up to two months and may include SPREP assistance in terms of the technical review. Once the environmental assessment report and/or proponent has either responded to any requests for further information or incorporated comments or revisions into the report, it will be endorsed and submitted to the Cabinet for approval. NUC may start developing the project after approval by the Cabinet Any conditions of approval will need to be included in the (i) contract documents for the site clearance and preparation activities and (ii) EPC tender documents.

23. **Land ownership, access and use**. The Lands Act, 1976 governs land leasing for purposes of phosphate mining industry, for other public purposes, and for the removal of trees, crops, soil, and sand, and the payment of compensation in respect of these. The Act allows the land to be leased with an agreement signed by more than three-quarters of the land owners (with endorsement from a Cabinet member). The Act also provides a schedule of fees for payment of lease fees, and payment of royalties or compensation for mining phosphate, coral/limestone removal and removal of trees. The associated fees for trees to be removed is included in the Fourth Schedule – Compensation for Removal of Trees.

24. **Avifauna protection**. The Wild Birds Preservation Ordinance, 1937 prohibits taking magpies (*Gymnorhina sp.*), snipe (*Gallinago gallinago)*, quail (*Coturnix coturnix*), Nauru canaries (*Serinus canaria*) and wild noddies (*Anous sp.*) throughout the year and black noddies (*Anous minutus*) between 01 August to 31 October every year. Harvesting of eggs of these bird species is also prohibited. Frigate birds may only be harvested with the permission of the Administrator. Possession of any trap or snare for purposes of taking these birds will be penalized. This ordinance was revised in 1967 and in 2011 to incorporate penalty provisions.

25. **Other laws**. The are other laws and regulations which will have relevance for activities during construction and subsequently operation of the project. These include:

- Nauru Rehabilitation Corporation Act 1997
- Explosives Ordinance 1924

- Disaster Risk Management Act 2008 and Statute Law Revision Act 2011
- Litter Prohibition Act 1983
- Nauruan Antiquities Ordinance 1935 (relating to antiquities, relics, curios and articles of ethnological and anthropological interest or scientific value)
- Public Health Ordinance 1925–1967
- Clearing of Lands (Amendment) Ordinance 1933 (to clarify the rights in and ownership of such trees as separate from the ownership of the land on which they are grown)
- Nauru Roads Act 2017
- Sanitary Inspection Ordinance 1921
- Plant and Animal Quarantine Regulation 2004 - to protect and regulate the agricultural and animals for the general well-being of the people of Nauru. Deals with method of preventing the introduction and further spread of invasive and/or alien species, injurious insects, pests, and diseases into Nauru.

26. Details of these legislations are provided in Nauru's online legal database: http://ronlaw.gov.nr/nauru_lpms/index.php

3. Regional and international agreements

27. The government is a party to the Basel Convention on Control of Transboundary Movements of Hazardous Wastes and their Disposal 12 November 2001. The rules came into force on 10 February 2002. Waste materials coming from Nauru to a receiving country is therefore governed by a set of rules, which will be ratified by both disposing and receiving countries (e.g. Australia, or with the country where the batteries and solar panels have been imported from and will be transported back for recycling and disposal).

28. Nauru is signatory to a number of international conventions, treaties, agreements and Memorandum of Understanding that relate to terrestrial, coastal and marine species habitats and environmental issues which signify the interest in the protection of global and Pacific environments for the benefit of future generations. Annex A lists the international treaties and agreements ratified by Nauru.

B. ADB Safeguard Requirements

29. **Purpose of the SPS**. The project will be financed by ADB and will comply with the SPS. The SPS seeks to avoid, minimise, or mitigate environmental and social impacts, and protect the rights of those likely to be affected or marginalised by project developments. The SPS consists of three policies: environment, indigenous peoples, and involuntary resettlement.

30. The project is located on government leased land with existing arrangements in place and therefore does not trigger the involuntary resettlement policy. A land due diligence report has documented and verified the lease arrangements. The majority of project beneficiaries are indigenous Nauruans and as their needs have been integrated into the design and delivery of the project, the project does not trigger the need for additional instruments to comply with the indigenous people's policy.

31. The safeguards requirement 1 - environment (SR1) is triggered by the project. SR1 aims to ensure the environmental soundness and sustainability of projects, and to support the integration of environmental considerations into the project decision-making process.[2] The SR1 requires the following, as they are relevant, to be considered and integrated into the design and implementation of projects: (i) environmental assessment, (ii) environmental planning and management, (iii) information disclosure, (iv) consultation and participation, (v) grievance redress mechanism, (vi) monitoring and reporting, (vii) consideration of unanticipated environmental impacts, (viii) biodiversity conservation and sustainable natural resource management, (ix) pollution prevention and abatement, (x) health and safety plans, and (xi) measures to protect physical cultural resources.

32. **Screening and categorization**. The SPS categorizes potential projects or activities into categories of impact (A, B, C or FI) to determine the level of environmental assessment required to address the potential impacts. The project comprises installation of a 6.0 MWh solar PV array combined with a 2.5 MWh/5.0 MW BESS on a 6-hectare (ha) area previously used for phosphate mining. The area is a spent open-pit phosphate mine with limited social or environmental values and no longer used for economic activities. The site is accessible through an existing adjacent road. The screening concluded that the works will be limited to the site, with the exception of haulage of materials and plant from the port to the site, and impacts will be site-specific and largely created during the construction phase, few if any of them are irreversible, and mitigation measures and controls from good international industry practice are readily available and can be implemented. The project has been classified as category B for environment, the appropriate level of environmental assessment for environment category B projects is an IEE or equivalent.

33. **Health and safety**. The SPS applies pollution prevention and control technologies and practices consistent with good practices as reflected in internationally recognized standards such as the World Bank Group's Environmental, Health and Safety Guidelines (EHSG). The EHSG provide the context of international best practice and contribute to establishing targets for environmental performance. Standards incorporated into the EHSG will be used in parallel with Samoan environmental standards (where they exist) throughout this document with the principals of due diligence and a precautionary approach adopted. Application of occupational and community health and safety measures, as laid out in the EHSG is required under the SPS.

[2] Refer to SPS Appendix 1 for full discussion of the Safeguard Requirements 1.

34. **Scope and limitations of the IEE**. The IEE forms part of the required documentation for the project appraisal and approval by the ADB Board and government. In general, the IEE sets out relevant information to:

- Reflect the policy objectives and relevant policy principles and safeguard requirements governing preparation and implementation of projects and/or components;
- Explain the general anticipated impacts of the project and/or components;
- Specify the requirements that will be followed for project screening and categorization, assessment, and planning, information disclosure, meaningful consultation, and grievance redress mechanism;
- Describe implementation procedures, including budgets, institutional arrangements, and capacity development requirements;
- Specify monitoring and reporting requirements; and
- Specify the responsibilities and authorities of the borrower/client, ADB, and relevant government agencies in relation to the preparation, submission, review, and clearance of safeguard documents, and monitoring and supervision.

35. The IEE report contains the initial environmental and social assessment of the pre-selected site for the project. The site has been evaluated against a set of criteria which was agreed with the NUC. The main factor that influenced the selection of the site is the presence of existing lease agreements between NUC and the land owners.

36. Project arrangements are still being discussed and confirmed between government and ADB, therefore some assumptions made in this IEE will need to be reviewed and confirmed later. The IEE will be subject to revision as part of the ADB inter-departmental review that forms part of the project appraisal process and following the review conducted by DCIE and SPREP. The IEE and EMP will be updated, as required, by the EPC contractor to ensure that the information provided through the detailed design and confirmed method for footing design and fabrication are reflected in the updated document.

3. DESCRIPTION OF THE PROJECT

A. Development of Solar Power Expansion Plan

37. In view of solar power as the least cost option for power supply in Nauru, the Solar Power Expansion Plan was developed and approved by the Cabinet. The Cabinet agreed to further investigate solar power expansion by having:

- The combination of ground-mounted solar at a site to be selected and rooftop solar to achieve the optimal renewable energy penetration of the grid.
- Funding options from donors and private sector investment to implement the plan.
- A battery energy storage system (BESS) with capacity of 2.5 MWh / 5 MW to satisfy low demand forecast and the option to increase battery capacity should demand exceed forecast.
- A plan for the optimal solar penetration of 47% by 2025.

38. Based on this, the development of 6.0 MW solar array coupled with 5.0 MW / 2.5 MWh of battery storage was conceptualized for funding partially by the government and partially by ADB. This IEE solely focuses on assessing the impacts associated with project activities to develop the project at the selected site.

B. Site Options Analysis and Selection

39. During pre-feasibility study four potential solar plant sites were investigated by the NUC. These included: the Canstruct site and prison site both in Meneng District, a vacant lot in Anabar District, and dispersed rooftop solar.

40. The sites were assessed against a number of criteria including technical, environmental, social, and constructability. Ownership of the land was deemed the most significant of the criteria. Land availability is a key risk and land not being available will potentially result in the project being unviable. Ground conditions, including geotechnical and civil conditions, were also considered as this dictates the necessary ground preparation activities. A low score in these items reflected the substantial costs to prepare the site for solar installation. Finally, shading issues and proximity to the grid were deemed the least important of the factors considered, as these can be resolved. Also, it was made public during the assessment, a new transmission line will be installed through the centre of the country which would allow for ease of connection to the grid for any of the sites.[3]

[3] The European Union will construct the 11kV transmission line as part of the solar power project co-financed with Government of New Zealand.

41. The cost to install the solar plant was not considered as a criteria for selecting the site. Costs that may vary between sites is captured by the criteria relating to that item (proximity to grid, etc).

42. The summary of scoring assessment for site selection is presented in the Table 3.1. Scores out of 5 were given to selection criteria through a weighted system; 5 being the top score and 1 the lowest. The site with the highest weighted score was identified as the most appropriate site. Given the assumed weighting, the maximum total score was 65.

Table 3.1: Site selection evaluation criteria and resulting weighted scores

Evaluation criteria	Site			
	Canstruct	Prison	Anabar	Rooftop solar
Ownership	15	9	9	15
Size	10	6	2	2
Proximity to the grid	5	5	4	5
Ground conditions	4	4	10	10
Environmental conditions	6	6	6	10
Shading issues	3	3	5	5
Site access	10	10	4	4
Total	**53**	**43**	**40**	**51**

Source: Solar Expansion Plan Report, GHD 2018

43. **Selected site**. The Canstruct site was selected for the project, and herein will be referred to as the 'site'. A total of 10.55 ha of land is allocated for solar power development at this site, the ADB-financed project will require 6ha. A key consideration was the site is comprised of nine lots all of which have existing lease agreements between the landowners and NUC. The lease agreements are for 20 years from July 2017. The lease rates are paid at a standard government rate of $8.5/m^2 per year. The leases may be renewed for an additional 10 years. On the basis of these signed agreements, NUC is permitted to use the land for solar power development.

44. Rooftop solar in combination with solar plant development at the site is no longer being considered for a variety of reasons. Therefore, this IEE does not assess environmental and social aspects of rooftop solar facilities.

45. Another portion of the site will be utilized for the Government of New Zealand Ministry of Foreign Affairs Trade (MFAT) and European Union (EU) co-financed 1.1 MW solar power plant which will require approximately 1.76 ha of land. The ADB (5.89-6 ha) and MFAT (1.76 ha) facilities will allow the remaining 2.53 hectares for future solar power expansion.

46. **Alternatives analysis**. The NUC explored possible renewable energy options namely, use of solar panels, wind resources, wave energy, and ocean thermal energy. Of these four options, the use of solar panels was deemed to provide more reliable power supply in Nauru. Solar data from existing micro-solar power facilities of up to 800 kW contributes to approximately 3% of the renewable energy generation in Nauru. Continuous monitoring of the existing solar power facilities is being undertaken to be able to model the realistic solar energy yield in Nauru.

C. Project Components

47. The major components of the project include the solar panels, inverters and battery energy storage system, including substation/switchyard (Table 3.2). Batteries to be used will be confirmed during preparation of tender specifications. The design engineer will define the technical specifications of project components during tender phase. Table 3.2 presents the list of project components.

Table 3.2: Components of Solar Power Development Project

Component	Description	Quantities
Solar array	Number of modules per 'table' JVA Solar @360 W capacity each	80 units
	Number of inverters (SMA Tripower 25000 TL)	240 units
	Number of tables per inverter	1 unit
	Total number of tables	240 units
	Total number of modules	19,200 units
Weather monitoring station	Meteorological station	1 unit
Battery energy storage system	BESS - 2.5 MW, 1.25 MWh	2 units
	BESS power converter unit	2 units
11 kV Switchyard equipment	Primary equipment (2MVA power transformer, MV transformer for 6MW solar farm)	3 units
	Primary equipment (2.5MVA power transformer, MV transformer for the BESS)	2 units
	MV cables (string to string inverters)	24,000 linear meters
	MV cables (string inverter to combiner box)	72,000 linear meters
	MV cables (combiner box to MV transformer)	30,000 linear meters
	Perimeter lighting system	1 lot
	Secondary equipment: Substation control system panel Line protection system Substation protection system panel Telecommunication system SCADA system AC & DC auxiliary system	1 lot each

Source: Feasibility Study Report (GHD, 2019)

48. **Foundation support for solar panels.** Foundation types suitable for the proposed solar panels based on the identified site ground conditions have been explored. Ground anchors and piled foundations are not preferred due to hard and granular ground conditions observed over the site extents. The preferred footing design will be determined by the EPC contractor. In any case, the ground conditions on which the foundation is to be placed on should be of 100 kPa bearing capacity. Although the risk of cyclones in Nauru is generally low, the foundations will need to be designed to consider the potential for uplift. The footing material can either be cast in place or pre-fabricated on island. In both cases, concrete production will be required from batching plants on the island.

49. **Managing corrosion.** Due to the karstic and alkaline nature of the geology, careful consideration should be made of the materials used. Corrosion of steel and or concrete in this environment may be aggressive and should be assessed.

50. **Access roads**. Existing access roads to the site are fit for purpose and no widening or upgrading is deemed necessary. The EPC contractor will confirm this during the detailed design phase. Surface drainage is not observed on the island due to the karstic landscape. Where well compacted construction platforms are built, sufficient gradient should be provided that water can run-off to areas where soakage can occur.

51. Subgrade strengths of internal access roads is adequate due to the strength of the limestone foundation. When filling the land, it is recommended the basecourse be compacted to 95% maximum dry density for the temporary/permanent access road as otherwise rutting and potholes will be widely observed due to the abundance of voids in the limestone.

52. **Ancillary facilities**. The ancillary or support facilities are those that are required either for the construction of the project or to support continuous operation project. These include construction camps, laydown areas, temporary waste storage facilities and water storage facilities. It also includes office maintenance, water storage tanks and pipelines/sprays during operation phase.

53. **Labor requirements**. The construction of the project will require skilled and unskilled workers. Workers for the site clearance and preparation activities will be provided by NRC. The number of workers required for the installation works, specific skills and qualification will be determined by the EPC contractor. Typically, around 20 to 30 workers are required for a solar power development of this size.

54. Table 3.3 presents an example table of information to be provided by the EPC Contractor during the detailed design phase. This same table can be updated by NUC during operation phase.

Table 3.3: Project skills requirements during construction and operation phase

Skills/role	Estimated number	Qualification
Construction phase		
Site manager	1	Civil engineer - experience in project management
Site engineer	1	Civil engineer - experience in solar power
Health, safety and environment	1	OHS training, environmental monitoring experience
Heavy machineries operator	7	Skills training certificate
Electrician and steel fixer	5	Skills training certificate
Truck drivers	5	Appropriate driver's license
Labourer	5	Manual labour experience
Security guards	4	Security training
Operation phase		
Team leader	1	Solar power specialist
Plant operator	1	Engineer or equivalent
Maintenance personnel	1	Electrician or equipment maintenance personnel
Vegetation maintenance, panel cleaning	1	Vegetation management, panel cleaning/inspection
Security guards	3	Experience as security guard

55. **Equipment and plant**. A number of equipment will be required for the construction, operation and maintenance of the project. The equipment to be used will be determined by the NRC during site clearance activities, EPC contractor during the construction phase and NUC during operation phase. Typical equipment used for site preparation include rock breakers and backhoe to collect the rocks and place them in trucks. Excavators will also be used to prepare trenches for cables. Cranes will be used to lift the solar panels and batteries. Table 3.4 list typical plant required during construction.

Table 3.4: List of construction equipment requirements

Equipment	Estimated number	Frequency of use
Construction phase		
Excavator	3	Daily during site prep. + footing construction
Crane for lifting solar panels	1	Daily during solar panel placement
Trucks for delivery of materials	2	During delivery (estimated 5 days)
Pile driver for foundation	1	Daily
Crusher for pinnacles	1	Daily during site preparation
Drilling equipment for explosives during blasting	1	As needed depending on site conditions
Small backhoe for trenching	1	Daily during cable trenching
Water truck	1	Daily

56. **Materials handling and management**. The project will be built using pre-fabricated materials delivered to Nauru by sea, to the port, and transported to the site using service trucks or appropriate heavy equipment for the material to be delivered. These pre-fabricated materials and equipment will be used only during the day. Construction during night time will be prohibited to avoid generating residual noise impacts in the nearby Regional Processing Centre (RPC) facility which is located 300m from the project site.

57. **Water requirements and supply**. The project will require a regular supply of water for periodic cleaning and maintenance. Water sources and supplies in Nauru is limited and the sustainable supply of water during operation and cleaning of the solar panels is a concern. The average monthly demand for cleaning the panels with a total area of 3.7ha (actual area of the panels to be installed) is estimated to be 0.166 ML. this is equivalent to two litres of water per panel per week. During rainy days, the demand for water may be reduced as rain naturally washes off the dirt that has accumulated on the panel. Water demand for cleaning the panels would be at its peak during dry weather conditions (or in the month of May when average rainfall is the lowest). Rainwater supply is abundant from December to March.

58. Water supply in Nauru is provided by a desalination plant, which also requires energy and is process intensive. The supply of water for cleaning the panels from the desalination plant may not be practical and it would be costly to truck the water regularly for purposes of washing the dirt on the panels in the long-term. The project feasibility study, therefore, suggests harvesting rainwater using gutters to collect the water and store in an underground tank, which could then be used for routine cleaning and maintenance of the panel surfaces. The size of the gutter will be determined based on the strength of the panel structure and rainfall intensity. The gutters will lead to pipes that will convey stormwater to an underground tank. The pipe size will be based on the extent of the gutter system draining to it. During wet months, excess runoff from the solar panels will exceed the storage capacity of the system. The proposed tank will have a by-pass outlet that will discharge to the surrounding environment. The water from the tank is then pumped out during routine maintenance and cleaning of the panels.

59. The feasibility study undertook a long-term monthly water balance using 70 years of rainfall data to determine whether rainwater harvesting can meet the forecasted demand. Using this historical data, the volume of the storage tank was estimated to be 83 kL, which is equivalent to twice the weekly demand. The double tank capacity was taken to reduce the deficit of water demand during dry months from approximately 3.3% to 0.8%.

D. Delineation of Project Impact Area

60. The IEE has been undertaken on the basis of identifying the project impact area as illustrated in Figure 3.1. Direct impact areas are those where the project will be built, the road on which the materials will be transported, from the Nauru Port to the project laydown area to be located within the area marked for solar power development, and within the area leased by NUC.

61. The temporary facilities, such as the batching and crushing plant, and haulage routes for the materials to be delivered through the port have been indicatively marked on Figure 3.1.

Figure 3.1: Project area and site layout

62. Additional impact areas will be identified by the EPC contractor during project tender phase such as location of on-island materials such as gravel and sand. Further impact assessment shall be performed, and risk assessment and EMP will be updated to address any additional impacts not identified in this document.

63. The indirect impact areas are those within the area of influence of the proposed location of the project, which may experience nuisance from noise and dust generation and disturbance due to movement of vehicles and heavy equipment during construction phase, and operation vehicles of NUC during routine maintenance at the facility. The direct and indirect impact areas are localised and are limited only within the delineated project area boundaries, the access roads to the site, and the port where the materials will be brought in (Figure 3.1)

E. Project Development Activities

64. The development of the project is divided into pre-construction, construction, operation, and decommissioning phases. The activities associated for each of the phases are described in the next paragraphs. The following assumes that:

- The project has been approved by the ADB Board
- The government (through the DCIE) has endorsed the IEE and issued approval for the project
- The SPS requirements and conditions of project approval have been integrated into the EPC tender documents
- The EPC tender documents have been reviewed by ADB
- The CSC has been recruited to support the NUC in evaluating tenders (including submission of bid evaluation report to ADB for review) and awarding the EPC contract.[4]

1. Pre-construction phase

65. During pre-construction the main activities include the site clearance and preparation activities to be undertaken by NRC and additional site survey activities as required to inform the detailed design, completion and review of detailed design undertaken by the EPC contractor. This will include updating of the IEE and EMP and risk assessments to inform the development of the SEMP and CEMP, preparation and submission of the SEMP and CEMP for review and clearance, mobilization, import and biosecurity clearance of materials, plant and equipment, site establishment, and continuing engagement with land owners and other stakeholders to provide information about the project.

66. Site preparation activities will include the earthworks to ensure the identified location meets the conceptual design and solar plant layout. They will require breaking down the pinnacles, cutting the trees and shrubs and cutting and filling of the solar PV array platform area.

[4] Firms bidding for the EPC contract will have to comply with the technical and commercial requirements set out in the tender documents and submit the tender as required by NUC. NUC (supported by the CSC) will assess the compliance of the documentation based on the requirements and prepare a bid evaluation report for review by ADB.

67. Options for site clearance to be undertaken by NRC include: rock breaking, drilling and blasting, and site filling and compaction; these are discussed further in Sections 5 and 7.

68. Site preparation will be undertaken by NRC while the EPC contractor is completing the detailed engineering design. For site clearance and preparation activities, the government and ADB will agree that: (i) SPS and good industry practice, in addition to Nauru laws, will apply to the land clearance and preparation activities; (ii) prior to activities commencing the IEE is cleared/approved by ADB and government; (iii) the pre-construction elements of the IEE will be integrated into the government's bid/procurement documents governing the NRC works; (iv) NRC will recruit a suitably qualified and experience specialist to help them prepare their site-specific environmental management plan (SEMP) for the site preparation activities; (v) ADB will have the opportunity to review and comment on the government's bid/procurement documents; (vi) government will engage an independent (not employed by NRC) engineer and environmental specialist, who—along with ADB—will review and clear the SEMP prepared and submitted by NRC; and (vii) the independent engineer and environmental specialist will supervise, monitor and report to NUC and ADB on the NRC works and implementation in compliance with the approved SEMP.

69. The project's grievance redress mechanism (GRM) should be established at this time and information about how to access the GRM distributed widely.

2. Construction Phase

70. After detailed design has been completed and the site has been cleared and prepared, site establishment works will commence including installation of the perimeter fence and temporary facilities, which includes office area and portable toilets, establishment of laydown areas, earthworks or excavation within the site including internal access roads, drainage system, cable trenching, materials haulage and stockpiling, concrete batching, construction of the foundations, concrete slabs and array platforms.

71. Once the site is prepared, installation and building activities can take place including:

- Construction of the substation, operations and maintenance building and installation of the solar PV system and BESS equipment
- Installation of ground-mounted structures, solar PV panels, inverters and connection boxes
- Installation of the MV transformers, BESS and BESS inverters
- Installation of transmission line poles and line stringing
- Electrical connection and step-up of the system (low to medium voltage, medium to high voltage and high voltage to the grid) which includes the protection and SCADA system.

72. After the civil and electrical works have been completed, the plant will be tested and commissioned by the EPC contractor together with NUC and the Engineer. Training of plant operators, by third party provider, will be conducted to ensure normal operation of the solar PV plant. Training manuals will also be provided for guidance.

3. Operation Phase

73. The solar PV plant is expected to operate for 25 years (or more) after testing and commissioning. During the operation phase, the operators shall conduct regular inspection and maintenance of the solar PV plant and the BESS based on the operational and maintenance manual provided to them. The operation and maintenance activities will include the following:

- Cleaning of the panels
- Vegetation maintenance
- Regular inspection of the solar PV plant and its equipment
- Conduct of schedule and unscheduled maintenance
- Report creation for documentation.

74. Operational and maintenance activities may require the operator to be on-site monitoring the performance of the solar PV plant while in operation (that will be at least 8-12 hours during the day). Depending on the requirement, operators or security may be present as well during the night time and it is advised that a shifting schedule is implemented for daytime and night time work rotation.

4. Decommissioning Phase

75. The project lifespan of 25 years based on the project warranty and its equipment durability may be extended, however, it is expected that during this time the solar PV plant and its equipment such as solar PV panels, inverters, transformers, etc., including the BESS, will be disposed either on decommissioning of the whole solar PV plant or when the equipment cannot be repaired. The batteries need to be replaced after 10 years.

76. A decommissioning plan will be outlined by the EPC contractor during the tender process and this will be developed in detail toward the end of the operations phase. Activities in this phase may include:

- Dismantling of the components and equipment of the solar PV plant
- Proper disposal of the components and equipment of the solar PV plant offsite
- Shipping of the waste materials outside of Nauru to Australia for recycling or return to its manufacturer for disposal, whichever is applicable.

F. Implementation Schedule and Cost Estimate

77. **Implementation schedule**. The project is anticipated to commence wit site preparation activities ahead of formal project approval, the bulk of design, construction and installation activities in 2019, with commissioning to be expected in 2021. NUC will request the funding for the site preparation from the government within the 2019-2020 budget. Site preparation will be conducted by the NRC and will be started as soon as the budget is approved and funds released, provided that the seven matters/items required by ADB are met or in process of being met. The EPC contractor may be contracted by December 2019, enabling detailed designs to be completed before site preparations have finished. Following installation of the solar panels, batteries and associated facilities, the project commissioning is expected in December 2021.

78. **Estimated cost**. Based on the project feasibility study, overall cost of the project, excluding site clearance, is estimated at US $18.6 million.

4. DESCRIPTION OF THE EXISTING ENVIRONMENT

A. Project Location

79. Nauru is a Pacific Island country located at coordinates 0°31'S 166°55'E. It lies 41 km south of the equator. The capital of the country is Yaren, where the international airport and port are located. The total land area of the country is 21 km^2, with the longest distance roughly 6 km and shortest distance is 4 km across the island. The island is divided into 14 districts with varying land areas, and dispersed number of inhabitants. The center of the island is at a higher elevation of approximately 20 to 45 meters above sea level, with some areas ranging from 50 to 70 meters above sea level. The center section of the island is commonly referred to as the “topside”. The topside has extensively been mined for phosphorus, which has changed the topography and ecosystem of approximately 90% of the total land area in Nauru during the peak of mining operations in the 1980s. This section of the island has remained to be uninhabited after the mining operations.

80. The areas near the reef on the perimeter of the island, is called the “bottom side”, where limited economic activities and inhabitants are concentrated. The proposed Nauru Solar Power Development Project is located at the “topside” at coordinates 0°32'S 166°55'E in Meneng District. The site is located approximately one kilometre from the “bottom side” or inhabited area of the island. The description of existing environmental and social conditions is described in this section.

B. Establishing Baseline Conditions within Project Area

81. Annex B provides a summary of key environmental and social aspects investigated as part of this IEE and the proposed methodologies and sources of information. The table was developed based on the information available and project understanding at the time of writing the report (circa. April 2019). The references used in preparing the IEE and the present understanding of project activities are indicated in the table to put into context the impact assessment of the project activities.

82. The IEE report will be reviewed and updated as more information becomes available after the feasibility study has been confirmed. The impact assessment was performed based on the information provided in the Feasibility Study report completed in April 2019. The IEE (including risk assessment) will be updated when the details of the project are further defined by the EPC contractor.

C. Physical Environment

83. This section describes the physical environment within the direct project impact area. The site-based physical environment has been characterized to determine the extent of the effect of project activities on existing land features and surrounding physical characteristics within the areas where the proposed solar plant is to be built. Based on initial assessments, the solar power project will result in changes in landform (site clearance) and will necessarily require land use change from mining rehabilitation area to solar power development.

84. The characterisation of physical environment includes geology, topography, soils, weather and climate, climate change, water resources, waste management, and natural hazards assessment.

1. Geology, soils and topography

85. **Geology**. The island of Nauru is positioned in the Nauru Basin of the Pacific Ocean, on a part of the Pacific Plate that formed at a mid-oceanic ridge between mid-Eocene and Oligocene times. A submarine volcano built up over a hotspot, and formed a seamount composed of basalt. The seamount rises over 4,300m above the ocean floor. This hotspot developed simultaneously with a major Pacific plate reorganization.[5] The volcano was eroded to sea level and a coral atoll grew on top to a thickness of about 500m. The original limestone has been dolomitized by magnesium from sea water. The coral was raised above sea level about 30m and is now a dolomite limestone outcrop which was eroded in classic karst style into pinnacles up to 20m high. To at least a depth of 55m below sea level, the limestone has been dissolved forming cavities, sinkholes and caves.

86. Nauru is an uplifted limestone island, initially covered in guano that had accumulated over centuries. Nauru's 'guano' made for the richest and purest source of phosphate in the world, which was primarily used in fertilizer. The land area consists of a narrow coastal plain or "Bottomside", ranging from 100-300m wide, which encircles a limestone escarpment rising some 30m to a central plateau, known locally as "Topside"

87. **Soils**. The coastal soils of Nauru are among the poorest in the world. They comprise a shallow (only about 25 cm deep), alkaline, coarse-textured layer of organic matter, coral sand, and limestone fragments that overlay a limestone platform. They contain more coral gravel than sand in the lower horizons. Potassium levels are often extremely low, and pH values of up to 8.2 to 8.9 and high $CaCO_2$ levels make scarce trace elements, particularly iron (Fe), manganese (Mn), copper (Cu), and zinc (Zn), unavailable to plants. Fertility is, therefore, highly dependent on organic matter for the concentration and recycling of plant nutrients, lowering soil pH, and for soil water retention in the excessively well-drained soils.

[5] GHD. 2018. Nauru Solar Power Project Feasibility Study - Geological Study.

88. The plateau soils of Nauru vary from shallow layers on the tops of limestone pinnacles, composed primarily of organic material and sand or dolomite with very little phosphate, to deep phosphatic soils and sandy phosphatic rock up to over 2m deep between the pinnacles. Top soils range from 10-30cm in depth, overlaying a deeper material that is frequently reddish yellow and between 25-75cm in depth, changing to pinkish grey at greater depth. Undisturbed plateau soils (what little remains) have a high level of organic material and are generally fertile. Calcium dominates the exchange complex and exchangeable magnesium is also high. The trace elements manganese, copper, cobalt and molybdenum levels are very low, and these, plus iron and zinc, are rendered unavailable to plants under pH values >6.5. Poorly developed but relatively fertile, wet soils are found around Buada Lagoon and in some poorly drained swampy areas near the base of the escarpment on Nauru (Morrison 1994).

89. The central plateau comprises a matrix of coral-limestone pinnacles and limestone outcrops, between which lie extensive deposits of soil and high-grade phosphate rock covering approximately 1600 ha (over 70% of the island). This area has been extensively mined with the ecosystem drastically altered (SPC, 2005 and Fenner, 2013). Scattered limestone outcrops or pinnacles can also be found on both the coastal plain and on inter-tidal flats of the fringing reef.

90. **Topography**. Nauru is surrounded by a fringing coral reef ranging from 120 m to 300 m wide, which drops away sharply on the seaward edge to a depth of approximately 3 km. The coastal plain is a zone of sandy or rocky beach on the seaward edge, and a beach ridge or fore-dune, behind which is either relatively flat ground or, in some places, low-lying depressions or small lagoons filled by brackish water (e.g. Buada lagoon) where the surface level is below the water table (freshwater lens). The raised central plateau (Topside) generally lies between 20-45 m above sea level with occasional elevations of up to 50-70 m.

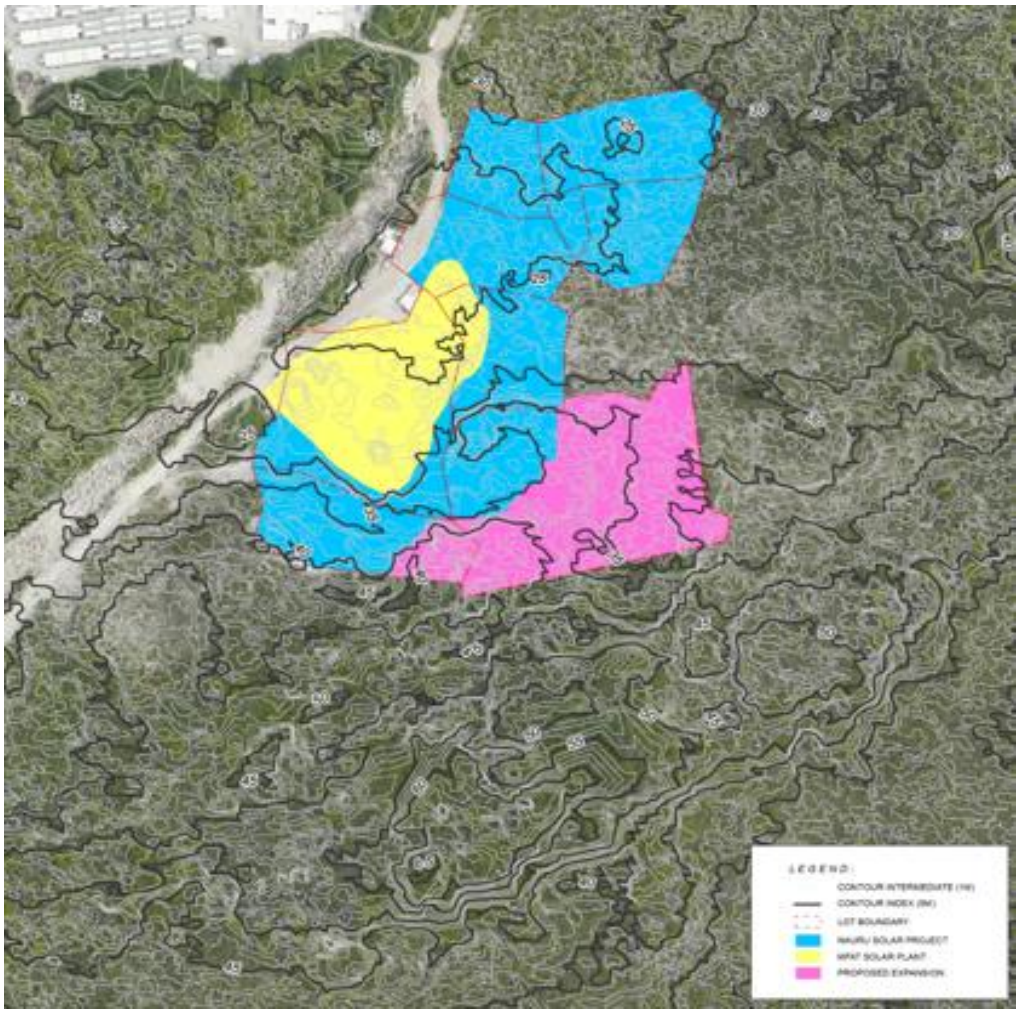
91. The highest point on the island is Command Ridge in the west at an elevation of 71 m above sea-level. Buada Lagoon, a landlocked, slightly brackish, freshwater lake, and its associated fertile depression (about 12 ha in area), is located in the low-lying southwest- central portion of the island at an elevation of about 5 m above sea- level. Like other coral atolls and islands, the soil is derived from limestone which has been formed as a result of coral formation over thousands of years. There are no andesitic rock formations of volcanic origin present. The soil is alkaline and therefore it does not support the growth of certain plants and trees. The poor and infertile nature of the soil is due to its alkalinity, porosity and lack of essential elements that limit fertility. This combined with the long history of mining and surface soil removal has created an environment that restricts intensive agricultural activities.

92. Before the phosphate mining commenced, Nauru had a cap of phosphate which partially or totally infilled between the limestone pinnacles. The phosphate was believed to originate from guano, which is accumulated excrement of bird over the last 300,000 years. Later studies seem to indicate that marine detritus deposited when the Island was submerged may have contributed to the deposit.

93. The land at Topside was exploited during the phosphate mining activities since the early 1900s that peaked in 1980s. As a result, approximately 80% of the total land area of the island was strip-mined and resulted in land not being suitable for human habitation or socio-economic development. The phosphate mining areas were cleared of vegetation and were left barren along with naturally occurring coral limestone pinnacles.

94. The 5.89 ha area identified for the ADB project is marked in blue in Figure 4.1. The area marked in yellow is where the MFAT Solar Power Facility will be built, while the pink area is the area remaining after the ADB and MFAT projects have been developed and will be retained as a future expansion area. The site, especially the blue area, still consists primarily of limestone pinnacles with depressions. The central and southern sections of the site are relatively flat with minor pinnacles, the northeast area is densely populated with 5-7m high limestone pinnacles.

Figure 4.1: Topographical map of development area

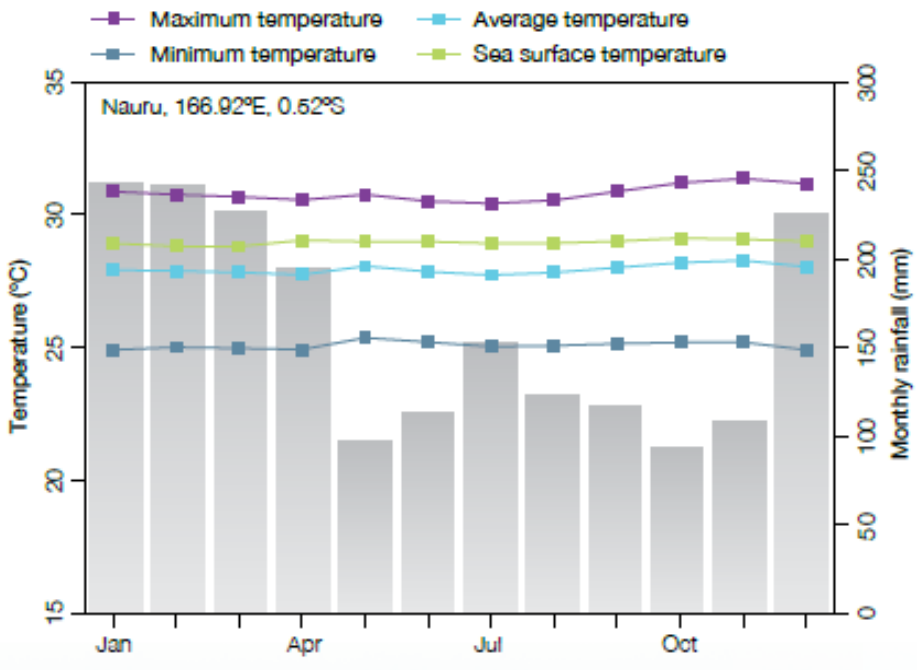


2. Climate and climate change

95. **Climate**. Nauru experiences a tropical maritime climate, with very little seasonal variability in air temperature. Mean minimum temperatures range from 25 to 25.5 ˚C throughout the year and mean maximum temperatures range from 30.5 to 31 ˚C. Sea surface temperatures are quite consistent at about 29 ˚C throughout the year. The average annual rainfall total is about 109 cm, but there is seasonal variability in this, with minimum rainfall amounts occurring from May to November resulting in about 100 mm per month (Figure 4.2) There is also considerable inter-annual variability in annual rainfall amounts; for example from a low of 300 mm in 1950, and 359 mm in 1999, to a high of 4,572 mm in 1940 (PCCSP data). During La Nina events, Nauru can experience drought, which leads to stress on trees, such as coconuts and breadfruit.

96. While there are no clear spatial variations in temperature and rainfall within Nauru, the seasonality in wind speed and direction has implications for sea conditions on the west and east coasts of Nauru (PRIF, 2015). During the wet season (December-April), winds are primarily from the north (northern trade winds), which leads to greater wave heights on the west coast of Nauru (and smaller waves on the east coast). Extra-tropical storms can produce quite high winds and increased swell heights (for example, the cyclone in March 2015). During the dry season (May-November), winds are generally from the northeast and southeast (trade winds), which produce larger waves on the east coast, and relatively calm conditions on the west coast.

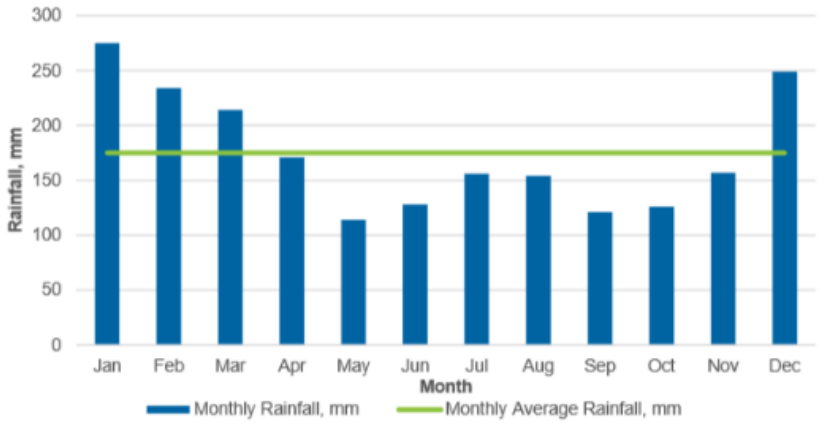
Figure 4.2 - Seasonal rainfall and temperature in Nauru



Source: PACCSAP (2014)

97. Rainfall patterns have been recorded from 1915 to 1887 (Hydrogeology and Groundwater Resources of Nauru Island, Central Pacific Ocean, Jacobson & Hill, 1988), and is illustrated in Figure 4.3. Wet months typically occur in December to March. The annual average rainfall over the recorded period is 1,994 mm, with high variability throughout the year. The drier months occur from May to November.

Figure 4.3: Rainfall patterns in Nauru 1915 - 1987



Source: PACCSAP (2014)

98. **Climate change**. Most climate change modelling shows that tropical storms will increase in frequency and severity and will be a characteristic of the project area in the future. Many of these extreme weather events can be linked to the El Niño/La Niña-Southern Oscillation (ENSO) pattern, but ENSO is predicted to also have an effect in modifying trade winds in the Pacific, strengthening of tropical deep convection, and alteration of monsoon flow. Nauru is not directly impacted by tropical cyclones, as it lies on the equator however indirect impacts resulting from these weather systems do have a direct impact on the nation weather, especially sea conditions (waves swell size and direction).

99. It is anticipated that with global warming trends, increased intensity albeit less frequency of extreme weather events may be expected. Adopting an integrated “all hazards” approach to disaster risk management will be vitally important for the future development of the Nauru. The main vulnerabilities faced by the people of Nauru can be summarized as (i) sea-level rise which exacerbates the severity of sea surges, increased rates of coastal erosion and heightened risks to public and private infrastructure (ii) more intense and more frequent storms which increase risks of damage from sea surges, high winds and strong inundation on public and private infrastructure and (iii) more frequent and longer periods of drought: which cause both intense short term difficulty and, of greater concern, long term damage to the freshwater lenses.

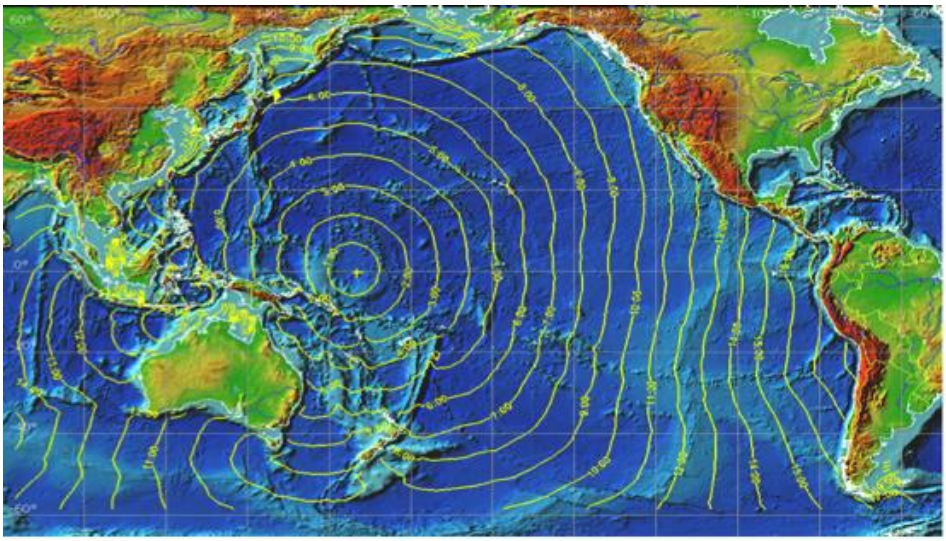
100. In summary climate change projections for Nauru (PCCSP, 2011) indicate that temperatures will likely continue to increase, with more very hot days expected in the future. Rainfall has not shown a clear temporal trend since 1950 but is expected that there will be more extreme rainfall days and less drought. Sea level near Nauru has risen over the last century and is expected to rise throughout the 21st century (15-20cm by 2050). Ocean acidification is also expected to increase in the future, with negative impacts on coral reef ecosystems. The project, being located at Topside, is not foreseen to be affected by impacts associated with sea level rise and wave action, as it is located at a higher elevation ranging from 30-40m above sea level.

3. Natural hazards

101. Nauru is not exposed to natural hazards. Cyclones have not been recorded in Nauru (Nauru Port Project IEE, March 2017). However, climate change related disasters are an increasing concern due to potential rise in sea levels and its potential effect in reducing the land area of the island.

102. The historical tsunami database, dating back several centuries including anecdotal evidence, contains very few reported incidences at Nauru. Since its installation in 1993, the SEAFRAME tidal gauge at Nauru has detected seven tsunami events, none damaging (Figure 4.4). The largest tsunami at Nauru recorded by the SEAFRAME is a signal of trough-to-peak height 16 cm following a magnitude 8.2 earthquake near Irian Jaya (Indonesia) in February 1996. No earthquakes originating on Nauru have been recorded, and there is no anecdotal evidence of earthquakes. If a submarine earthquake did occur along the Marianas Trench offshore of the Japanese islands, the ensuing tsunami would reach Nauru in approximately six hours.

Figure 4.4 - Tsunami travel times to Nauru



Source: PACCSAP Pacific Country Report Sea Level and Climate (2010)

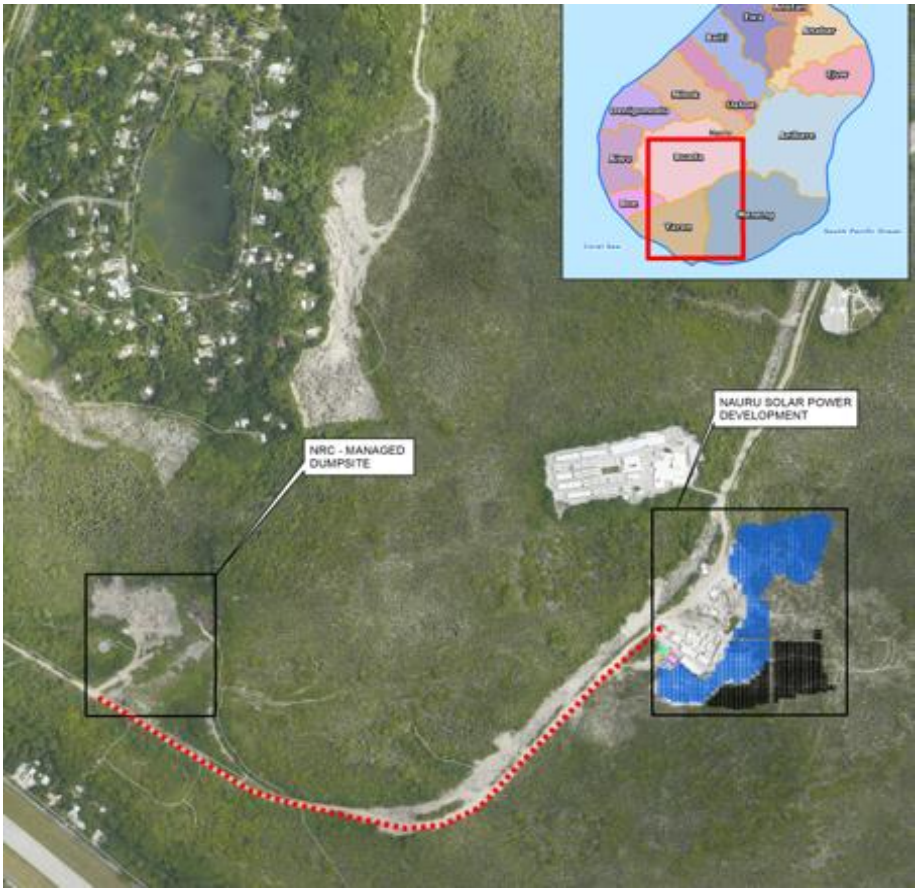
4. Water resources

103. There are no rivers or surface running water features in Nauru. The surface water resources are limited to the fresh water Buada Lagoon, a 14 hectare-water body in the southwest part of the topside (located 1.3km from the project site), which is not used for drinking water. Freshwater resources exist underground as water lenses floating on seawater. There are no water bodies located within or near the project site. The sea (from the Nauru Port) is approximately 2.6km away (closest sea shore in the Meneng District is about 1.1km away).

5. Waste management

104. Management of solid wastes in Nauru is the responsibility of the NRC. There is one sanitary landfill on the island handling wastes for various materials, the bulky wastes are most evident which includes used cars, abandoned parts of mining processing equipment, scrap metals and other materials which can be further recycled. Figure 4. depicts the location of the NRC operated open dump site, which is approximately 1.5 km from the project site.

Figure 4.5: Location of NRC managed dumpsite in Nauru



105. The landfill facility is fenced and accessible using an old mining access road. The bulky wastes are not compacted and left exposed to rainfall in an open dump area located south-west of the island. There appears to be no recycling facility on the island.

106. During the site visit in July 2017, a scrap metal storage yard was observed to exist on the island (see Plate 4.1)

Plate 4.1: Scrap metal yard in Nauru

6. Unexploded ordnance

107. Significant volumes of ordnance were used on Nauru by the US forces during World War II (WWII). These originated both from US air force bombers and naval vessels (green area on Figure 4.6). The bombing targeted the area from the Nauru Port—in the vicinity of Arijejen and Orro, which is believed to be the Japanese troop accommodation area—to the airfield at Yaren and Command Ridge (Boe) and all areas to the south and southwest (the airfield). Unexploded ordnance (UXO) have been located in other areas of the island and have been located during topsoil disturbance associated with the mining operations.

108. Remnant bomb craters are found throughout the port area including the reef flat adjacent to the north-western end of the runway and approximately 700m south of the port. UXO detection associated with mining operations is still a threat in areas that have not been previously mined (this is only a small proportion of Topside).

109. Although the area has undergone significant physical changes and construction since WWII, UXO continue to be located throughout this area and therefore remain a serious threat to humans. Recent UXO discoveries (December 2015) include a 5-inch explosive projectile located at the foreshore at the southern end of the runway.

Figure 4.6: Location of WWII US forces bombing target area on Nauru

110. Considering the project site has been exploited during mining operations, presence of UXO within the solar power development area is unlikely. Given the historical and anecdotal information on unlikely presence of UXO (Ronphos, NUC, and NRC in March 2019) and therefore further UXO survey is no longer necessary. This, however ,does not prevent NRC from taking the necessary precaution to assess site safety against potential encounter with suspected UXO during site reconnaissance and preparation for construction activities.

D. Biological Environment

111. This section describes key biological environment aspects including terrestrial vegetation, terrestrial fauna, and sensitive habitats in Nauru and specifically at the proposed project site.

1. Terrestrial flora

112. The indigenous flora and vegetation of Nauru can be regarded as among the poorest and limited in the world. Based on various terrestrial flora surveys conducted from the 1980s to 2007, the total number of indigenous and introduced plant species in the island is only 63 and 510, respectively (Thaman, Hassall, and Takeda, 2009). Physical isolation from other Pacific islands, expansion of monocultural plantations especially coconuts, and over seven decades of open-cast phosphate mining have led to the serious degradation of the island's floral diversity (Thaman, 1992). There are no mangroves on the west coast of Nauru (there are a few *Bruguiera gymnorhiza* and *Rhizophora stylosa* trees around the anchialine ponds in Anabar on the north coast, which have a subterranean connection to the sea-oak.

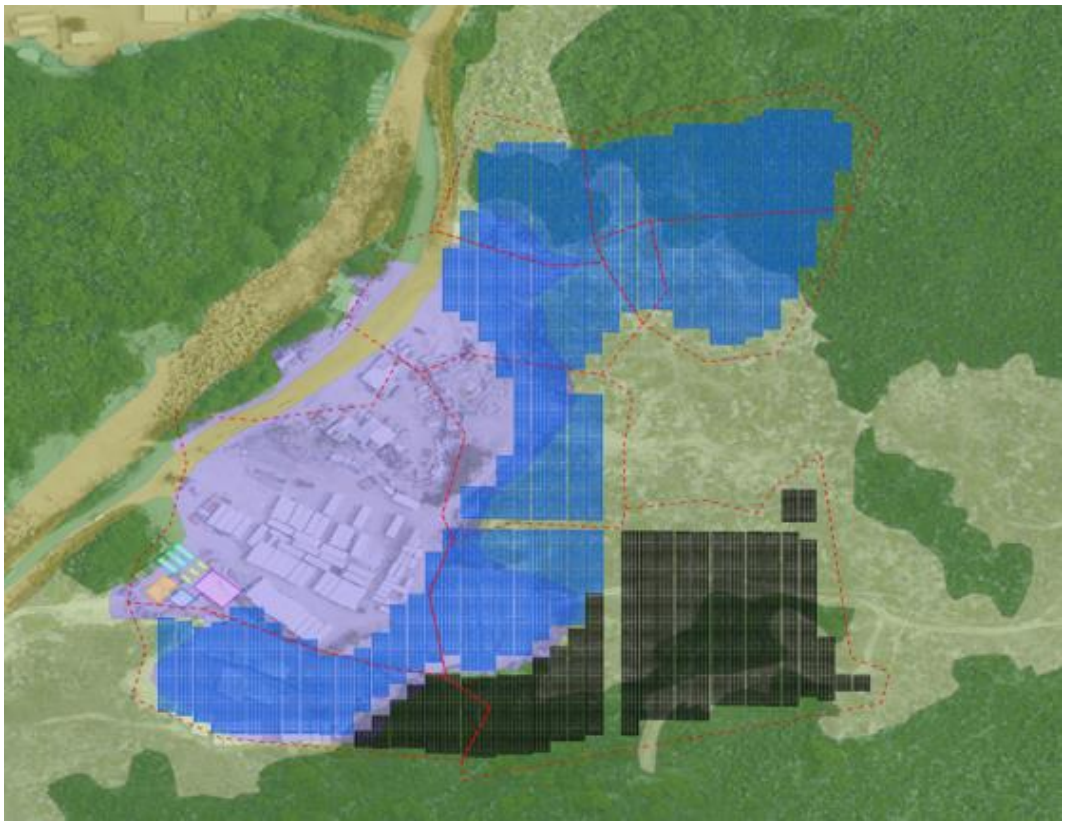
Plate 4.2: Dominant flora species within the project site

Clockwise from upper left: bin (*Leucaena leucocephala)*; emet (*Scaevola taccada*); idibener (*Premna serratifolia*); deneno (*Morinda citrifolia*); tanenbaum (*Casuarina equisetifolia*); and iyo (*Calophyllum inophyllum*)

113. The general vegetation type of the site is a combination of open or ruderal, dense vegetation and light regrowth (Figure 4.7). Purple denotes the mined area; dark green denotes dense vegetation and light green/grey denotes light regrowth. Open or ruderal areas are composed mainly of fast-growing grasses, sedges and shrubs.

114. Dense vegetation can be found in areas that have been mined out and left to regenerate for 15 years or more. Within these vegetation areas, a number of monospecific stands can be observed. The most notable of which are stands of Leucaena leucocephala, iyo (*Callophyllum innophyllum*), and *Adenanthera pavonine*,-eaeo (*Ficus prolixa*) association.

Figure 4.7: Land cover and vegetation map



115. Based on interpretation and analysis of an available aerial photo of the project site, 1.53 ha are classified as dense vegetation, which will be covered by the proposed project footprint and another 1.18 ha may be covered by the project's future expansion (not within the project scope but included in this assessment). Covering 3.36 ha of the project's footprint, are light regrowth vegetation areas, characterized by regeneration that are less than 15 years old. The most notable species observed in this vegetation type is emet (*Scaevola taccada*) usually found in between limestone pinnacles and outcrops where sufficient amount of soil and sand are present for the plants to thrive.

116. Other plant species observed in this type of vegetation are irin (*Tournefortia argentea*), *Muntingia calbura*, and some solitary tanenbaum (*Casuarina equisetifolia*), eoerara (*Ochrosia elliptica*), and *Ficus prolixa*.

117. **Non-native and invasive plant species.** Based on several botanical surveys conducted in the past decades, the vegetation of Nauru can be described as an assemblage of introduced, naturalized, and non-native species of flora. Endemic and or unique species of flora are not present in the island. Native and naturalized species were reported to be around 56 to 59 respectively (Thaman 1992; Thaman et.al. 2009). More than 500 out of 573 species of flora that are found in the island are considered non-native or introduced (Thaman et.al. 2009). From this number at least six species are considered as highly invasive and recorded within the project area (Table 4.1:).

Table 4.1: Invasive species of plants recorded within the project site

Species Name	Local Name	Remarks
Leucaena leucocephala		Cultivated as fodder, for green manure, as a windbreak, for reforestation, as a biofuel crop etc. This species can form dense monospecific thickets and is difficult to eradicate once established. It renders extensive areas unusable and inaccessible and threatens native plants.
Casuarina equisetifolia	Christmas tree, Tanenbaum	Adventive and actively spreading on some of the regenerating mined sites, particularly around the topside.
Adenanthera pavonina	Bin	This is a fast growing tree included in the Global Compendium of Weeds as a natural and agricultural weed. It is commonly planted in agroforestry systems for green manure, animal forage, and soil improvement. This species is considered t*hroughout the* Pacific as one of the worst invasive plant species. In Nauru, *A. pavonina* is observed colonizing disturbed and undisturbed forests found along escarpments and on pre-mining limestone pinnacles.
Sphagneticola trilobata	Trailing daisy	*Wedelia* has become extremely invasive in most Pacific islands and has the ability to successfully outcompete local indigenous plants in coastal sandy areas, roadside and wetlands.
Coccinia grandis	Ivy gourd, Knob vine	A minor food plant, commonly grown by Indians and other Asians, was seen restricted to growing on trellis fencing bordering vegetable gardens at Buada in 2007. It has shown itself to be a very serious weed of gardens, disturbed sites and inner coastal forests in neighbouring Fiji where it grows into weedy liana with knobs forming along the climbing trunks.
Eustachys petrea		A very aggressive grass that has taken over and outcompeted other introduced grasses and herbs, and seedlings of woody plants. It was seen present and spreading for the first time in 2007 in the area of the mining rehabilitation trials. Has proven potential to spread rapidly in dry tough environments.

Source: Government of Nauru - Rapid Biodiversity Assessment (2015)

118. **Conservation of important plant species.** The Nauru BioRAP report in 2013 has recommended nine species of flora for conservation and protection due to their rare status in the island and their value to Nauru's indigenous knowledge and traditional practices. Three out of the nine species can be found within and near the vicinity of the project's boundary. These species are eongo (*Cordia subcordata*), eora (*Erythrina variegata*), and eoerara (*Ochrosia elliptica*). Eongo is a littoral species valued for its timber, only few species have remained in the island. Eora is another littoral species but can be also observed on highly dense vegetation. A number of Eoerara was observed within the project site, this species was initially planted to provide shade around the accommodation areas.

119. Based on international wildlife conservation list and classification (Table 4.2:), i.e. the International Union for the Conservation of Nature (IUCN) and the Convention on International Trade of Endangered Species (CITES), only three species recorded were identified as least concern in the IUCN 2017 Red List while none were identified in the CITES Appendices I - III.

Table 4.2: List of flora species classified under various conservation categories

Species Name	Local Name	IUCN 2017 Red List Classification	CITES Appendix
Cordia subcordata	Eongo	Least Concern	Not classified
Erythrina variegata	Eora	Least Concern	Not classified
Ochrosia elliptica	Eoerara	Not in the list	Not classified
Callophyllum innophyllum		Not in the list	Not classified
Pteris vittata		Least Concern	Not classified

Source: IUCN – Red List (2017)

2. Terrestrial fauna

120. The Nauru BioRAP[6] report provided a comprehensive discussion on Nauru's terrestrial fauna population. Due to the island's size and terrain, finding and encountering the reported species within and adjacent the project site is highly probable. Based on the report, at least 87 species of invertebrate comprising of moths, mollusks and other insects, eight species of reptiles and 37 species of avifauna were recorded in the island. The eight reptiles recorded for the island comprised three ground skinks, four geckos and one invasive snake. One of the recorded ground skink species is potentially a new and endemic species to Nauru. From the 36 avifauna recorded, two are classified as land birds which include the reed warbler (*Acrocephalus rehsei*) and the Micronesian pigeon (*Ducula oceanica*), while the other 34 species are classified as sea birds.

[6] Government of Nauru. 2015. Rapid Biodiversity Assessment.

121. The BioRAP identified three land snails as endemic to the island. These are *Sturanya subsuturalis* and two species of *Trochomorpha sp*. The distribution of the former species around the island is widespread but is considered vulnerable due to habitat fragmentation. An undescribed ground skink (*Emoia sp.*) which appeared to be endemic to the island was recorded during the BioRAP in 2015. Preliminary measurements and scale counts confirmed that the specimen does not match any described species that was collected and encountered on the island.

122. The island of Nauru contains a diverse population of avifauna which play an important role on Nauruan culture and diet. The BioRAP indicates that the *Acrocephalus rehsei* in the only endemic bird on Nauru and is currently listed as vulnerable but stable by the IUCN red list (2018). Its distribution is common across the island but limited along recently mine-out areas where vegetation is low to none. Other bird species that were recorded on the island and classified under various conservation categories by the IUCN are the Micronesian pigeon (*Ducula oceanica*), the two species of noddies (*Anous spp*.), frigate birds (*Fregata sp*.), and the bristle-thighed curlew (*Numerius tahitiensis*). The species of bird whose population is subjected to too much pressure due to hunting are the brown noddy (*Anous stolidus*) and the black noddy (*Anous minutus*).

123. These species are considered as traditional source of protein of the Nauruan people thus being hunted throughout the year. The capture of both noddy species is being done using traditional methods whereby bird call is used to lure the birds onto nets fixed at the end of long bamboo poles. Noddy population has declined in recent years wherein only around 15 to 25 birds are captured compared to 60 90 birds captured employing the same level of effort forty years ago. The decline is mainly due to overhunting and loss of noddy nesting areas, thus it is critical that areas classified as nesting areas are preserved and native trees are planted to enable local noddy population to increase.

3. Sensitive habitats

124. Nauru has yet to proclaim protected areas, important bird areas and other similar areas by virtue of either national legislation or local ordinances for the purpose of ecological conservation and protection. However, the government's Fifth National Report to the Convention on Biological Diversity has recommended five sites as priority conservation areas for the protection and conservation of the habitats of threatened native species of invertebrates (Figure 4.8:). These sites range from coastal and littoral zones to lentic, escarpment forest zones and some non-coastal pre-mining pinnacle considered as high value due to remnant biodiversity. Around ten non-coastal pre-mining pinnacles were identified within the island and one site is located 120 meters south of the proposed project site boundary.

Figure 4.8: Location of recommended conservation sites

E. Socio-economic Environment

125. The socio-economic information and statistics are provided below for general reference and understanding of existing conditions in the island, although it has to be expressed that negative impacts on the local population is unlikely during construction and operation of the project. The directly affected people involve the shareholders of the lands being leased by the NUC for purposes of the solar power development.

1. Population and demography

126. The Nauru population was 10,084 persons based on 2011 census and 11,614 people as of 2018. The female to male ratio is 0.91 females to 100 males. The average population density is 478 people/km^2. The crude birth-rate is 27.2 and the crude death rate is 7.5 (data taken for period 2007 to 2011) and life expectancy is 59.7 years overall and 56.8 years for men and 62.7 for women. The median age is 25.3 years and the population age structure indicates that a third of population is 0-14 years, 65.6% of population is aged between 15 years and 64 years and 1.8% being 65 years or older; accounting for 98% of the population being 54 years or younger (2014 data). The ethnicity of the population is Nauruan (58%), other Pacific Islander (26%), Chinese (8%), and European (8%) according to the 2011 Census.

127. The Home Affairs Department monitors the population as part of the national health wellness monitoring program in the island. Table 4.3: summarises the recorded population based on interview with and records of the Home Affairs Unit, October 2018. Some 11,614 people were recorded, with majority of the population living in Meneng, Aiwo, Denigomodu, and Denig Districts. The refugees living in the RPC facilities and contractors operating on the island have not been included in this population record

Table 4.3: Recorded population

No.	District	Number of residents
1	Anetan	536
2	Anabar	452
3	Ijuw	20
4	Anibare	245
5	Meneng	1,483
6	Yaren	747
7	Boe	851
8	Aiwo	1,220
9	Buada	452
10	Denigomodu	1,867
11	Denig	1,549
12	Loc	318
13	Nibok	501
14	Uaboe	329
15	Baiti	531
16	Ewa	513
Total		**11,614**

Source: Nauru Home Affairs Department (2018)

128. The IEE study did not include a detailed population survey as the project is not foreseen to cause any direct impact on the local population on the island. The project site is uninhabited. The nearest area of residence is an RPC facility located 300 meters away, which houses refugees and RPC employees. Apart from the RPC facility, other residential areas include around the Buada Lagoon (Buada District) and near the shore in the Meneng District, approximately 1 km from the project site.

129. Despite requests during meetings, the number of people housed at the RPC facility was not disclosed by government of the Government of Australia. There was no data on GWh power usage for the RPC facility (Camp No. 1) in 2018 that could have been used to estimate the number of people living there. The NUC has forecasted a power generation demand of 2.0 GWh at the RPC Camp No. 1 in 2019, and an increase of up to 4.0 GWh from 2020 onwards for purposes of determining overall power demand on the island.

2. Health and Education Facilities

130. **Health**. There is one general hospital for the island, which operates emergency, in-patient, and out-patient services. The hospital has been improved in recent years, largely due to the support of the Government of Australia. There is a wellness center and a public health center in Yaren. Almost all women give birth in the main hospital. Health expenditures accounted for 9.8% of gross domestic product in 2011.

131. In terms of wellness and health status, adult obesity was recorded at 71% in 2008, the second highest in the world after American Samoa. The main non-communicable diseases in the population are diabetes, cardiovascular disease and cancer. There have been three reported cases of HIV/AIDS, two expatriates and one visiting sailor who required treatment. The staff of the hospital and public health office are planning to undertake a HIV/AIDS/STI training course conducted by United Nations Development Programme (UNDP). The Department of Health distribute free condoms.

132. The Household Income and Expenditure Survey (HIES)[7] reported low life expectancy rates with 58 years for men and 63 years for women. The Department of Health has recently conducted an anti-smoking campaign. Although there are no publicly-available statistics at the time of writing the report, public health staff report high numbers of teenage pregnancy.

133. **Education**. Public education is available; the average period of school attendance is nine years for males and ten years for females. Literacy in Nauru is defined as people reaching at least Grade 5 primary education and accounts for 96% of the population (2011). Some 4% of the population aged 15 years and older have a primary education, 91% have a secondary education and 5% have a tertiary education.

[7] Government of Nauru. 2013. Household Income and Expenditure Survey report 2012.

134. There are five pre-schools, four primary schools, three secondary schools and one college – University of South Pacific campus, with a newly constructed A$11 million secondary school financed by Government of Australia. Based on 2013 data, there were 3,190 enrolled students and 104 teachers. Following a near-collapse of the education system in the mid-2000s when teachers were not paid, exams were not conducted and schools lacked funds for basic functions, the Government of Australia supported the Department of Education resulting in 5.7% increase in students and teachers with degrees increased from 30% to 93%.

3. Living standards and wellbeing

135. **Overview of economy**. Nauru became independent in 1968 and took control of phosphate mining operations in 1970. From that time on all profits were retained by Nauru, and until the early 1990s Nauruans derived one of the highest average per capita incomes in the world. Mining extended across a large part of the island, so the royalties received as payment for mining rights were shared among many families in proportion to the amount of land they owned. During the peak years of phosphate mining virtually all Nauruans enjoyed a high standard of living; virtually all household needs, including food and drinking water, were imported from overseas.

136. Although residual mining continues, both government revenue and average household income have decreased dramatically. Insufficient revenue now limits capacity to maintain public and private buildings, and sometimes, even capacity to pay public service salaries. Slow growth in the public and private sectors means few opportunities for young people entering the labor market.

137. Gross domestic product (GDP) of Nauru recorded a value of $8,344 per capita compared with 2017 GDP of $10,514 per capita.[8] The feasibility study has assumed a country inflation rate of 3% (GHD, 2018). The main economic activities in the island is the operation of the RPC, the ongoing exploration of secondary mining by the Republic of Nauru Phosphate Corporation (RONPHOS), and the NRC. Other economic activities on the island are limited to small business enterprises, stores, banking and restaurants to support the local population, refugees, and workers on the island.

138. **Household poverty and hardship status**. The HIES completed in 2012 and published in 2013 found that 24% of the population or 16.8% of households were living below the basic needs poverty line, although the incidence of food poverty was zero. The basic needs poverty line is the estimate of the cost of minimum nutritional dietary intake plus costs for non-food essential basic needs to achieve acceptable standards of living. According to the report, 7.9% of Nauru's population or 6.2% of households were extremely vulnerable.

[8] https://www.worlddata.info/oceania/nauru/economy.php; website accessed on 1 December 2018

139. The HIES data indicates significant income gaps, with the top decile earning 30% of the total income but the bottom decile earning only 1.7%. The Situational Analysis of Employment in Nauru report (2015) concludes that it is likely that a significant proportion of the population, especially non-landowning people, are in poverty and suffering from the high and rising cost of services and imported food. Additionally, there has been an increase in government programs focused on housing, health, education and welfare payments since the conduct of the HIES. Salaries of public servants have also increased. These all indicate that the living standards of the population have improved since the HIES was conducted. Kin networks in Nauru are also strong, creating a social protection mechanism. Affluent family members often assume responsibility for payment of education, electricity and water costs and other regular essentials for extended family or friends.

140. **Income and household support**. The government provides non-contributory pensions for the elderly, as well as disability benefits. The HIES report identified that the majority of households surveyed reported some cash income from a current wage and salary job (93.3%), while other key household incomes include land-lease receipts (45.9%), royalties (42.4%) and home production consumption (30.0%). Irregular income from gifts, other receipts, and ad-hoc home production were received by 52.6% of households and while 36.3% households reported receiving ad-hoc 'bought goods'. Some households have moved in with relatives in order to make their homes available for rent by staff of Government of Australia and associated businesses and contractors, resulting in a booming property market

141. Overall the HIES revealed that households have multiple streams of income (wages, land lease payments, royalties, etc.) and that gift giving is a social norm. The HIES found that 85% of households earned wages and 7% reported income from their own business. Average annual household incomes were A$25,025, however, the lowest 10% of the population earned an annual income of A$706/person.

142. **Employment**. Most employment is with the government or the RPC (since 2012). Customary landowners and their extended families receive additional income from the government and business land leases, or phosphate royalty payments from secondary mining activities. Since the reopening of the RPC in August 2012 there has been a shift by some from government employment to higher-paying jobs.

143. **Food security**. Food security on the island is an island due to lack of agricultural land and small contributions of subsistence farming and/or bird hunting. Supplies for food and basic needs are imported and brought in through shipped container cargoes. Agriculture in Nauru is limited to backyard gardening. In 2013, Government of Nauru reported only about 13% of the households have kitchen gardens and are tending livestock in their backyard. Most households rely on imported frozen poultry for protein needs and supplemented by marine resources. About half (51%) of households undertake subsistence fishing. Food supply for the workers on the project is likely to be imported.

4. Land use and ownership

144. The Lands Act 1976 governs ownership of lands in Nauru. Ownership of land includes rights to grant life interests and profits, which extends to compensation of vegetation on lands if these were to be removed. Land is not owned by single individual landowners, but instead ownership is based on clans and families. Nauruans own about 630 individual plots. The family and clan members often each have different share sizes of the portion of land, and often have shares in many portions on the island due to the process of inheritance. Land is leased by the government and/or other institutions for government infrastructure and services, as well as phosphate mining.

145. NUC has an existing signed lease agreements for the land to be used for the project. The lease agreement stipulates the use of the land for solar power generation. The proposed area for solar power development, leased by NUC, consists of nine parcels of land, which are sized corresponding to the values indicated in (Table 4.4). The land parcels and lot areas are illustrated in Figure 4.9.

Table 4.4: Parcels of land allocated for solar power development

No.	Lot number	Number of shareholders	Size (ha)	MFAT 1.0 MW solar power facility – impact area	NUC 6.0 MW Solar Power Development Project - impact area
1	240	29	0.72		Yes
2	241	131	0.13		Yes
3	242	156	1.00		Yes
4	249	30	0.58		Yes
5	250	100	0.94	Yes	Yes
6	252	131	0.93	Yes	Yes
7	253	28	2.17	Yes	Yes
8	265	95	3.00		Yes
9	267	99	1.08		Yes
Total area		**799**	**10.55**	**1.76 ha**	**5.89 ha**

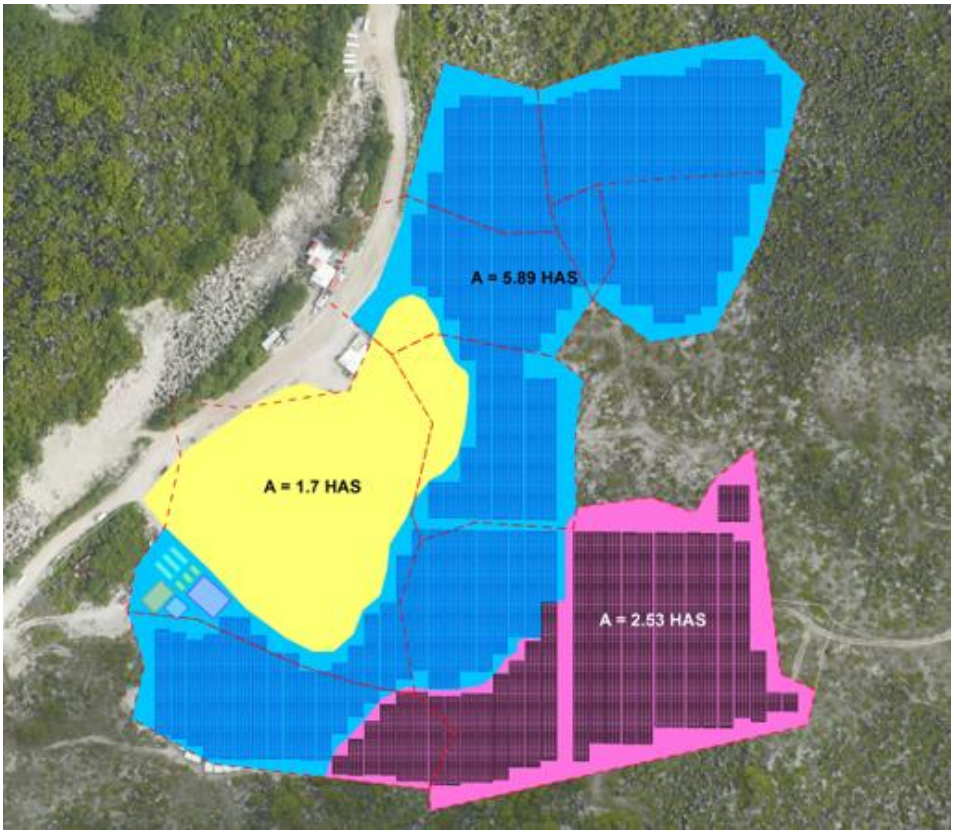
Source: NUC (2018)

Figure 4.9: Parcels of land leased by NUC 2018

146. The land leased by NUC will also include the MFAT 1.0 MW solar power facility. The land required for the project covers nine portions of land, owned by 779 shareholders; landowners may have shares for more than one portion being leased by NUC. The proposed land use and future expansion is shown previously on Figure 4.1.

147. The proposed solar farm will be situated in an area formerly utilized by private companies, Canstruct International and Fulton Hogan. A portion of the site was levelled and was used as a storage yard by Fulton Hogan (Figure 4.10).

Figure 4.10: Proposed land use after project implementation and further solar expansion



5. Traditional land owners

148. As land is an important asset to Nauruans, it is not allowed to be sold to foreigners or Non-Nauruan citizens. Nauruan society is divided into 12 tribes. The island is divided in land portions and for each number or portion there are records of the rightful landowners listed down. Individual landowners often each have different share sizes of the portion of land, and often have shares in many portions on the island due to the process of inheritance. Land is inherited through matrilineal and patrilineal lineage. The process of inheritance involves a meeting convened by the Land Committee with the family and extended kin, wherein the beneficiaries of a deceased person's shares of land are determined through group consensus. An announcement of the agreement is made in the government Gazette, which lists the deceased person's land shares and beneficiaries and provides 21 days for people to raise objections. As stated in the Lands Act, the government has the right to lease land for public interest, as well as be granted easement, way leave or other right to the land. In general land leases are issued for 20 years. If not less than three-fourths of the share owners of a portion of land (both by number and by interest) agree to lease it for public purposes, then the Minister may override the refusal of the minority. However, if less than three-quarters agree, there is no provision for compulsory lease arrangements (or acquisition).

6. Civil society organization

149. There are a small number of civil society organizations in the island. The IEE team consulted with the Nauru Community-Based Organization which is made up of community representatives from the 14 districts. The community representatives provide assistance to the government to disseminate information to community members in the districts. There is also a Nauru Private Business Sector Organization and members, which also organize their own events, such as the Women in Business Night Market selling handicrafts, clothing and food. There are also reportedly faith-based organizations, and a disabled persons association, but our enquiries suggested that these groups were not known to government officials.

7. Infrastructure and services

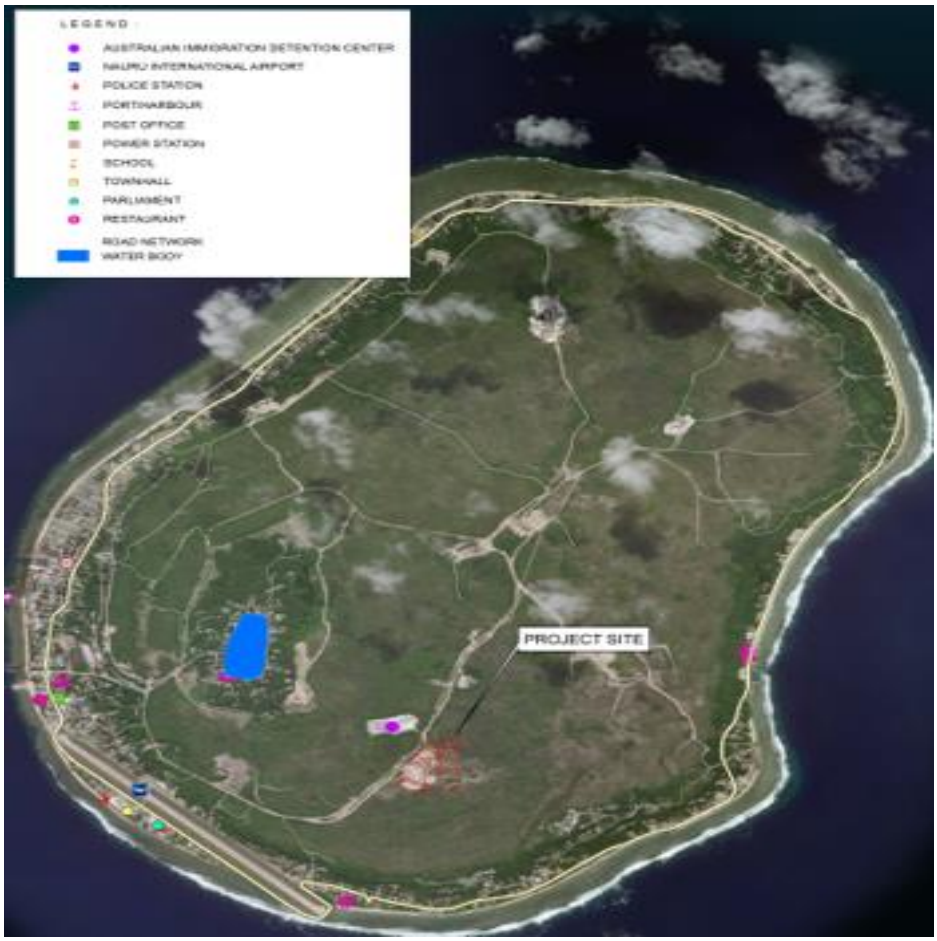
150. **Water supply**. Drinking water is imported in bottles and are sold in commercial establishments. For the people living in Nauru, water is supplied through a Desalination Plant located east of the Nauru Port. Some houses collect rainwater from roofs and catchments and is used for general cleaning. Groundwater water supply is limited and is not suitable for drinking but may be used for domestic household use. According to the government most people have access to improvement water supply (96%), and toilet and sanitation (65.6%).

151. **Road network and transportation**. The main access road in Nauru is the national ring road on the "bottom side" of the island, near the coastline. The inner roads leading to "topside" are roads built for purposes of mining operations. The total road network is approximately 44km. The Nauru Port, where majority of the materials will be brought in, is approximately 3.5km to the proposed project site. The Nauru Port will be upgraded in 2019. The documentation related to the Nauru Port upgrade is available online.[9] The international airport is located in the District of Yaren, which is approximately 2 km from the project site. Workers for the project may get into the island through the immigration control at the Airport in Yaren (Figure 4.11).

152. Hauling of construction equipment, solar power components, and appurtenant facilities using heavy equipment vehicles will be made through the existing road from the District of Aiwo, through to Boe, Yaren, and to Meneng Districts. The transport vehicles will pass through a 3.5 km of paved road at Aiwo, Boe, and Yarren Districts, and off to a 1.5 km of unpaved road to Meneng District. Existing access roads to the site are fit for purpose and does not necessarily require alteration or upgrade.

[9] https://www.adb.org/projects/48480-001/main, website accessed on 1 December 2018

Figure 4.11: Key facilities and features



153. **Energy**. The island of Nauru is 100% electrified and is heavily reliant on power supplied by diesel generators. The recorded energy demand from July 2017 to June 2018 is presented in Table 4.5. The average monthly power demand is calculated as 2,340,844 kWh. The total recorded yearly demand for 2017-2018 was 28,089,826 kWh, with slightly less demand between July to January 2017, compared with February to June 2018.

Table 4.5: Recorded power demand July 2017 to June 2018

Month	Demand (kWh)
July 2017	2,219,912
August 2017	2,140,205
September 2017	2,328,289
October 2017	2,353,030
November 2017	2,253,952
December 2017	2,319,205

Month	Demand (kWh)
January 2018	2,135,580
February 2018	2,531,833
March 2018	2,509,703
April 2018	2,125,057
May 2018	2,477,158
June 2018	2,696,206
Total recorded demand	**28,089,826**

Source: NUC (2018)

154. The existing solar power facilities in Nauru is presented in Table 4.6. The existing solar power installations contribute about 3.3% of solar generation capacity. In addition to the existing solar facilities, the MFAT is funding the installation of a 1.0 MW capacity solar power plant in Meneng District, to be located adjacent to the proposed Nauru Solar Power Development Project.

Table 4.6: Existing solar power installations in Nauru as of Oct-2018

Solar power installation	Connection	System	Capacity (kW)
Buada Solar Farm	Grid connected	Ground-mounted	500
Noddy Building	Grid connected	Roof-mounted	138
Government Building	Grid connected	Roof-mounted	52
NUC Office Solar	Grid connected	Roof-mounted	20
NGH (Hospital)	Behind the meter	Roof-mounted	22
Odin Aiwo Hotel	Behind the meter	Roof-mounted	5
Nauru College	Behind the meter	Roof-mounted	40
Capelle Apartments	Behind the meter	Roof-mounted	30
Angelique Ika	Behind the meter	Roof-mounted	N/A
Meneng Disabled School	Behind the meter	Roof-mounted	N/A
Total existing capacity			**807 kW**

Source: NUC (2018)

8. Cultural Heritage

155. Moqua cave with a natural free flowing spring, is considered culturally significant but has not been preserved; the cave is frequented by tourists on the island. The Moqua cave is located in Yarren District, approximately 3km form the project site. During the site visit in July 2017, lots of trash was found inside the cave floating on spring water. The cave appeared to have not been preserved as vandalism was evident on the rock formation (Plate 4.3). The site does not contain any cultural heritage or is not believed to be protected for preserving local cultural practices. Some dilapidated structures left after the peak of mining activities are found standing on site. These structures are not believed to be preserved and is not of cultural significance.

156. Some cultural heritage sites, or sites which may have been preserved due to its historical significance include war relics during World War II (see Plate 4.4).

Plate 4.3: Moqua cave and spring water located in Yarren District

Plate 4.4: War relics located around the center of the island

9. Noise

157. The ambient noise environment in the project area is relatively quiet as there are no identified sources of noise within the project site. Intermittent noise is generated by vehicles and trucks using the road adjacent to the project site, travelling to and from the RPC facilities and secondary mining areas (including the transportation of heavy equipment/materials using trucks). The site preparation methodology is rock breaking with use of explosives as required. NRC will be tasked to prepare the land for solar power development and shall employ the methodology while avoiding or minimising impact on elevated noise level to nearby RPC residents and workers. Noise baseline monitoring or validation of noise levels during construction may be necessary when noise levels are excessive and when complaints due to noise is received.

5. ANTICIPATED ENVIRONMENTAL AND SOCIAL IMPACTS AND MITIGATION MEASURES

158. The initial environmental examination and impact assessment was undertaken using a risk-based approach. The methodology for risk-based impact assessment is described below. The findings of the impact assessment are presented per project phase starting with pre-construction, construction, operation and maintenance, and decommissioning phases.

159. The impacts were assessed according to the resulting residual impacts associated with the project activities described in Section 3 per components and project phases, which are presented under Sections 5 B-E. The effect of project activities on the existing environmental and social conditions were determined, and the resulting residual impacts were taken to develop mitigation measures and create environmental management plans to address such impacts.

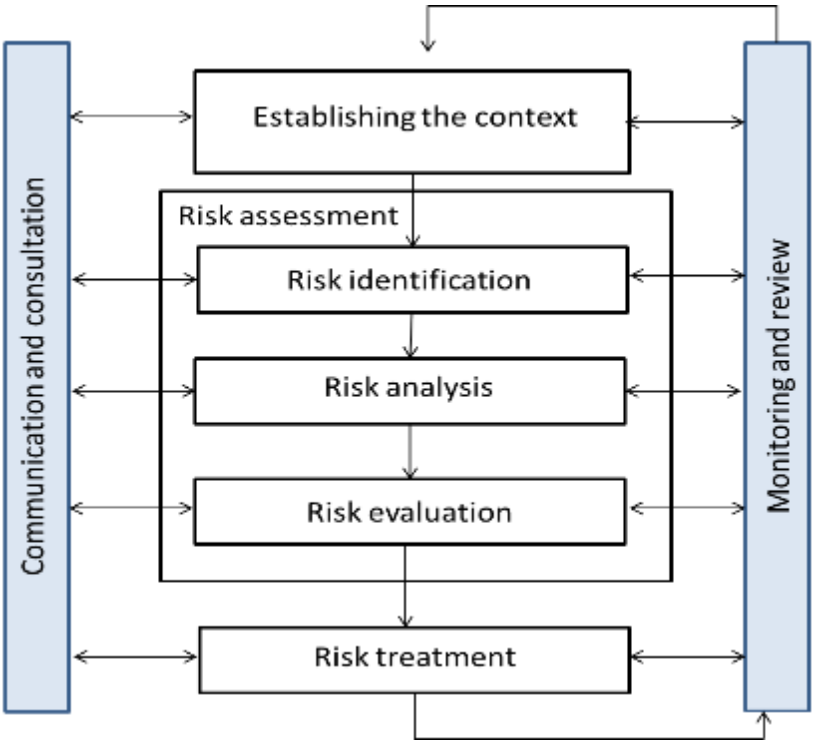
A. Methodology of Impact Assessment

160. The impact assessment follows a risk-based approach using the following reference as guidelines:

- Asian Development Bank. Environmental Assessment Guidelines – Initial Environmental Examination for Category B Projects and Measuring Magnitude of Impacts (2003).
- Secretariat of the Pacific Regional Environment Programme (SPREP), Strengthening Environmental Impact Assessment – Guidelines for Pacific Island Countries and Territories. Tool for risk assessment for EIA reports (2016).
- International Finance Corporation's Guidance Notes on Performance Standards and Environmental and Social Sustainability (2012).
- AS/NZS ISO 31000:2009 Standard – Risk Management – Principles and Guidelines (2009).

161. Figure 5.1 illustrates the steps adopted to determine the impacts using risk-based approach. The process of identifying the risks takes into account existing environmental and social values and the probability of the impact affecting these values/aspects/sensitive receptors. The steps of risk assessment and impact identification and are described below.

Figure 5.1: Risk assessment process



Source: AS/NZS ISO 31000 (2009)

162. **Step 1 - establishing the context.** Determines the baseline environmental and social resources that are present within the project's area of influence and confirms the presence of sensitive receptors that are likely to be affected by the project development phases. Within this step, the project development activities likely to result in impact on environmental and social values/resources/receptors are reviewed.

163. **Step 2 – risk/impact identification.** Carried out using professional judgement based on experience on similar project and good industry practices. The impact on physical, biological, socio-economic environment within the defined area of influence is determined according to the proposed project activities per development phase.

164. **Step 3 - risk analysis.** Explains the resulting impact on the environmental and social attributes. The cause and effect are described in detail per project activity and according to the project phase or timing of development activities causing such impact. The spatial and temporal extent of risks or impacts are analyzed according to the criteria set out in Table 5.1 and Annex C.

165. **Step 4 - risk evaluation.** Aims to quantify or rate the risk or impact. As detailed in Annex C, the likelihood of risk or impact occurring is quantified or ranked from 1 to 5, with 1 as "rare" and 5 as "almost certain". Subsequently, the consequence of risk of impact occurring is ranked from A to E, with A as "insignificant" and E as "catastrophic".

166. The evaluation of likelihood and consequence evaluation criteria is described in Table 5.1 and Annex C.

Table 5.1: Likelihood evaluation criteria

Score	Descriptor	Description	Frequency	Probability
5	Almost certain	The event is expected to occur in most circumstances.	Once per week	>90%
4	Likely	The event would occur on recurrent intervals.	Once per month	51-90%
3	Occasional	The event occurs on an irregular basis	Infrequently	21-50%
2	Unlikely	The event would be an uncommon occurrence and would occur in remote circumstances.		10-20%
1	Rare	The event may occur only in exceptional circumstances. The event is not likely to occur in this location.	Rarely	<10%

167. Significance of environmental effects was also derived by combining the magnitude/severity of impact and sensitivity of receptors. Severity of risks essentially describes the intensity of the change that is predicted to occur on the receptor as a result of the project's impacts. Generally, magnitude or severity of an impact can be assessed as a function of extent, duration, scale, and frequency, the ratings used are outlined in Table 5.2:

Table 5.2: Establishing the severity/magnitude of an impact on a receptor

Rating	Establishing the severity of an impact
High	High magnitude of the impact from the Project's proposals Permanent impact which is irreversible The impact will be of high intensity, highly likelihood to occur and of a high frequency
Medium	Medium magnitude of the impact from the Project's proposals Temporary or short term impact but is irreversible The impact will be of medium intensity, likely occur and of a medium frequency
Low	Low magnitude of the impact from the Project's proposals Temporary or short term impact which is reversible The impact will be of a low intensity, highly unlikely to occur and of a low frequency
Negligible	No impact will occur from the Project's proposals

168. The establishment of the sensitivity of receptor is the other step in the assessment of significance of environmental effects. There are a range of factors to be taken into account when establishing the sensitivity of the receptor, which may be physical, biological, cultural, or human. Other factors may also be considered when characterizing sensitivity, this includes legal protection, government policy, stakeholder views, and economic value. The sensitivity importance ratings used herein for all receptors is outlined in Table 5.3:

Table 5.3: Establishing the sensitivity of receptor

Rating	Establishing the sensitivity of receptors
Very high	Sensitive receptor with little resilience to imposed stresses
High	Sensitive receptor with little resilience to imposed stresses
Medium	Sensitive receptor has a moderate natural resilience to imposed stresses
Low	Sensitive receptor has a high natural resilience to imposed stresses

169. Once severity/magnitude and sensitivity has been characterized, the significance can be assigned for each impact. Impact significance is designated using the matrix shown in Table 5.4.

Table 5.4: Determination of significance of environmental effects

Sensitivity of receptor	Severity of impact			
	High	Medium	Low	Negligible
Very high	Major	Major	Moderate	Minor
High	Major	Moderate	Minor	Minor
Medium	Moderate	Moderate	Minor	Negligible
Low	Minor	Minor	Negligible	Negligible

170. The outcome of this risk assessment process is identification of project activities that may pose risk to the environment and the community. This will be the basis of the construction environmental management plan (CEMP) to be prepared by the contractor and reviewed and approved by NUC and the construction supervision consultant (CSC). For each project development activity, the process identified potential risks and consequences (i.e. impacts) that may occur even with controls in place, planned as part of the construction and operation strategies described in Section 3, updated as required based on the methodology and approach proposed by the contractor. To address such impacts, mitigation measures were defined, and an environmental management plan was developed (see Section 7 and Table 7.2), to manage the risks and to ensure that these risks are reduced to an acceptable level. The risk assessment tables are provided in Annex D.

171. The risk assessment table will be a live document that will be reviewed and updated throughout the project life or whenever circumstances change such as:

- Introduction of new regulatory requirements.
- Project design changes or new operational methods.
- Implementation, modification, or shutdown of any activity or process.
- Change in raw materials to be utilized.
- Occurrence of an environmental event or incident.

172. The aspects identified from pre-construction, construction, operation, and decommissioning phases were subjected to risk characterization and subsequent rating, with respect to environmental impacts including vegetation and waste management, occupational health and safety of construction workers during project implementation and operation phases, and public safety during construction materials transport. The risk assessment was determined in two stages – (1) without control and mitigation measures and (2) with control and mitigation measures in place. Residual impacts are identified rated accordingly and additional mitigation measures are described. The detailed environmental management plan and mitigation measures are described in Section 7.

173. The impact assessment and proposed mitigation are described per project phase in the next sections.

B. Pre-construction Phase

174. The risk assessment and impact evaluation has initially identified potential impacts and threats likely to be caused by the proposed project implementation activities during the pre-construction phase (Annex D – Table 1).

1. Requirements for IEE approval and project clearance

175. The project will require approval by ADB Board and the government. The DCIE provides clearance of projects and developments on behalf of the government. This IEE will be submitted to DCIE for review and to issue the overall project approval which includes the site clearance and preparation activities to be undertaken by NRC and the construction and installation activities to be undertaken by the EPC contractor.

176. Potential issues include stoppage of work and impact on project implementation if any work is undertaken without the appropriate clearances and approvals. As land clearance will be undertaken before the project is approved by the ADB Board, specific caveats will be agreed between government and ADB including:

- SPS and good industry practice, in addition to Nauru laws, will apply to the land clearance and preparation activities;
- Prior to activities commencing the IEE is cleared/approved by ADB and government; (iii) the pre-construction elements of the IEE will be integrated into the government's bid/procurement documents governing the NRC works;
- NRC will recruit a suitably qualified and experienced specialist to help them prepare their site-specific environmental management plan (SEMP) for the site clearance and preparation activities;
- ADB will have the opportunity to review and comment on the government's bid/procurement documents;
- The government will engage an independent (not employed by NRC) engineer and environmental specialist, who—along with NUC and ADB—will review and clear the SEMP prepared and submitted by NRC; and
- The independent engineer and environmental specialist will supervise, monitor and report on the NRC works and implementation in compliance with the approved SEMP.

177. Retroactive financing will be made available to the government in order that an engineer and environmental specialist will be recruited for the duration of the site clearance activities to ensure that contractual and safeguard measures are complied with by NRC.

178. For the remaining pre-construction and construction activities, the NUC will list the necessary permitting requirements the EPC contractor needs to secure from the government prior to project implementation, including work permits for bringing in workers to implement construction execution plan, and importation permits for equipment and materials brought into the island from off-shore.

2. Unexploded ordnance

179. There is a low risk that UXO could be uncovered during site clearance activities. Prior to the commencement of site clearance activities, the NRC will be required to conduct a 100% sweep by mine/metal detectors of the project site and access to the project site.

180. The Nauru government has protocols for addressing an UXO finding based on public safety and safe UXO handling and disposal. While these protocols have not as yet been documented or gazetted into a legal document, they are, however, understood by individuals and agencies responsible. These protocols need to be strictly adhered to during the pre-construction assessment of the port. These protocols form part of the EMP and will be incorporated into the contract covering scope of works for the site clearance activities to be undertaken by NRC.

181. Should UXO be detected the safe disposal will follow established Nauru protocols and international best practice which includes: (i) implementation and adherence to international standards of ordnance survey; (ii) all work to conform to the government existing Ordnances Regulations in conjunction with the standards required for mine clearance, issued by the Mine Clearance Policy Unit, Department of Humanitarian Affairs, United Nations; and (iii) implementation of international standards on safety procedures if an UXO located, management and disposal.

3. Site clearance and preparation

182. NRC will undertake the site clearance and preparation activities. The site will be cleared through a combination of excavation (smashing) and blasting to remove the pinnacles and prepare a flat area for solar array installation. The following general principles will apply to site clearance.

183. Site preparation activities will include the earthworks to ensure the identified location meets the conceptual design and solar plant layout. For this project, cutting and filling of the area is required which may include breaking down the pinnacles and cutting the trees and shrubs in the area. Site preparation will be performed by NRC. Options for site preparation methodologies were explored. The options include rock breaking, drilling and blasting, and site filling and compaction.

184. The rock breaking method involves using heavy equipment to hammer the pinnacles to a uniform level. The pinnacles/rock will be crushed and will be levelled to the same elevation. Constant hammering of the pinnacles will be done five days a week, with working hours between 08:00 AM to 16:00 PM. For the 6-ha area, preparation using only the hammering method may take up to one year.

185. The drill and blast method utilizes explosives to maximize working on bigger areas within a shorter period. Similar to the rock breaking method, the crushed pinnacles/rock will be levelled to an elevation suitable for the solar panel installation. Due to safety risks associated with the use of explosives, the access road adjacent to the site may have to be closed during blasting. Furthermore, the project site will be restricted during blasting, except for the drilling and blasting personnel. NRC estimates four hours of drill and blast work in a day, within two to three days a week. Working hours will be between 08:00 AM to 16:00 PM. NRC will announce the schedule of the blasting through radio, text messages, and signage at the site.

186. The third option considered is filling and compacting the land with a substantial volume of aggregates and soil suitable for flattening the land to a desired elevation for solar panel installation. The volume of fill and type of materials which will result in stable ground shall be approximately 180,000 m^3.

187. The preferred method for clearing is rock breaking with limited use of explosives as required to remove the larger and deeper pinnacles.

188. The NRC will prepare and submit a SEMP for the site and activities for review and clearance by government and ADB prior to commencement of activities. The SEMP will detail NRC's proposed site layout, approach to the activities and include work method statements detailing procedures for blasting, haulage off-site of unusable material, noise and dust control, health and safety and emergency response. The outline of the measures to be included in the SEMP are provided in Section 7 D.

4. Site clearance – chance finds of physical cultural resources

189. Any site clearance, digging and excavation activities undertaken during preconstruction can un-earth physical cultural resources including cultural or archaeological assets and grave sites. In the event this occurs; work shall cease immediately, and the relevant authorities, will be informed. Activities shall not re-commence until the authorities have signed-off that the site/resources have been dealt with appropriately and that work may continue.

190. The NRC shall be responsible for complying with the requirements of authorities, and the NUC shall monitor the same. The NRC will develop a chance finds procedure in their SEMP based on the measures identified in the EMP. Mitigation measures for potential impacts on include:

- Site agents will be instructed to keep a watching brief for relics in excavations.
- Should any potential items be located, the NUC will immediately be contacted, and work will be temporarily stopped in that area.
- The NUC, in coordination with the relevant authorities, will determine if that item is of potential significance and the appropriate government ministry who may arrange for an inspection of the physical cultural resources and work will be stopped to allow time for this inspection.
- Until the appropriate government ministry has responded to the inspection request site clearance activities will not re-commence in this location until agreement has been reached between the parties as to any required mitigation measures, which may include supervised excavation.

5. Construction environmental management plan

191. Through the bid and contract documentation requirements, NUC shall ensure that the EPC contractor prepares a site-specific CEMP for the construction and installation stage activities, which includes all the relevant provisions in the EMP included in Section 7 E. A CEMP will be prepared with site-specific plans for construction elements or particular site conditions as necessary.

192. Prior to commencement of construction works the EPC contractor will prepare their construction program and work method statements and the CEMP will be based on these, reflecting the specific construction approach and activities and setting out exactly how the contractor will implement the mitigation measures and meet the targets identified in the EMP (Section 7 E).

193. The CEMP will be activity and site specific and demonstrate the manner (location, responsibilities, schedule/timeframe, budget, etc.) in which the EPC contractor will implement the mitigation measures specified in the EMP. The CEMP will be updated as necessary to respond to any unanticipated impacts that may arise as the project is implemented.

194. The CEMP will be prepared at least one month prior to any physical works commencing and will be reviewed and approved by the NUC and CSC. The contractor will demonstrate how the CEMP will be properly resourced and implemented including through the recruitment of a qualified/experienced person to be the full-time environment, health and safety officer (EHSO).

195. The EHSO will maintain a site diary and complete checklists which will be summarized in weekly and monthly reports to the CSC. The CSC will conduct regular checks and joint inspections of compliance with the approved CEMP, NUC and ADB will audit the effectiveness of the supervision and implementation of the approved CEMP and review mitigation measures as the project proceeds.

6. Contractor mobilization

196. Mobilization of the contractor and initial establishment of site office, work site and plant/materials storage areas will bring about interaction between local people and construction workers. Prior to contractor mobilization to the site, NUC will work with the EPC contractor to establish the communications protocol between the project and communities as per the project's CCP. The EPC contractor will identify one member of their staff to be the liaison between village leaders and the contractor, as well as between the contractor and NUC.

197. The contractor will adopt good management practices to ensure that fuels and chemicals, raw sewage, wastewater effluent, and construction debris/scarified material is disposed of in controlled conditions to reduce the risk of contamination. Measures to minimize disturbance by construction workers and presence of the works site/area include:

- Code of conduct–workers' protocols to be discussed and agreed with community leaders–to be shared with workers as part of awareness and mobilization training; The contractor is to ensure that workers' actions outside work site are controlled and that rules of conduct are observed always;

- The contractor will identify one member of their staff, fluent in Nauruan and English, to be the liaison between the community leaders and contractor, as well as between the contractor and NUC;
- Adequate signage—in Nauruan and English—and security will be provided at the site office and works yard and prevention of unauthorized people (especially children) entering the area;
- Hire and train as many local workers as possible by using local labor if possible;
- Potable water, hygienic sanitation facilities/toilets (portable lavatories) with sufficient water supply, worker rest area and first aid facilities will be provided at the project site and accommodation;
- Wastewater effluent from maintenance/workshop area and equipment washing yards will be passed through gravel/sand beds and all oil/grease contaminants will be removed before discharge. Oil and grease residues shall be stored in drums awaiting disposal in line with the agreed waste management section of the EMP. Point of discharge will be agreed with NUC and CSC;
- Predictable wastewater effluent discharges from construction works shall have the necessary permits/approvals from DCIE before the works commence;
- Provision of adequate protection to the public near the site, including notice of commencement of works, installing safety barriers, and signage or marking of the work areas;
- At all times workers should respect Nauruans and follow the code of conduct, including those addressing women and elders;
- Avoid damage to productive trees and gardens or other private property; and
- Land used for worksites shall be restored to the original condition as far as practicable and the area shall be planted with appropriate trees / shrubs as soon as practicable after it is vacated and cleaned.

7. Biosecurity

198. To prevent or reduce risk of introduction and/or spread of invasive or alien species (flora and fauna) any equipment/plant, vehicles and construction materials (or even food and alcohol brought in for foreign workers) imported to Samoa for the project and the vessels that import them will be subject to clearance procedures under the quarantine regulations and may require issue of phytosanitary certificates from Quarantine Section – Department of Justice.

8. Social issues concerning lease agreements

199. The land to be utilized for the project is leased by NUC. Lease agreements were executed with the nine groups of landowners in July 2017 and are valid for 20 years until 2037. These lots are mined-out phosphate fields and are not used for economic activities such as crop production and grazing. The land owners are currently compensated by the government for the lease agreement.

200. Potential issues concerning land lease agreements are associated with conflict with the government due to timely payment of rentals and land lease rates. Land owners are likely to ask more questions related to land lease arrangements when the solar facility is built. Enquiries raised by communities during consultation held in October 2018 and April 2019 are related to possibilities of the government increasing land lease rates in the future. Monitoring of satisfactory payments of the lease agreement would have to be made to ensure grievances from local communities are avoided. The severity of this impact is high if issues pertaining to lease agreements are not quickly resolved. Since the land has not recently been utilized for economic activity, sensitivity is therefore Low. The significance of this impact is therefore has been assessed as being minor.

201. NUC will continue to engage with the land lessors (owners) on land lease arrangements and the proposed use of land for solar power development. The lease rates are defined by the government under the Lands Act. Therefore, any increase in land lease rates shall be defined accordingly under the Lands Act or in consultation with the Cabinet. Refer to the Land Due Diligence Report for further information.

9. Project impact on gender

202. Indirectly, the project can encourage the participation of women in discussions of leasing matters, through gender-sensitive consultations with customary landowners. Women must be involved in community meetings, consultations and awareness events about the project and its implementation program. If necessary, separate meetings have to be organized to give women an opportunity to express their views about the project. The project will target for capacity building, training and employment within the project to include 20 percent of women.

C. Construction Phase

203. The risk assessment and impact evaluation has identified eleven potential impacts and threats likely to be caused by the proposed project construction activities (Annex D – Table 2). The positive impacts in relation to job creation and capacity building of NUC and NRC staff are not included in the impact assessment and risk rating but instead described above, as one of the positive impacts the project will bring to local residents and workers in Nauru.

1. Impacts on the physical environment

204. **Waste generation and ad hoc dumping of spoil**. During site preparation, significant volume of excessive crushed pinnacles/rocks and vegetation trimmings will be generated. These will have to be properly handled, managed, and dumped to the island's dumpsite. Due to the magnitude and volume of spoils and vegetation wastes that will be generated, the area covered by the dumpsite can potentially be expanded which could subsequently impact adjacent land uses and communities. The severity of impact of haphazard dumping of spoils and rocks has been assessed as high.

205. The site is not in close proximity to any water body, forested area hence the sensitivity of these receptors to this impact has been assessed as Low. The rocks to be removed from the site are the property of the landowners, which means removal, transport, and reuse of such rocks/debris taken from the site should be coordinated with the landowners. The landowners will subsequently determine the preferred use of the excess rocks/debris to be taken out from the site.

206. The significance of impact due to haphazard dumping of excessive spoils and rocks including other associated wastes has been assessed as minor. The actual quantities of spoils and rocks to be generated will be determined by the EPC contractor after assessment of topographic conditions. In addition, the EPC contractor will develop the waste management plan (WMP) that will define the management measures for controlling, hauling, storage, treatment and delivery of the materials for proper disposal.

207. Improper disposal of debris from dilapidated structures. There are abandoned structures, made up of steel, wood and concrete foundations, at the site (Plates 5.1 a and b). These structures will be removed, and debris and demolished materials need to be handled and disposed of properly.

Plates 5.1 a and b: Dilapidated structures at the site

208. NRC is managing a waste disposal landfill on the island. The scrap metals and debris will be disposed of properly in this landfill. Similar to the haphazard excess spoils and rocks, they too will potentially occupy most of the existing dumpsite resulting to its expansion in order to accommodate other waste (i.e. domestic). In terms of volume, this waste will account for a small proportion of waste generated and the severity has been assessed as moderate.

209. The project site and the landfill/dumpsite are both more than one km away to have a significant impact to receptor such as water body, settlements and heavily vegetated areas, the impact sensitivity is considered low. Considering severity and sensitivity of impacts and receptors, respectively, the impact significance of improper debris disposal from dilapidated on-site structures is considered minor.

210. **Non-functioning drainage causing localised flooding**. Changes in land use and land form will be primarily for the PV fields, access roads, and ancillary facilities such as the switch yards, BESS and site office. The levelling of the land will lead to permanent modification of the site geomorphology and hydrology and may potentially affect surface runoff and localized flooding if drainage is not provided and properly designed (Plate 5.2). Construction activities undertaken during rainy days may result in run-off from the site mixing with the disturbed rock/soil and will drain towards the lower portion of the site, which may remain undrained for a period of time. This will create muddy surface run-off requiring proper management. The severity of this impact has been assessed as moderate.

211. The project area will exhibit a generally flat topography once the PV farm and its ancillary facilities are constructed. There are no significant streams or creeks running within the project site that may potentially impact local drainage affecting settlement or communities located in Bottomside area apart from localized gullies that act as natural drainage during the rainy season hence, the sensitivity has been assessed as low.

Plate 5.2: Localized ponding north of project site

212. Changes in the geomorphology will be limited to the project footprint and the corresponding significant impact will be minor as on-site water-logging will be minimal and temporary. To avoid ponding and allow draining of surface runoff from the site area, the land preparation and elevation will be designed with proper slopes to allow site drainage along the perimeter of the solar power facility, and along the sides of footing foundation. Pervious layer of soil/gravel bedding will be placed onsite as finishing layer to allow natural seepage of surface runoff. Rainwater run-off will be collected in drains and stored in a tank for reuse during solar panel routine cleaning and site maintenance.

213. **Construction requirements creating competition for water supply**. Water will be required during the construction phase to support earthworks/ground levelling, operation of the batching plant and for workers' needs. The project's water use has the potential to result in decreased water availability for other users due to the fact that Nauru has limited water supply. The local communities wholly rely on the desalination plant for the supply of domestic water. Once construction of the solar facility commences it will compete with local water supply. The construction of the solar power facility will require approximately 500 m^3 of water for construction of footing foundations and 1,000 m^3 of drinking water for plant workers (to be confirmed by EPC contractor). Due to the limitations of water source, the severity of this project impact has been assessed as high.

214. The EPC contractor will need to identify ways to reduce the impact and manage water supplies to the site and will develop a water resources management plan as part of the CEMP. Refer to Section 7E.

2. Impact on biological environment

215. **Permanent removal of vegetation.** The proposed project would result in the long-term removal of vegetation associated with the substation, switching station, BESS, monitoring and maintenance facilities, solar PV tables, and access roads and this could lead to loss of habitat to certain species of flora and fauna in the area.

216. The vegetation in the proposed site is described as a combination of open or ruderal vegetation, light regrowth, and some portion of dense vegetation. The project will require removal of vegetation and trees from the 1.4 ha classified as dense vegetation and 3.3 ha of light regrowth vegetation (regeneration less than 15 years). The vegetation removal is permanent but is unlikely to affect the viability or function of the vegetation communities as a whole. Furthermore, the vegetation affected is highly disturbed and modified and not of biodiversity or conservation significance. Therefore, the significance of the impact from vegetation removal is assessed as negative but minor.

217. Vegetation removal cannot be avoided, there are a number of management and mitigation measures to be put in place to ensure impacts associated with vegetation removal are reduced and do not result in the disturbance to the surrounding vegetation communities. These include: (i) preparation of a site survey and plan identifying the trees and vegetation to be removed from the site, the NUC and CSCS will approve the plan; (ii) based on the plan the vegetation and trees to be removed will be identified on site with hi-vis markers or paint to reduce the likelihood of additional vegetation being removed; and (iii) clear establishment of the site boundary prior the actual preparatory and construction activities to further limit the extent of vegetation clearing. In this way work will be restricted and confined within the clearly demarcated project boundaries.

218. **Introduction of invasive weeds and pests.** Previous ecological studies characterized the entire island to have very low endemism, in fact, the assemblage of flora and fauna of Nauru is mainly composed of non-native and exotic species either deliberately or naturally introduced. While non-native species are already widespread within the project site, an increase and expansion of their population would potentially affect established non-endemic species of flora and fauna. The extent of the surrounding habitat will not be adversely affected in the long-term by the impacts associated with the accidental introduction of invasive species because the ecosystem has long been disturbed by mining and has adopted to the associated disturbance including the introduction of exotic and invasive species. Considering the absence of noteworthy species of wildlife within the project site, the impact on invasion or proliferation of invasive species can be categorized as moderate.

219. The impact of the introduction of invasive species can be avoided by ensuring disturbance will be limited in the project area and trucks and vehicles hauling materials between the site and other areas are cleaned so accidental spread of species from one site to another is reduced. As soon as construction or use of a disturbed site is completed, rehabilitate and revegetate in order to eliminate opportunity for invasive species to flourish.

220. **Disturbance to wildlife due to noise generation and vehicle movement.** The sources of noise in the project area during the construction phase include construction activities, operation of the batching plant and crusher, operation of diesel generators and movement of vehicles. Construction activities, heavy equipment, and vehicle use onsite during construction potentially could cause mortality or injury to a variety of wildlife species, especially slower-moving species, small animals, species that thrives on burrows, or ground or shrub nesting avifauna. Construction could also cause short-term visual and noise disturbance associated with the activities, human presence, vehicles and night-lighting.

221. Construction activities are expected to last for 12 months and will be limited to during the daytime. Construction activities including batching and crushing plant operation, construction of ancillary facilities will occur away from vegetation communities where potential wildlife are thriving. In addition, there will be increased noise levels because of a larger number of people being active in the area.

222. Direct effects would occur within the project footprint, but indirect effects could also occur in areas immediately adjacent the project site. Visual and noise disturbances could cause wildlife to alter their foraging, migration, and breeding behavior. A proposed conservation site is located at least 150 meters south of the project footprint. This area is designated as such due to its dense vegetation cover and its potential as habitat to important species of amphibians in the island. The associated disturbance and noise level could be intolerable to wildlife populations that occupy adjacent vegetation hence, the severity of impact can be categorized as high.

223. In order to mitigate the disturbance from noise and construction activities to wildlife all noise generating equipment such as generators, batching plant, crusher, etc., should be sited away from potential ecological receptors. High noise activities should be undertaken over short periods and where possible scheduled to avoid simultaneous operation of high noise generating equipment. Traffic movement within the project site should be confined to designated access and haulage routes to limit potential disturbance to wildlife.

224. **Dust generation from construction activities affecting plants**. Dust generation during construction will result from earthworks and other activities and movement of vehicles. The occurrence and significance of the dust generation will depend upon prevailing weather and ground conditions at the time and location of activities. However, under normal meteorological conditions, the magnitude of impact of dust is assessed as high within several hundred meters of the construction area affecting nearby vegetation communities.

225. Dust generation can potentially affect the ability of nearby vegetation to survive and maintain effective evapotranspiration. Baseline assessment of the vegetation cover within the project area's vicinity identified regrowth and ruderal vegetation as the most dominant. These primary ecological receptor characterized mainly by non-native pioneer species of flora considered to have minimal ecological and conservation significance. Overall, the significance of this impact to existing vegetation has been assessed as moderate.

226. Fugitive dust control measures can be applied during construction to minimize dust generation. Mitigation measures can include regular watering of unpaved access roads and exposed areas within the site, limit on-site vehicle speed to 15 mph, and prohibition of dust generating activities during periods of high winds.

3. Impacts on socio-economic environment

227. **Presence of construction workers**. Risk of social conflict through presence of foreign workers creating: (i) increased risk of illicit behavior and crime; (ii) influx of additional population (workers and their "followers"); (iii) impacts on community dynamics; (iv) increased burden on and competition for public service provision; (v) increased risk of communicable diseases and burden on local health services; (vi) gender-based violence; (vii) child labour and school dropout; (viii) local inflation of prices; and (ix) increase in traffic and related accidents.

228. In addition, presence of workers can induce environmental issues and problems including: (i) inadequate waste disposal and illegal waste disposal sites; (ii) wastewater discharges; (iii) increased demand on freshwater resources; (iv) camp related land use, access roads, noise and lights; (v) increased deforestation, ecosystem degradation, and species loss; and (vi) competition for, increased use of / demand for natural resources.

229. The EPC contractor will prepare a labor management plan (LMP) and code of conduct for workers (refer Section 7E). In addition, the contractor will provide information boards near the work sites to inform and instruct the public on how to conduct themselves and to be aware of their surroundings if they must approach the works. No tolerance will be allowed for any form of gender-based violence of public. Information boards will also state that the NUC and contractor have an open-door policy for complaints.

230. Utilising local companies and unskilled labour will minimize risks related to an influx of external workers and related social and health ailments. A program of delivery of communicable diseases awareness and prevention (including HIV/AIDS and gender-based violence) on the construction site will be built into the CEMP and monitored (see health and safety plan – Section 7E). The program will be delivered by an approved service provider recruited by the contractor.

231. **Change in landform and land-use.** The installation of the solar PV arrays will entail change in land use and land form. Much of the change to landform will have occurred following site clearance activities undertaken during pre-construction, several construction activities will also alter the land form and land use including site levelling and foundation works, establishment of temporary laydown areas and other ancillary facilities (i.e. batching plant, crushing plant), and opening of access roads within the project site. A portion (approximately 1.7 ha) of the overall site has already been flattened for the MFAT solar power facility (Plate 5.3). The remaining pinnacles and vegetation within the 6 ha for the project will be removed and a dilapidated structure will be demolished and removed (Plate 5.4).

Plate 5.3: Flattened and prepared area reserved for MFAT solar power facility

Plate 5.4: North-east area of project site

232. The changes in land form will be permanent and the project site will resemble much of the already mined areas. Though the changes in land use will be reversible after the lifespan of the project, the change from mining to renewable energy production for the period of the project is considered a positive impact. Any residual impact will be moderate as additional areas for expansion will require approval from government authorities.

233. **Land ownership and access**. Due diligence of the land lease arrangements and process was undertaken as part of the feasibility study and a Land Due Diligence report has been separately prepared. The following measures are to be implemented as part of the management actions:

- Obtain copies of land lease agreements and maps with coordinates of the lot boundaries. Engage a geodetic surveyor to ground-truth the leased land and mark the boundaries on the ground with pegs or markers.
- Validate the actual areas leased as per land lease agreement against the areas measured on the ground.
- Present the findings to the landowners and discuss any discrepancy against the land lease agreement and actual area to be occupied by the project.
- Settle any dispute (if any) according to judiciary procedures in Nauru, and consistent with the Lands Act 1976 and its amendments.
- As required, sign amended lease agreement according to final negotiated / agreed area of lease.

234. **Site security.** In order to secure the whole site leased to NUC for solar power purposes (10 ha) from trespassing during construction activities and potential encroachment, the entire area will be fenced similar to the UAE funded solar facility (Plate 5.5). The fence will be installed at the commencement of site establishment activities.

Plate 5.5: Security fence at the UAE-funded solar facility

235. **Noise generation affecting sensitive receptors**. Construction activities are inherently noisy; vehicle and plant operations, operation of batching and rock crushing plant, operation of back-up generator sets. Construction will occur for a period of approximately 12 months and generally, unless otherwise agreed, between 7.30 am and 5.30 pm. Noise will be generated at the site and will be audible off-site. Activities undertaken concurrently will create noise levels within industrial decibels attributed to use of heavy equipment and the sound level to be produced will exceed typical residential levels at the site boundary as required under the EHSG i.e. 55 dBA. Anticipated noise levels generated by typical plant is given in Table 5.5.

236. The location of a sensitive receptor (the RPC) some 300m from the site and project construction significantly increasing noise results in the severity of this impact being assessed as high.

Table 5.5: Anticipated noise levels generated by construction plant

Equipment	Estimated number	Typical noise level (decibels)
Excavator for footing	1	81
Crane for lifting solar panels	1	81
Trucks	2	76
Pile driver for foundation	1	110
Crusher	1	90
Drilling equipment	1	81
Excavator with rock breaker	2	81
Small backhoe for trenching	1	78
Water truck	1	76

237. In order to minimize the impact of noise generated during construction, a number of mitigation measures will be implemented by the EPC contractor. Careful siting of plant and activities (back-up generator sets, batching plant, crushing plant) within the site will enable some noise to be reduced due to buffering by other buildings (for example a location of the crushing plant has been proposed as shown in Figure 3.1). During construction phase, use of heavy equipment creating elevated noise levels beyond typical levels for residential areas (i.e. RPC facility) will be limited to only during daytime. Should noise exceed the 55 dBA limit for more than four hours per day for more than three consecutive days, the EPC contractor will install suitable noise barriers to reduce the noise level at the RPC boundary. Construction during night time will be prohibited to avoid generating residual noise impacts in the nearby RPC facility. A schedule for heavy equipment usage at the site will be communicated to the RPC at least one week in advance. Activities identified to generate high level of noise should be undertaken over short period and where possible scheduled to avoid their simultaneous operation.

- The EMP and contract documents will require the contractor to include a noise measurement device to record noise levels and that all vehicle exhaust systems and noise generating equipment be acoustically insulated and maintained in good working order and that regular equipment maintenance will be undertaken to minimize noise emissions;
- The contractor will prepare a schedule of operations that will be approved by NUC. The schedule will establish the days, including identifying days on which there should be no work, and hours of work for each construction activity and identify the types of equipment to be used;
- Vehicles and plant will be maintained in good condition to reduce emissions including noise;

- Workers will be provided with ear protection as required; and
- Any complaints regarding noise will be dealt with by the contractor in the first instance through the communications plan and if unresolved they shall be referred through the grievance redress mechanism.

238. **Dust generation**. Dust generation during construction will result from levelling activities, and other activities associated with site preparation. Other major dust sources will be coming from the movement of vehicles over the project's access roads and cleared work area within the project site. In general, dust generation will cause nuisance depending upon the prevailing wind. Dust will be suspended in the air and will reduce visibility on the nearby road during construction and cause nuisance to residents. Reduced visibility will create a traffic hazard for passing vehicles on the road nearby the site, as well as create nuisance to nearby residents at the RPC facility located approximately 300 meters away from construction site. With the exception of the RPC facility, there are no other receptors within a 1 km radius of the site area, this impact is assessed as medium.

239. The EPC contractor will be required to implement good housekeeping and dust prevention and control measures to minimize the impact.

240. **Traffic management**. The project will cause temporary negative impacts through presence of vehicles and equipment. Inconvenience, minor disruptions to traffic on the road as well as on the access to/from the site and port (import of materials, plant and equipment) during the construction period. This includes potential accident risks associated with the traffic volume as a segment of the route will traverse a busy intersection in Boe and Yangor. To address these issues the EPC contractor will prepare and submit to NUC, a traffic management plan (TMP) detailing diversions and management measures. These measures will include the following:

- The contractor will prepare a TMP including traffic controls (signage, flaggers and spotters etc) and identifying haulage routes and times as part of their CEMP;
- Management of signage and traffic flows – especially safety signage during implementation;
- Enforcement of speeding limits and driver monitoring – no tolerance of speed for contracted truck drivers;
- Measures to ensure children do not have access to work sites, road crossing protocols and other related actions;
- Signs and other appropriate safety features will be used to indicate construction works are being undertaken in Nauruan and English;
- Contract clause specifying that care must be taken during the construction period to ensure that disruptions to access and traffic are minimized and that access to villages along the project road is maintained at all times;

- The police will be consulted in the event that access has to be disrupted for any time and temporary access arrangements made;
- The road will be kept free of debris, spoil, and any other material at all times;
- Disposal sites and haul routes will be identified and coordinated with local officials;
- Provision of adequate protection to the general public in the vicinity of the work site, including advance notice of commencement of works, installing safety barriers and signage or marking of the work areas; and
- Provision of safe access across the work site to people whose access are temporarily affected during the project construction.

241. **Health and safety hazards - workers.** The project's construction phase can cause a range of health and safety impacts. The SPS requires that health and safety impacts on workers and the community are identified and mitigation measures proposed in line with the requirements of the EHSG. Air pollution, noise, traffic, and risk of spread of communicable diseases which are also relevant to health and safety aspect, have already been discussed.

242. There are many activities during the construction phase that will expose the workers to hazards. Impacts/risks will be for a defined period (i.e. the construction period of 12 months) and will vary according to the construction program, worker experience and other factors such as weather. The construction work site will be equipped with a health post which will include first-aid and basic medical supplies and first aid kits will be provisioned in all vehicles. To reduce the risk of incidents at the work site, access to the site by people other than those authorized will be prohibited. Overall the risks posed to health and safety of workers is considered high.

243. The EPC contractor will prepare a health and safety plan (HSP) which will detail the necessary measures to manage potential health and safety issues. Appropriate health and safety procedures will be aligned with both Nauru laws and regulations and the SPS.

244. The HSP will address worker health and safety and will establish routine safety measures including mandatory communicable diseases awareness and prevention (including HIV/AIDS) training and will be linked with the emergency response plan. The contractor will maintain an accident and incident register.

245. **Health and safety hazards - community.** Throughout the construction phase, there will be potential health and safety risks to the communities surrounding the project area and along the access roads and haul routes . The severity of impact is assessed as being high. The EPC contractor will be required to establish and maintain a safe working environment by addressing community health and safety as part of the HSP (see Section 7E). Also, a TMP associated with the project activities will be developed in consultation with the communities and NUC regarding the key project routes, timing of peak materials and equipment transport, types of vehicles and heavy equipment and provision of road safety awareness to the surrounding community.

246. **Risks to physical cultural resources**. The site has been heavily disturbed during the peak of mining operation and as such presence of physical cultural resources is highly unlikely. The transport of materials from the port to the site will utilize existing roads and no disturbance to cultural sites, sacred places or historical monuments is anticipated. In the unlikely event of encountering a physical cultural resource during construction activities, the matter will be handled as per the chance find procedure to be included in the CEMP (see Section 7E).

247. **Creation of jobs for local people**. During the construction of the project short-term opportunities for local employment is expected to become available. More so, employees within NUC will have increased capacity due to the project implementation support, training and institutional strengthening program. The demand for jobs, as described in Section 3, will benefit the poor and vulnerable groups who would possibly be employed as local laborers.

D. Operation Phase

1. Impact on the physical environment

248. During the operation phase, the site is expected to be cleared of vegetation already, however, regular clearing and cutting of growing vegetation would have to be made to avoid shading and interfering with solar power generation efficiency. Generation of waste from various project activities and can impact sensitive receptors, particularly land and nearby waterbodies. Given that the island appears do not have a recycling facility, bulky metal waste that may be generated by the project may cause concern. As discussed above, the site is not near any body of water that will consequently or ultimately, be affected by environmental impacts associated with waste generation. Details are provided in Section 7 F.

249. **Improper disposal of facility wastes**. During operation, it is unlikely the solar power plant will generate large volumes of waste. Waste will include organic waste (leaves, vegetation clippings) which can be used as compost material and solid waste generated by few site personnel office and which can be disposed of at the landfill.

250. The waste will be collected from the site and disposed of in the nearby landfill operated by NRC. With proper management of waste which is easy to achieve, the project impact during operation is considered negligible.

251. **Improper disposal of used oil and hazardous wastes**. A minimal amount of fuel and lubricating oils for equipment maintenance will be stored at the facility once operational. When not properly handled onsite, used oil and hazardous chemicals (e.g. weed control chemicals, and fuel oil for grass cutters) may cause contamination of soil in its immediate vicinity and eventually be carried to areas with lower elevation and ultimately, to bodies of water. Considering the non-volatility of oil and persistent organic pollutants associated with herbicides, possible spillage may cause irreversible damage to environmental receptors.

252. Considering the low volume of used oil and hazardous waste that may be used by the project, the generation of hazardous waste is considered a moderate impact. However, it is important that proper storage, handling, and management of hazardous chemicals and wastes will be implemented by the power facility operator/s according to the EMP. This should also include serious consideration of off-shore disposal, according to requirements of transboundary movement of waste.

2. Impact on biological environment

253. **Vegetation maintenance**. Vegetation growth will be controlled within the solar power facility and immediate periphery as described above during project operation. At its current stage, large portion of the proposed project site is considered open or ruderal, thus is devoid of large trees while those with dense vegetation cover are those that are have regenerated from previously mined areas. Vegetation within the immediate periphery of the solar power facility (within 5 to 10 m away from the edge of the solar panel, depending on height of tree) will be removed. Vegetation cuttings and weeds will be disposed of properly.

254. **Loss of vegetation cover and habitat for fauna**. By the time the plant is operational, the site will already have been cleared of most of the vegetation. Apart from vegetation maintenance requirements (as described above), there should be no further removal or clearance of vegetation and trees for the project. Birds may perch or establish nests on remaining trees along the site boundary or buffer areas. Small animals with smaller niche requirements such as geckos, skinks and snails may adapt to the presence of the solar plant and may return to the site to forage or scavenge for food. This impact is considered negligible.

255. **Bird strike on solar panels and associated infrastructure causing injury or fatality**. Similar to other facilities occupying a large track of land, there is the risk of collision for bird species. As some species of birds may get attracted to the shaded areas underneath the solar panels, other birds may also attempt to drink from plastic sheets, and water-birds can mistake the glossy blue panel for a body of water; collision may cause injury and even fatality. Apart from collision injury or fatality, these risks will not pose significant effects for most birds.

256. Sea birds or marine birds (mostly non-breeding visitors) that make up for the majority of bird species in Nauru are likely to prefer flying over and hunting for food in the sea. Considering the low number of inland bird species, the probability of occurrence of risk collision may be considered low. The absence of endemic and protected bird species also lessens the concern about interaction with the project facilities during operation. Bird deterrents should still be considered such as use of LED lights (night and security lighting) to attract fewer insects which is food for some birds and small animals, reorientation of panels to lessen exposure for birds, and anti-perching spikes.

3. Impact on socio-economic environment

257. **Reduced carbon emissions**. The project will result in a reduction of carbon emissions. The feasibility study has calculated that 71% of carbon will be displaced when Nauru utilises this solar power plant as source of power to replace existing diesel power generation facilities at NUC, accounting for a reduction of 11,155 tonnes CO_2/year. This then creates the opportunity to reduce carbon emissions and reduced reliance on fossil fuel on Nauru in the long-term. This positive impact is considered significant and may be further enhanced by proper operation and maintenance of the facility.

258. **Achievement of strategic directives**. This project is in line with ADB's country operations business plan for Nauru, 2019–2021 and the Pacific Approach, 2016-2020, which promotes job creation, inclusive economic growth and human development through a three-pronged strategy focusing on reducing costs, managing risks and enabling value creation. Nauru's National Development Strategy 2005-2025 (revised 2009) includes goals in the areas of energy security, water security, food security, a healthy environment, a healthy people and productive, secure land resources. The project contributes specifically towards the long-term milestone within the strategy of viable power generating capacity including alternative (renewable) energy sources.

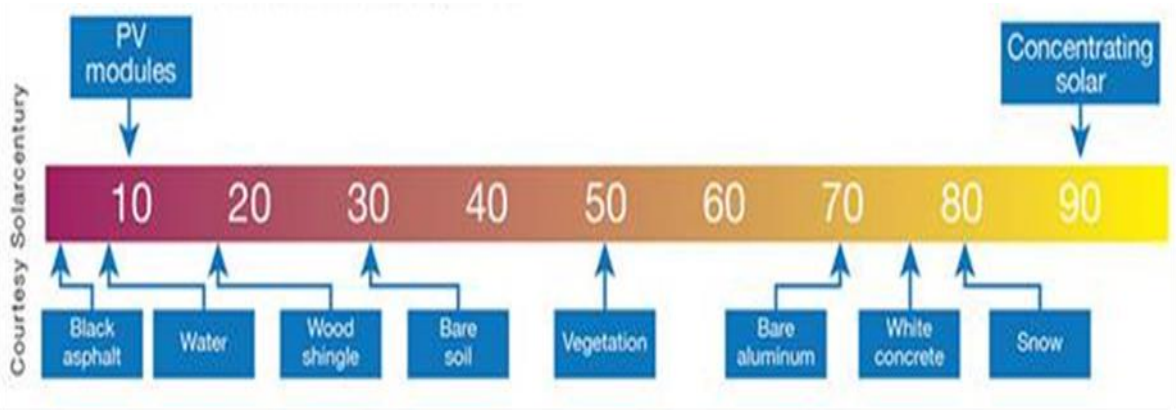
259. **Increased reliance on renewable energy and reduction in cost of power.** Largely as a result of reduced electricity costs from renewable energy sources and improved reliability of supply. The project will increase reliability of electricity supply by reducing the over reliance on diesel generated power, which can be subject to supply interruptions and rising oil prices. Some of the causes of outages will be mitigated by the project, resulting in service interruptions becoming less frequent.

260. In addition, the project will increase utilization of renewable energy within the grid, which over the life of the solar plant is cheaper than diesel generators. In the future, rising oil prices could reduce the ability of NUC to recover expenses, resulting in higher tariffs for electricity customers, including poor households. The shift to renewable energy sources reduces this risk for poor households.

261. **Potential competition for local water supply.** Water for routine maintenance and cleaning of panels will be required during operation of the solar power facility. The monthly demand for water during operation is 0.166 megalitres, sufficient to maintain a total of 3.7 hectares of installed solar panels. This is equivalent to two liters of water per panel per week. With the limited water supply in Nauru, further competition for water for local residents, this poses a significant impact and means that a sustainable water supply and source will have to be identified during the solar power facility operation, as an alternative to supply from the desalination plant. The solar power facility will be equipped with rainwater harvesting facilities to collect rainwater and store it for use for panel cleaning and routine maintenance, as described in Section 3.

262. **Risk of glare**. Due to the closest receptors, glare from solar panels is unlikely to cause hazards. Solar panels are designed to absorb light rays from the sun and are not likely to reflect light causing glare impact. The airport and aircraft navigation is 5 km away from the project site and unlikely to be affected by risk of glare. Studies for solar panels installed at or near airports in many cities have shown to present no hazard to air navigation. Figure 5.2: provides typical albedo[10] values for a variety of materials, which indicates PV modules have a very low albedo value compared with, for example, white concrete.

Figure 5.2: Typical albedo values for different materials



E. Decommissioning Phase

263. During decommissioning of the project, the solar panels, batteries, and equipment parts would have to be removed. The impacts identified are summarized in Table 4:are primarily associated with improper handling of decommissioned plant main components – solar panels and batteries – and equipment parts.

264. **Improper handling of decommissioned solar panels and BESS, and equipment parts.** Decommissioning of the project is anticipated after 25 years of useful life. The solar panels and inverters would have to be removed and replaced after serving useful life. Batteries need to be replaced after 10 years of useful life. Solar panels and batteries will no longer yield efficient energy production at the end of its useful life and hence they must be removed and replaced with new panels. The manufacturing supplier of the solar panels will be engaged to collect the panels, and these panels will be shipped offshore for recycling and reuse.

[10] Albedo is a measure of how much light that hits a surface is reflected without being absorbed. Something that appears white reflects most of the light that hits it and has a high albedo, while something that looks dark absorbs most of the light that hits it, indicating a low albedo.

265. Similarly, batteries shall be recovered and recycled by the manufacturing supplier at the end of useful life. The panels and the battery will be disassembled, collected, placed in a yard for collection and transport to the port. These panels will be shipped offshore to Australia for proper disposal and reuse. At present, solar panels and BESS systems are almost entirely recyclable, with a number of facilities spread around the world. At the time of decommissioning, the locations of these sites will need to be determined.

266. A detailed decommissioning and recycling plan will be developed by the plant operator at least one year prior to decommissioning components of the solar power facility.

6. INFORMATION DISCLOSURE AND STAKEHOLDER CONSULTATION

A. Consultations

267. Consultations with land owners, district representatives and members of NGOs and government stakeholders were conducted during project preparation. The consultations enabled customary landowners and community representatives to be informed of the project concept and initial designs, potential environmental and social impacts, and allowed time for questions and concerns to be addressed. During the consultations, the preference for jobs to be available to landowners and equally shared among the districts was expressed. A representative from the business NGO was nominated as the project contact person, who will be responsible to disseminate information and represent the organization on behalf of the other members and communities. It is suggested that this representative be included in the Project Steering Committee when it is formed during project implementation.

268. A consultation meeting was held with 12 representatives of landowning groups on 24 October 2018 during the feasibility study stage and meetings with land owners and stakeholders individually as part of the project disclosure process. At each meeting, an outline of the project and preliminary designs were presented, as well as anticipated social and environmental impacts. Stakeholders consulted are listed in Table 1 and initial stakeholder mapping is shown in Table 2 of Annex E.

269. Issues and comments raised during the consultation meeting included:

- The yearly rate of the land lease and whether it could be increased. Abraham Simpson, NUC's Chief Executive Officer, clarified that the lease rate is based entirely on government-set lease rates and this is the rate of A$8.50/m² per year.
- The availability of employment opportunities for landowners during installation and operation of the project. Abraham Simpson advised that the selection of workers will be implemented with fairness, with priority for landowners to be considered.
- The ownership of the solar facility once in operation. Abraham Simpson explained the different responsibilities of the government, ADB, NUC, and the plant operator in terms of funding, designing, tendering, procurement, operations and maintenance of the solar facility project.
- The ability of the solar plant to provide enough electricity for the whole island. Abraham Simpson explained clearly the purpose and capabilities of grid-tied solar facilities based on percentage of generation.
- The possibilities of increasing the land lease rate when the solar facility is in operation in the future (5 or more years). Abraham Simpson explained that land

lease rates are entirely dependent on Cabinet's future declared lease rate amendments; hence NUC has no authority over setting the lease rates. If the Cabinet announces an increase in the commercial lease rate, then NUC will pay the landowners the new rate from that time onwards.

- The extent of environmental impact at the site where the batteries, diesel generators and substations will be located. Abraham Simpson said that an environmental assessment was being conducted and it will include an environmental management plan. This will be carefully monitored. The batteries are different to the type commonly used in small appliances, and the chance of leakage of chemicals is low.
- The amount of land required for the 6 MW solar facility. Abraham Simpson explained that an estimate of up to 6 ha of land will be used, however, the remaining land area has been earmarked for future solar expansion projects or the relocation of diesel generators. This matches the purpose of the lease, as defined in the lease agreement.
- When the landowners were asked about the closure of the old mining road within the land lease area, the group responded that there would not be an issue as the area is only used for noddy bird catching and there are plenty of other areas on the island to catch the birds.

B. Ongoing Consultations and Communications

270. A stakeholder communications strategy has been prepared for the project and is included in the Project Administration Manual. This will be developed into the project's communication and consultation plan (CCP) early in project implementation. The strategy covers the project implementation phase, and will be implemented by NUC, with guidance from the project implementation support consultants. As there are limited civil society organizations on the island, a participation plan was deemed not required.

271. A CCP shall be further developed by the NUC supported by the CSC and will be implemented for the remainder of the project. This will include elements being implemented by other parties such as NRC, the EPC contractor, involving project identified stakeholders, for implementation during the project life cycle. Table 3-Annex E provides a summary.

272. Regular consultation is needed with the stakeholders and customary landowners, especially prior to site preparation and construction activities. NUC is tasked to inform the stakeholder groups and land owners, including the nearby RPC Camp No. 1 management and residents, about the project.

7. ENVIRONMENTAL MANAGEMENT PLAN

A. Introduction

273. An EMP addresses the environmental impacts and outlines the key environmental management and safeguards that will be implemented during a project to avoid and/or reduce the project's key environmental impacts. The general purpose of the EMP is to:

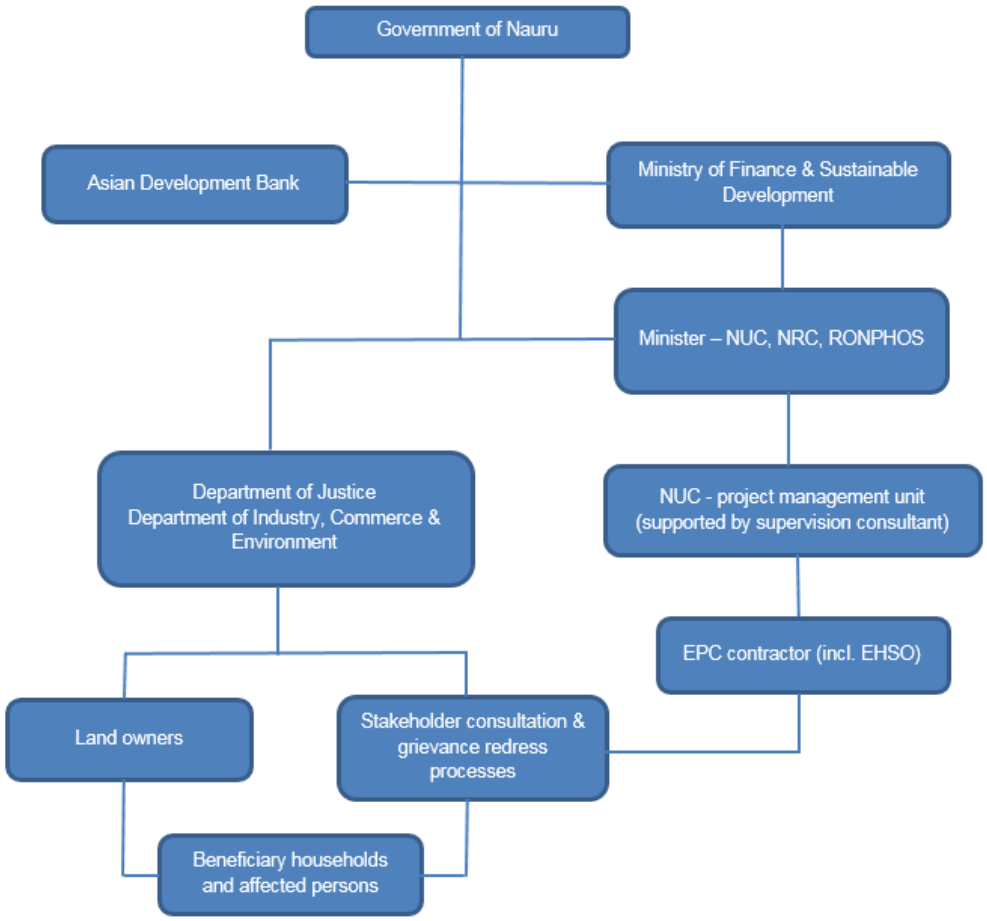
- Encourage good management practices through planning and commitment to environmental safeguarding and management;
- Provide rational and practical environmental and social guidelines that will assist in avoiding and/or minimizing the potential environmental impact of activities;
- Minimize disturbance to the environment (physical, biological and ecological, socioeconomic, cultural, and archaeological);
- Combat all forms of air, noise, land, water, waste and pollution and prevent land degradation;
- Comply and adhere to all applicable laws, regulations, standards and guidelines of government and the ADB's SPS;
- To adopt best practicable waste management for all types of waste (liquid and solid), including asbestos during decommissioning of buildings, with the objective to prevention, minimization, recycling, treatment or disposal of wastes;
- Describe the monitoring procedures; and
- As a result of the foregoing, reduce environmental and social risks.

274. The EMP covers activities and impacts associated with the preconstruction, construction, operational and decommissioning stages of the project. The mitigation measures that will be implemented during the project to minimize negative impacts are described in the EMP matrix (Table 7.2); this details several components crucial to effective environmental management, including: (i) organizational responsibilities (for various aspects of EMP implementation); (ii) consultation and information disclosure; (iii) plan for mitigation of impacts (during pre-construction, construction and operation); (iv) grievance redress; and (v) monitoring and reporting. These are explained in detail in the sub-sections below.

B. Implementation Arrangements for Environmental Management

275. Successful implementation of the mitigation measures described in the EMP depend on a coordinated effort between all participants in planning, design and construction of the project. The relationships between the primary participants in the proposed project are shown in Figure 7.1 and described below.

Figure 7.1: Institutional arrangements for environmental management



276. **Nauru Utilities Corporation**. As the agency implementing the project, NUC will perform the role of project management, including overseeing the production of the tender package, review and evaluation of the bids, award of contract, supervision of construction and post-construction activities. The NUC will be responsible for monitoring the progress of implementing the provisions of EMP and all mitigation measures. This includes ensuring that all government and ADB requirements and procedures relating to environmental safeguards are maintained. The NUC will be supported by the CSC and together with DCIE and other government departments and agencies, ensure compliance with policies and regulations. In this manner, the NUC and other agencies play an important role in ensuring that the mitigation measures are included in the site clearance and EPC tender packages. During construction, NUC will take the lead for site supervision, and, through site inspections and support of the CSC, will evaluate the effectiveness of the implementation of the approved CEMP. The NUC will appoint a safeguards focal point to work with the CSC.

277. **Construction supervision consultant**. The CSC will assist the NUC to supervise the proposed works and ensure that the project is implemented according to the environmental safeguards of Nauru and SPS. The CSC will include an international environmental specialist (IES) and national environmental specialist (NES) to liaise between government agencies, CSC, contractor and the NUC. The IES and NES will work closely with the NUC safeguards focal.

278. **Contractors**. The NRC and EPC contractor will be responsible for responding fully to all contract conditions including those covering environmental mitigation, mobilization, awareness raising/training and monitoring and reporting. The NRC and EPC contractor will be responsible for implementing all environmental, health and safety actions included in the EMP and relevant clauses in the bidding documents and contract during the pre-construction and construction period. The NRC will prepare its SEMP and the EPC contractor will prepare their CEMP based on the site- specific conditions and construction methodologies they propose to use and the direction in the EMP. The SEMP and CEMP will further develop the EMP in Table 7.2 and will detail measures for all impacts covered in the EMP including but not limited to traffic management, waste management, hazardous material and waste management and health and safety. The NUC and ADB will review the SEMP prepared by NRC prior to any site clearance activities commencing. The NUC and CSC will review and approve the CEMP developed by the EPC contractor before the commencement of construction. The CEMP will be shared with ADB for comment during the review process. The approved SEMP and CEMP will be submitted to DCIE for information.

279. The NRC and EPC contractor will each appoint an EHSO who will be responsible for site inspections on a daily and weekly basis to check compliance with the approved SEMP and CEMP and ensuring implementation of all health and safety requirements, these will be documented and subject to monitoring by NUC, ADB and DCIE. The responsibilities of the NRC and EPC contractor include:

- Appointing an EHSO, sending letter to NUC confirming that this position has been filled and by whom before site clearance and construction respectively commences (the bidding documents and contract specify the roles and tasks of the EHSO);
- Coordinating with NUC for preparing and submitting the SEMP and CEMP , the EHSO will be responsible for ensuring that NRC and the EPC contractor complies with the clauses in the contract and bidding documents in respect of environment, health and safety;
- As required, preparing, and submitting for review and approval, appropriate plans (tree removal, traffic management, waste management etc.);
- Coordinating with NUC in respect of community consultation and information dissemination i.e. establishing GRM, road closures and diversions, blasting dates and times etc.; and

- Undertaking daily and weekly site inspections (by the EHSO) recording the findings in a site diary and participating in monitoring and coordinating with NUC to ensure that environmental management activities are reported in monthly reports as required.

280. **Department of Commerce, Industry and Environment**. The DCIE-Environment leads the management of Nauru's environment and natural resources. The DCIE is responsible for reviewing environmental assessments prepare for developments and projects and issuing project clearance/approval on behalf of government.

281. **Capacity development**. The NUC has had the benefit of training and mentoring through a previous ADB-financed project. Although the project will be relatively short, the CSC will take the opportunity to provide as much capacity development in environmental management as possible to NUC and DCIE. Assistance in the form of professional advice on all aspects associated with environmental assessments and EMP development and implementation will assist the government to further delivery its supervisory, management and monitoring responsibilities.

282. Table 7.1 summarizes the roles and responsibilities.

Table 7.1: Responsibilities for environmental management and monitoring

Agency	Responsibilities
Implementing agency - NUC	Overall responsibility for project construction and operation Ensure that sufficient funds are available to properly implement all agreed environmental safeguards measures Ensure that the project complies with the requirements of Nauru and SPS Ensure that tender and contract documents for civil works include all relevant parts of the environmental assessment and project agreements Appoint the safeguards focal point Ensure that requisite measures from the IEE are incorporated into the contract documents Monitor and inspect project implementation including compliance with the approved SEMP and CEMP Submit at least quarterly safeguards monitoring reports to ADB
DCIE-Environment	Review the IEE and issue approval for the project Ensure that any conditions of approval and EMP provisions are implemented to mitigate environmental impacts to acceptable levels Ensure that the contractor has obtained necessary environmental permits and license(s) prior to award of civil works contracts Assist in the establishment and implementation of the GRM Undertake inspections of implementation of the SEMP and CEMP
Construction supervision consultant	Support NUC in implementation of environmental safeguards for the project in compliance with Nauru requirements and SPS Support NUC in all of its tasks and work closely with the safeguards focal point Prepare, on behalf of NUC, quarterly or semi-annual environmental monitoring reports for submission to executing agency and ADB Provide mentoring and capacity development to staff of NUC, NRC, DCIE

Agency	Responsibilities
Site clearance and construction contractor(s)	Participate in induction training on EMP provisions and requirements delivered by the NUC and CSC Prepare the SEMP and CEMP and submit to NUC and CSC for review and approval Obtain necessary environmental license(s) for project works, materials sources, concrete batching plant etc. prior to commencement of works Ensure that all workers, site agents, including site supervisors and management participate in training sessions. Maintain a record of training and conduct of awareness sessions for staff to ensure compliance with environmental and safety statutory and contractual obligations including the approved SEMP and CEMP Ensure compliance with contractual obligations and proper implementation of ADB requirements including approved SEMP and CEMP Based on the results of SEMP and CEMP monitoring, cooperate with the NUC to implement environmental corrective actions and corrective action plans, as necessary. Respond promptly and efficiently to requests and instructions from LTA for environmental corrective actions and corrective actions and implement additional environmental mitigation measures, as necessary. Provide sufficient funding and human resources for proper and timely implementation of required mitigation measures in the EMP.

C. Environmental Management Plan

283. This section describes the proposed EMP for each development phases, to address key impacts, the NRC, EPC contractor will be required to develop its SEMP and CEMP respectively to address the issues identified in this IEE during project pre-construction and construction phases. NUC shall establish the procedures for implementing the requirements of the EMP during operation phase. The decommissioning and recycling plan will be developed at least one year before decommissioning phase.

284. Table 7.2 presents the environmental management plan, key responsibilities and implementation phase of respective plans. Details of respective sub-plans and management plans are described in Section 7D, 7E and 7F.

Table 7.2: Environmental management and monitoring plan

Mitigation				Monitoring		
Project activities and environmental impacts	**Mitigation and management measures**	**Responsibility**	**Implementation timeline**	**Parameter**	**Frequency and means of verification**	**Responsibility**
Pre-construction phase						
Initial environmental examination (IEE) reviewed and project approved	DCIE reviews the IEE and EMP; DCIE, in writing, provides environmental clearance of the project; Any conditions of approval included in bid and contract documents	NUC DCIE	Prior to start of site clearance activities	SPS and system for government approvals complied with	Prior to site clearance activities commencing. IEE submitted and reviewed; Project approval (environmental clearance) issued by DCIE	ADB
Site clearance and preparation - chance finds of UXO	Implement UXO protocols: - implementation of Nauru protocols and adherence to international standards of ordnance survey; - all work to conform to the government existing Ordnances Regulations in conjunction with the standards required for mine clearance, issued by the Mine Clearance Policy Unit, Department of Humanitarian Affairs – UN; and - implementation of international standards on safety procedures if an UXO located, management and disposal. Refer Section 7D for detail.	NRC, Police, National Emergency Services Department	Prior to site surveys and/or site clearance activities commencing	Any discovered UXO safely handled and disposed of	Prior to and during site clearance activities. Record of finds and disposal	NUC, ADB. National Emergency Services Department
Site clearance and preparation – rock breaking and blasting	NRC to recruit a suitably qualified and experienced environmental specialist to prepare and submit SEMP for activities; SEMP will detail proposed site layout, approach to the activities and include work method statements detailing procedures for UXO finds, blasting, haulage off-site of unusable material, chance finds, noise and dust control, health and safety and emergency response; Approved SEMP to be implemented during activities. Refer Section 7D for detail.	NRC	During site clearance and preparation activities	Compliance with approved SEMP; Effectiveness of measures	Prior to and during activities. Approved SEMP; Monitoring checklists completed; Monitoring reports submitted	NUC, ADB
Site clearance and preparation - chance finds of physical cultural resources	NRC to prepare chance finds procedure as part of its SEMP; Site agents will be instructed to keep a watching brief for relics in excavations. Should any potential items be located, the NUC will immediately be contacted, and work will be temporarily stopped in that area. NUC, in coordination with the relevant authorities, will determine if that item is of potential significance and the appropriate government ministry who may arrange for an inspection of the physical cultural resources	NRC, NUC, relevant authorities	During site clearance and preparation activities	Any discovered finds handled in compliance with approved procedures included in SEMP; Effectiveness of measures	Prior to and during activities. Approved SEMP; Monitoring checklists completed; Monitoring reports submitted	NUC, ADB

Mitigation				Monitoring		
Project activities and environmental impacts	**Mitigation and management measures**	**Responsibility**	**Implementation timeline**	**Parameter**	**Frequency and means of verification**	**Responsibility**
	and work will be stopped to allow time for this inspection. Until the appropriate government ministry has responded to the inspection request site clearance activities will not re-commence in this location until agreement has been reached between the parties as to any required mitigation measures, which may include supervised excavation. Refer Section 7D for detail.					
Contractor start-up and development of construction program and CEMP	Contractor will prepare CEMP with site-specific plans and sub-plans for construction elements or particular site conditions as necessary based on their construction program and work method statements; Contractor will demonstrate how the CEMP will be properly resourced and implemented including through the recruitment of a qualified, experienced person to be the full-time environment, health and safety officer (EHSO); CEMP will include: - Approach to environmental management viz the project requirements; - Organizational arrangements including reporting and communication channels (also to be shown on an organization chart), training, awareness raising and linkages between sections or sub-plans; - Consents and permits required to be obtained by the contractor, timeframe and plan for application; - Materials management and spoil disposal; - Vegetation removal, tree cutting and replanting (including any enhancement planting); - Waste management plan (covering general waste and hazardous waste); - Concrete plant, rock crushers and materials supply; - Erosion control and sediment runoff; - Dust and noise minimization and controls (including noise baseline, watering schedule); - Traffic management and controls (including haulage routes); - Code of conduct (see below) – protocols for workers' behaviour – as agreed with community leaders; - Health and safety - workers and community (including training);	EPC contractor	At least one month prior to commencement of construction activities	Construction activities undertaken in compliance with approved CEMP; Effectiveness of measures	Prior to and during activities. Approved CEMP; EHSO designated and on-site; Monitoring checklists completed; Monitoring reports submitted	NUC, CSC

Mitigation				Monitoring		
Project activities and environmental impacts	**Mitigation and management measures**	**Responsibility**	**Implementation timeline**	**Parameter**	**Frequency and means of verification**	**Responsibility**
	- Chance find procedures for accidental discovery of archaeological assets, cultural sites or resources; - Decommissioning, rehabilitation, revegetation and recontouring of the site; - Communications, information and grievance redress (demonstrating compliance with the project's CCP and GRM); and - Monitoring and reporting (including proposed checklists). Refer Section 7E for detail.					
Contractor mobilization – site office and works yard establishment, materials and plant	Contractor will adopt good management practices to ensure that fuels and chemicals, raw sewage, wastewater effluent, and construction debris/scarified material is disposed of in controlled conditions to reduce the risk of contamination; Code of conduct–workers' protocols to be discussed and agreed with community leaders–to be shared with workers as part of awareness and mobilization training; The contractor is to ensure that workers' actions outside work site are controlled and that rules of conduct are observed always; The contractor will identify one member of their staff, fluent in Nauruan and English, to be the liaison between the community leaders and contractor, as well as between the contractor and NUC; Adequate signage—in Nauruan and English—and security will be provided at the site office and works yard and prevention of unauthorized people (especially children) entering the area; Hire and train as many local workers as possible by using local labour if possible; Potable water, hygienic sanitation facilities/toilets (portable lavatories) with sufficient water supply, worker rest area and first aid facilities will be provided at the project site and accommodation; Wastewater effluent from maintenance/workshop area and equipment washing yards will be passed through gravel/sand beds and all oil/grease contaminants will be removed before discharge. Oil and grease residues shall be stored in drums awaiting disposal in line with the agreed waste management section of the EMP. Point of discharge will be agreed with NUC and CSC; Predictable wastewater effluent discharges from construction works shall have the necessary	EPC contractor	During start-up of site establishment and construction activities	Permits, as required, from DCIE; Construction activities undertaken in compliance with approved CEMP; GRM shows complaints resolved quickly and satisfactorily; Effectiveness of measures	Prior to and during activities. Approved CEMP; EHSO designated and on-site; EHSO site diary; Training records; GRM register and complaints of incidents between workers and residents; Monitoring checklists completed; Monitoring reports submitted	NUC, CSC

Mitigation				Monitoring		
Project activities and environmental impacts	**Mitigation and management measures**	**Responsibility**	**Implementation timeline**	**Parameter**	**Frequency and means of verification**	**Responsibility**
	permits/approvals from DCIE before the works commence; Provision of adequate protection to the public near the site, including notice of commencement of works, installing safety barriers, and signage or marking of the work areas; At all times workers should respect Nauruans and follow the code of conduct, including those addressing women and elders; Avoid damage to productive trees and gardens or other private property; and Land used for worksites shall be restored to the original condition as far as practicable and the area shall be planted with appropriate trees / shrubs as soon as practicable after it is vacated and cleaned. Refer Section 7E for detail.					
Introduction of invasive and/or alien species	All equipment/plant, vehicles and construction materials (or even food and alcohol brought in for foreign workers) imported to Samoa for the project and the vessels that import them will be subject to clearance procedures under the quarantine regulations and may require issue of phytosanitary certificates.	EPC contractor, Quarantine Section – Department of Justice	Prior to offloading any plant, equipment, materials etc	Inspected imports verified okay for use on project	Phytosanitary certificates issued; Quarantine Section records	NUC, CSC
Land access and lease arrangements – timely payments	Land Due Diligence report; NUC will continue to engage with the land lessors (owners) on land lease arrangements and the proposed use of land for solar power development; Any government approved lease rate increases to be reflected in new and updated agreements.	NUC	Prior to and during project delivery	As per Land Due Diligence report	Land Due Diligence report; Leases remain valid	CSC, ADB
Gender awareness and continuing engagement	Gender-sensitive consultations with customary landowners.; Women will be involved in community meetings, consultations and awareness events about the project and its implementation program. If necessary, separate meetings have to be organized to give women an opportunity to express their views about the project; The project will target for capacity building, training and employment within the project to include 20 percent of women.	NUC	Prior to implementation	Gender targets identified; Measures included in design and implementation (incl. training)	Throughout project delivery. Records of consultations and meetings; Records of training and awareness sessions	NUC, CSC, ADB
Construction phase						
Waste generation and ad hoc dumping of spoil	Quantities of spoils and rocks to be generated will be determined by the EPC contractor after assessment of topographic conditions.	EPC contractor	Throughout construction activities	WMP as part of CEMP; Disposal at designated sites	Daily, weekly - visual inspection; Site clear of rubbish;	NUC, CSC

Mitigation				Monitoring		
Project activities and environmental impacts	**Mitigation and management measures**	**Responsibility**	**Implementation timeline**	**Parameter**	**Frequency and means of verification**	**Responsibility**
	Contractor will develop the waste management plan (WMP) that will define the management measures for controlling, hauling, storage, treatment and delivery of the materials for proper disposal. Refer Section 7E for detail.				Review of disposal record;	
Improper disposal of debris form dilapidated structures	Contractor will remove structures and debris and demolished materials will be handled and disposed of properly at the landfill	EPC contractor	At start of site establishment and construction activities	All debris removed from site; Disposal at designated sites	Review of disposal record	NUC, CSC
Poor drainage and flooding/ponding at project site	Land preparation will be designed with proper slopes to allow site drainage along the perimeter of the solar power facility, and along the sides of footing foundations; Pervious layer of soil/gravel bedding will be placed onsite as finishing layer to allow natural seepage of surface runoff; Rainwater run-off will be collected in drains and stored in a tank for reuse during solar panel routine cleaning and site maintenance.	EPC contractor	At start of site establishment and construction activities	Appropriate drainage and no ponding on site	Visual inspection – site plans and drainage effectiveness	NUC, CSC
Competition for water supply	Contractor to consult with water authority; Contractor to confirm volumes required and to ensure source and water supply do not create grievances or issues with residents; Contractor to develop water resources management plan (WRMP) as part of CEMP. Refer Section 7E for detail.	EPC contractor	Throughout construction activities	WRMP prepared and approved; No. of complaints regarding domestic and/or commercial water supply	Records of consultations and meetings; Grievance register; Records of WRMP monitoring	NUC, CSC
Removal of vegetation	Vegetation clearance during surveying and demarcation activities will be minimized. Major trees to be removed will identified on a plan developed by the contractor, trees to be removed will be clearly marked, only marked trees will be removed; Contract documents and technical specifications will include clauses expressly prohibiting the felling of trees, not requiring to be cleared by by construction workers for the term of the project; and Construction workers will be informed about general environmental protection and the need to avoid unnecessary felling of trees. Refer Section 7E for detail.	EPC contractor	Throughout construction activities	Area/number of felled trees/ vegetation removal.	Approved plan and survey; Trees/vegetation marked on ground; Trees/vegetation removed	NUC, CSC
Invasive weds and pests	Ensuring disturbance will be limited in the project area and trucks and vehicles hauling materials between the site and other areas are cleaned so accidental spread of species from one site to another is reduced;	EPC contractor	Throughout construction activities	Effectiveness of measures	Visual inspection – Monitoring checklists completed;	NUC, CSC

Mitigation				Monitoring		
Project activities and environmental impacts	**Mitigation and management measures**	**Responsibility**	**Implementation timeline**	**Parameter**	**Frequency and means of verification**	**Responsibility**
	As soon as construction or use of a disturbed site is completed, rehabilitate and revegetate in order to eliminate opportunity for invasive species to flourish.				Monitoring reports submitted	
Disturbance of wildlife from noise and vehicles	Noise generating equipment such as generators, batching plant, crusher, etc., should be sited away from potential ecological receptors. High noise activities should be undertaken over short periods and where possible scheduled to avoid simultaneous operation of high noise generating equipment; Traffic movement within the project site should be confined to designated access and haulage routes to limit potential disturbance to wildlife; DCIE to assist in monitoring any effects at proposed conservation area.	EPC contractor, DCIE	Throughout construction activities	TBD	Visual inspection – Site layout and siting of noisy plant or activities; Traffic routes and vehicle movements; Monitoring checklists completed; Monitoring reports submitted	NUC, CSC, DCIE
Generation of dust affecting plants	Fugitive dust control measures can be applied during construction to minimize dust generation; Regular watering of unpaved access roads and exposed areas within the site; Limit on-site vehicle speed to 15 mph; Prohibition of dust generating activities during periods of high winds.	EPC contractor	Throughout construction activities	Plant health at adjacent sites	Visual inspection – Vehicles speeds around site; Watering schedule; Monitoring checklists completed; Monitoring reports submitted	NUC, CSC
Presence of construction workers	Contractor will prepare a labor management plan (LMP) and code of conduct for workers. Contractor will provide information boards near the work sites to inform and instruct the public on how to conduct themselves and to be aware of their surroundings if they must approach the works; No tolerance will be allowed for any form of gender-based violence of public; Information boards will be refreshed as necessary and show the name and telephone contacts in NUC and the contractor for complaints about the works. Information boards will also state that the NUC and contractor have an open-door policy for complaints; Contractor to recruit an approved service provider to deliver communicable diseases awareness and prevention program; CEMP to include a program of delivery of communicable diseases awareness and prevention (including STIs, HIV/AIDS and gender-based violence) Preparation and implementation of health and safety plan (HSP); Refer Section 7E for detail.	EPC contractor, Approved service provider	Throughout construction activities	No. and type of complaints; Local people hired for construction works; Effectiveness of liaison; Information boards	LMP and code of conduct for workers; Approved HSP; Approved service provider recruited and implementing program; GRM and register; No. and type of complaints; Records of consultations and meetings; Records of training (workers and community)	NUC, CSC

Mitigation				Monitoring		
Project activities and environmental impacts	**Mitigation and management measures**	**Responsibility**	**Implementation timeline**	**Parameter**	**Frequency and means of verification**	**Responsibility**
Land ownership and access	Obtain copies of land lease agreements and maps with coordinates of the lot boundaries. Engage a geodetic surveyor to ground-truth the leased land and mark the boundaries on the ground with pegs or markers. Validate the actual areas leased as per land lease agreement against the areas measured on the ground. Present the findings to the landowners and discuss any discrepancy against the land lease agreement and actual area to be occupied by the project. Settle any dispute (if any) according to judiciary procedures in Nauru, and consistent with the Lands Act 1976 and its amendments. As required, sign amended lease agreement according to final negotiated / agreed area of lease.	NUC	As per Land Due Diligence report	As per Land Due Diligence report	As per Land Due Diligence report	CSC, ADB
Site security	Signage erected at access point/gate advising only authorized personnel are permitted to enter site; Entire area will be fenced similar to the UAE funded solar facility. The fence and signage will be installed at the commencement of site establishment activities.	EPC contractor	At start of activities on site	Signage and fencing provided at site	Visual inspection	CSC, ADB
Noise affecting sensitive receptors and workers	Contractor to conduct baseline and have noise measurement device on hand; Contractor to ensure all vehicle exhaust systems and noise generating equipment be acoustically insulated and maintained in good working order and that regular equipment maintenance will be undertaken to minimize noise emissions; The contractor will prepare a schedule of operations that will be approved by NUC. The schedule will establish the days, including identifying days on which there should be no work, and hours of work for each construction activity and identify the types of equipment to be used; Vehicles and plant will be maintained in good condition to reduce emissions including noise; Workers will be provided with ear protection as required; and Any complaints regarding noise will be dealt with by the contractor in the first instance through the communications plan and if unresolved they shall be referred through the GRM; Careful siting of plant and activities (back-up generator sets, batching plant, crushing plant) within	EPC contractor	Throughout construction activities	No. and type of complaints; Noise baseline and exceedances of EHSG standards; Effectiveness of measures;	Visual inspection of site layout; GRM and register; Complaints; Schedule; Notices issued; Workers wearing PPE; Monitoring checklists completed; Monitoring reports submitted	CSC, ADB

Mitigation				Monitoring		
Project activities and environmental impacts	**Mitigation and management measures**	**Responsibility**	**Implementation timeline**	**Parameter**	**Frequency and means of verification**	**Responsibility**
	the site to enable some noise to be reduced due to buffering by other buildings; Use of heavy equipment creating elevated noise levels beyond typical levels for residential areas (i.e. RPC facility) will be limited to only during daytime; Should noise exceed the 55 dBA limit for more than four hours per day for more than three consecutive days, the EPC contractor will install suitable noise barriers to reduce the noise level at the RPC boundary. Construction during night time will be prohibited to avoid generating residual noise impacts in the nearby RPC facility; Usage of heavy equipment will be communicated to the RPC at least one week in advance; Activities identified to generate high level of noise should be undertaken over short period and where possible scheduled to avoid their simultaneous operation. Refer Section 7E for detail.					
Dust generation	Contractor will be required to implement good housekeeping and dust prevention and control measures to minimize the impact; Regular watering of unpaved access roads and exposed areas within the site; Limit on-site vehicle speed to 15 mph; Prohibition of dust generating activities during periods of high winds.	EPC contractor	Throughout construction activities	Complaints about dust resolved quickly and satisfactorily	Visual inspection – Vehicles speeds around site; Watering schedule; Monitoring checklists completed; Monitoring reports submitted	NUC, CSC
Traffic management and control	The contractor will prepare a traffic management plan (TMP) including traffic controls (signage, flaggers and spotters etc) and identifying haulage routes and times as part of their CEMP; Management of signage and traffic flows – especially safety signage during implementation; Enforcement of speeding limits and driver monitoring – no tolerance of speed for contracted truck drivers; Measures to ensure children do not have access to work sites, road crossing protocols and other related actions; Signs and other appropriate safety features will be used to indicate construction works are being undertaken in Nauruan and English; Contract clause specifying that care must be taken during the construction period to ensure that disruptions to access and traffic are minimized and that access to villages along the project road is maintained at all times;	EPC contractor, Police	Throughout construction activities	Site and road safety during construction traffic movement; Complaints about construction traffic resolved quickly and satisfactorily	TMP approved; Haulage schedule; Flaggers and spotters and traffic control measures at site and along haulage routes; Monitoring checklists completed; Monitoring reports submitted	NUC, CSC, Police

Mitigation				Monitoring		
Project activities and environmental impacts	**Mitigation and management measures**	**Responsibility**	**Implementation timeline**	**Parameter**	**Frequency and means of verification**	**Responsibility**
	The police will be consulted in the event that access has to be disrupted for any time and temporary access arrangements made; The road will be kept free of debris, spoil, and any other material at all times; Disposal sites and haul routes will be identified and coordinated with local officials; Provision of adequate protection to the general public in the vicinity of the work site, including advance notice of commencement of works, installing safety barriers and signage or marking of the work areas; and Provision of safe access across the work site to people whose access are temporarily affected during the project construction. Refer Section 7E for detail.					
Health and safety hazards - workers	Contractor will prepare a health and safety plan (HSP) which will detail the necessary measures to manage potential health and safety issues. Appropriate health and safety procedures will be aligned with both Nauru laws and regulations and the SPS. The HSP will address worker health and safety and will establish routine safety measures including mandatory communicable diseases awareness and prevention (including HIV/AIDS) training and will be linked with the emergency response plan. Refer Section 7E for detail.	EPC contractor, Approved service provider	Throughout construction activities	No. and type of complaints; Safety of site and plant; Effectiveness of liaison; Information boards	HSP approved; Approved service provider recruited and implementing program; GRM and register; Accident register; Records of consultations and meetings; Records of training (workers and community)	NUC, CSC,
Health and safety hazards - community	As above. Refer Section 7E for detail.	EPC contractor, Approved service provider	Throughout construction activities	No. and type of complaints; Safety of site and plant; Effectiveness of liaison; Information boards	HSP approved; Approved service provider recruited and implementing program; GRM and register; No. and type of complaints; Accident register; Records of consultations and meetings; Records of training (workers and community)	NUC, CSC

Mitigation				Monitoring		
Project activities and environmental impacts	**Mitigation and management measures**	**Responsibility**	**Implementation timeline**	**Parameter**	**Frequency and means of verification**	**Responsibility**
Chance finds and risks to physical cultural resources	Contractor will prepare chance finds procedure as part of CEMP. Refer Section 7E for detail.	EPC contractor	Throughout construction activities	Any discovered finds handled in compliance with approved procedures included in CEMP; Effectiveness of measures	Prior to and during activities. Approved CEMP; Monitoring checklists completed; Monitoring reports submitted	NUC, CSC
Job creation for Nauruans	Contractor to prioritize employment for unskilled and semi-skilled Nauruans. Refer Section 7E for detail.	EPC contractor	Throughout construction activities	No. of Nauruans employed; Equal wages for equal work	Employment contracts, labor records and wages logs/schedule	NUC, CSC
Operations phase						
Improper disposal of facility waste	Develop and implement waste management plan as part of the operations manual of the solar power facility; Waste will be collected from the site and disposed of in the nearby landfill. Refer Section 7F for detail.	NUC	Prior to handover and start of operations	TBD	TBD	Executing agency, ADB
Improper disposal of hazardous chemicals and wastes from plant maintenance	Develop and implement hazardous waste management plan as part of the operations manual of the solar power facility. Refer Section 7F for detail.	NUC	Prior to handover and start of operations	TBD	TBD	Executing agency, ADB
Vegetation routine maintenance	Vegetation within the immediate periphery of the solar power facility (within 5 to 10 m away from the edge of the solar panel, depending on height of tree) will be removed; Vegetation cuttings and weeds will be disposed of properly (composted for re-use where possible); Develop vegetation management plan as part of the operations manual of the solar power facility. Refer Section 7F for detail.	NUC	Prior to handover and start of operations	TBD	TBD	Executing agency, ADB
Bird strike	Bird deterrents should still be considered such as use of LED lights (night and security lighting) to attract fewer insects which is food for some birds and small animals, reorientation of panels to lessen exposure for birds, and anti-perching spikes.	NUC	Prior to handover and start of operations	TBD	TBD	Executing agency, ADB
Decommissioning and recovery/recycling of solar panels and BESS	Develop detailed decommissioning and recycling plan for solar panels, inverters, and batteries and other components to be decommissioned Refer Section 7F for detail.	NUC	At least one year before end of useful life.	TBD	TBD	Executing agency, ADB

D. Site-Specific Environmental Management Plan

285. This section describes the content and coverage of the SEMP and sub-plans to be prepared by the NRC.[11] The NRC will develop their plans based on the outline EMP included in this assessment and reflecting their approach, construction methodology and work method statements. The SEMP and sub-plans will be reviewed and cleared by NUC and ADB prior to any activities commencing at the site.

286. The SEMP will identify key staff designated to specific roles and communication channels. THE NRC will designate a suitably qualified EHSO to ensure compliance with the approved SEMP and who will report on the same. The checklists proposed to be completed on a daily and weekly basis by the EHSO will be included as an annex to the SEMP. The SEMP will include the following sub-plans designed to address the impacts identified and minimize or control the impacts.

1. Unexploded ordnance management plan

287. The coordination of UXO handling falls under the Disaster Risk Management Act 2008, the National Disaster Management Plan 2008 and falls to the National Emergency Services Department to implement. For purposes of site preparation activities by NRC, the process to manage a UXO finding will include the following (modified from the procedures described in the Nauru Port Development IEE):

- If UXO is unearthed during site preparation work, the work is stopped.
- The site of the finding is cleared of all people, including workers, and cordoned off. People and workers are moved to a safe distance to be determined by the NRC officer-in-charge.
- The National Emergency Services Department and the President's Office are contacted and alerted of the finding.
- The Nauru Police Force is contacted, alerted of the finding and mobilized to secure the site and manage public safety.
- The Australia High Commissioner is contacted and alerted of the situation and, if required, a formal request for assistance to provide suitable qualified members of the armed forces to help assess and manage the UXO.
- If, however, skilled UXO people are on the island, they are contacted and an assessment of the UXO is made. NRC qualified staff member assists in this process.

[11] The NRC will recruit a qualified and experienced environmental specialist to assist in development of the SEMP.

- A decision shall be made whether there is a need to evacuate the vicinity of the area including the nearby RPC facility, which is about 300 m away from the site.
- UXO is assessed (active or not) and a clearance plan is developed. The UXO may not be moved and remains in situ (protected and cordoned off – no access) until qualified personnel are on island to dispose of it or the UXO is moved by qualified personnel to a storage bunkering location to be disposed of when qualified people are on island. The bunker site is situated on the 'topside' in a secure area (old mining area).
- UXO are normally detonated at an agreed location on island under professional advice.

288. These protocols form part of the SEMP and shall be implemented by NRC during site preparation activities if UXO is encountered.

2. Site clearance and blasting plan

289. The method for removing pinnacles will lead to increased noise levels and blasting that is likely to impact the nearby RPC residents and workers (located approximately 300 meters from the project site) and road users. Coordination with RPC management and the police will be necessary to inform the residents and workers and road users about the timing and schedule of blasting and rock breaking activity and its duration.

290. Due to the geology of the land and nature of the pinnacles, blasting will be required as part of site clearance activities. The following requirements shall be met.

- Blasting operations shall be conducted in such a manner as will not cause danger to life or property.
- While blasting operations are being carried out within 500 meters of any road or buildings, such number of persons as may be necessary shall be stationed thereon with warning notices to warn persons in the vicinity of danger and to prevent access to the danger area.
- A blasting management plan (BMP) shall be prepared, approved by NUC and ADB, and a copy shall be available on site at all times. The BMP will be prepared to ensure that all blasting operations shall be conducted in a manner that will not cause danger to life or property. Import of explosives as well as blasting operations shall be undertaken in terms of all applicable laws of Nauru and be conducted according to best international practice.

291. The BMP will detail at least the following:

- All explosives shall be stored in purpose built locked magazines on a site within the quarry boundary but remote from blasting operations. Detonators shall be stored in a separate locked magazine but similarly sited.
- Operation of magazines for the storage of explosives and for the storage of detonators, the quality of explosive that may be removed from a magazine at any one time, and the procedure for quarry explosive cases.
- Explosives to be carried in securely covered containers, tamping of explosives and diameter of drill holes.
- Persons allowed to fire shots.
- Time when charges are to be fired, detonation delay, firing warnings, blasting shelters and treatment of misfired charges.
- Inspection of work site after each detonation by the quarry manager or an approved person appointed in writing by the quarry manager.

292. The BMP will also stipulate detailed requirements and procedures for magazines, opening of explosive cases, dust suppression, and health and safety. Refer to Annex F.

3. Health and safety plan

293. The HSP will cover managing and reducing risks to workers and the community. The HSP will include the following information: (i) safety protocols during construction activities, (ii) plan for informing workers about construction health and safety protocols during regular toolbox meetings, (iii) working schedule to avoid workers' fatigue, (iv) health check-up of workers at the beginning of employment and annual regular check-up, (v) information about medical services to be provided by the NRC in case of accidents and emergency procedures, (vi) emergency evacuation procedures in case of serious illness or injury, (vii) health insurance terms and conditions for project workers.

294. In addition, the HSP will demonstrate how the following measures will be implemented during the site clearance activities:

- NRC will demonstrate to the NUC and ADB they are properly resourced by identifying a qualified/experienced EHSO in the bid and subsequently in the SEMP;
- Establishment of safety measures as required by law and by good engineering practice and provision of first aid facilities at work sites, in vehicles and establishment of a first aid/health post at the work site will be at the core of the SEMP;
- NRC will conduct regular training for all workers on safety and environmental hygiene at no cost to the employees. The NRC will instruct workers in health and

safety matters as required by law and by good engineering practice and provide first aid facilities;

- NRC will instruct and induct all workers in health and safety matters (induction course) including site rules and site agents will follow up with toolbox talks on a weekly basis. Workforce training for all workers starting on site will include safety and environmental hygiene;
- Workers shall be provided with appropriate personal protection equipment (PPE) and safety equipment appropriate to their tasks. PPE will include safety boots, helmets, reflector vest, gloves, protective clothes, dust mask, goggles, and ear protection at no cost to the workers;
- Fencing will be installed on all areas of excavation greater than 1m deep and sides of temporary works;
- Reversing signals (visual and audible) shall be installed on all vehicles and plant used at the site;
- Provision of potable water supply shall be maintained at all times in all work locations sufficient for each worker to receive at least 2 liters per day;
- Where worker exposure to traffic cannot be eliminated, protective barriers and warning signs shall be provided to shield workers from passing vehicles. Another acceptable measure is to install channelling devices (e.g., traffic cones and barrels) to delineate the work zone and trained flag men at each end of the current working zone;
- Work sites shall be provided with men and women's toilets/sanitation facilities in accordance with local regulations to prevent any hazard to public health or contamination of land, surface or groundwater. These facilities shall be well maintained and cleaned regularly to encourage use and allow effective operation and emptied regularly so as never to overflow;
- NRC will maintain an accidents and incidents register which will include documentation of near misses. All accidents will be fully documented to the NUC and ADB within 24 hours and a follow up report after investigation has been completed within three days of the accident;
- Workers will be provided with uniform and identification system will be implemented for controlled access to site;
- The site and vehicles will be equipped with fire extinguishing equipment;
- Electrical equipment and flammable materials will be properly stored onsite with labels. Fuel tanks for transportation vehicles will be installed with appropriately designed bund walls and equipped with spill kits and oil-water separator; and
- A no alcohol policy will be implemented at the site.

4. Vegetation clearing and management plan

295. The SEMP will detail procedures for land preparation, managing excess spoil and the removal of grass, shrubs, trees and stumps. NRC will clear the area of vegetation and properly dispose of vegetation stumps and debris according to the procedure described below.

- Vegetation cover, including trees of diameter-at-breast height greater than 15 cm, will be surveyed, inventoried, marked (numbered) on the ground, species identified and delineated on geographic information system map. The total area of vegetation to be cleared will be confirmed, and the number and volume of trees, by species, to be cleared will be calculated.
- NRC will develop the plan that will include: (i) areas covered with vegetation and to be cleared, according to the geographic information system map prepared and marked on the ground; (ii) stand and stock table indicating the volume in cubic meters of trees to be cleared, according to species identified; (iii) clearing schedule and duration; (iv) equipment to be used for clearing vegetation; (v) plan for utilizing logs and wood debris/stumps/branches/foliage/roots; and (vi) plan for disposal of unutilized vegetation components and potential for using such material as compost material.
- NRC will undertake, through a bird specialist (ornithologist), birds nest survey within the project affected areas. The nests will be mapped and counted. Trees which are found to have bird nests will not be felled during bird nesting period. Trees which are free of nests will be felled first, and the remaining trees found to have bird nests will be felled after the bird nesting period. The timing of tree cutting will be determined after the tree inventory and the bird nest survey has been conducted.
- Noise generation will be managed by limiting tree cutting activities to only during daytime.
- Logs will be removed from the site. Burning of remaining debris at the project site will be prohibited.
- Vegetation clearing will be limited to only within the site and as marked and fenced. Vegetation clearing in adjacent areas will not be allowed.

5. Rocks and spoil disposal management plan

296. Site preparation will necessitate removal of pinnacles and rocks at the project site. The land owners are recognised as the owners of rocks on the land areas to be used by the project. As such, the sale of these rocks as raw material for construction purposes or as filling materials requires the consent of the landowners, with the proceeds belonging to the landowners.

297. NRC will develop the plan to manage rocks and excess spoils generated from site preparation activities. A materials flow chart will be drawn to describe the procedures for managing rocks, crushing and collection. A rock storage area will be delineated within the project site for temporary storage of rocks removed at the site. The final destination of the rocks and excess spoils will be also be identified in the plan.

E. Construction Environmental Management Plan

298. This section describes the content and coverage of the plan to be prepared by the EPC contractor. The EPC contractor will develop their CEMP and sub-plans based on the outline EMP included in this assessment and reflecting their approach, construction methodology and work method statements. considering the findings of the initial environmental examination of the proposed project. The CEMP shall include the following sub-plans designed to address the impacts identified and minimize / eliminate residual impacts.

299. The following will be included in the CEMP either as sections or sub-plans:

- Approach to environmental management viz the project requirements and demonstration of proper resourcing for CEMP implementation by identifying a qualified/experienced EHSO in the bid and subsequently in the CEMP;
- Organizational arrangements including reporting and communication channels (also to be shown on an organization chart), training, awareness raising and linkages between sections or sub-plans;
- Consents and permits required to be obtained by the contractor, timeframe and plan for application;
- Materials management and spoil disposal;
- Vegetation removal, tree cutting and replanting (including any enhancement planting);
- Waste management plan (covering general waste and hazardous waste);
- Rock crushers, concrete batching and aggregate/materials supply;
- Erosion control and sediment runoff;
- Dust and noise minimization and controls (including noise baseline, watering schedule);
- Traffic management and controls (including haulage routes);
- Code of conduct – protocols for workers' behavior – as agreed with community leaders;
- Health and safety - workers and community (including training);

- Chance find procedures for accidental discovery of archaeological assets, cultural sites or resources;
- Decommissioning, rehabilitation, revegetation and recontouring of the site;
- Communications, information and grievance redress (demonstrating compliance with the project's CCP and GRM); and
- Monitoring and reporting (including proposed checklists).

1. Demolition and debris management plan

300. The site has identified abandoned dilapidated structures made of steel, concrete foundation and timber. The EPC contractor will demolish these structures. A demolition and debris management plan will be developed for removing the existing structures at the site and disposing of the debris at an approved designated site. The plan will include the following information: (i) estimate of materials to be demolished; (ii) determination of procedures for demolishing the structures; (iii) equipment to be used for demolition; (iv) temporary storage yard for demolished materials; and (v) transport and disposal, or potential reuse, of demolished materials/debris.

2. Worker code of conduct and social mobilization plan

301. The CEMP will detail the plan for mobilizing and accommodating foreign workers and for managing all workers (foreign and local) for the period of the construction activities. The CEMP will detail how the EPC contractor will comply with the requirements of the project's CCP and how it will implement the relevant elements of the GRM. The following will be included in the CEMP:

- Contractor will prepare a labor influx management plan (see below) and agree with community leaders and heads of women's committees a code of conduct (social protocols) the workers will adhere to;
- Induction of workers on requirements of the project's CCP[12] and GRM[13] and a code of conduct (socially and culturally appropriate protocols) established for any contact between local communities and contractor/workers;
- The contractor will engage an approved service provider to deliver a communicable disease awareness and prevention program targeting risk of spread of STIs and HIV. The training will be delivered to the communities and workers;
- The contractor will put up notice boards regarding the scope and schedule of construction, as well as certain construction activities causing disruptions or access restrictions;

[12] A CCP has been prepared for the project. The CCP will be further developed during the initial stage of project implementation.
[13] See Section 7.F.

- The facilities—project site and off-site office and compound if any—will be fenced and sign-posted and unauthorized access or entry by general public will be prohibited;
- Potable water, clean water for showers, hygienic sanitation facilities/toilets with sufficient water supply, worker canteen/rest area and first aid facilities will be provided on-site. Adequate toilet facilities shall be installed. Separate toilets shall be provided for male and female workers;
- For unskilled activities and labor, as many local people (including women) as possible will be recruited and trained;
- The contractor's facilities area will be cleaned up to the satisfaction of NUC, land owner, and local community after use; and
- Post-construction, the area shall be fully rehabilitated, and all waste materials shall be removed and disposed to the designated disposal sites approved by the local authority.

3. Recruitment and labor management plan

302. The EPC contractor will prioritize hiring of Nauruan workers and will promote use of local unskilled and semi-skilled labor. The contractor will develop the recruitment and labor management plan as part of the CEMP. The plan will include the following information: (i) total number of workers and skills requirement, including qualifications required; (ii) number of foreign and local labor workforce to be recruited (disaggregated by sex and age); (iii) hiring procedures, forms, and interview schedule; (iv) procedures for advertising job vacancy and informing residents of Nauru; (v) workers benefit and compensation packages for specific positions and labor requirements; and (vi) working hours and statutory holidays as per the laws of Nauru, transportation procedures for local workers to and from working sites, and workers insurance coverage.

303. The plan will identify how the following management measures will be implemented:

- Identify number of workers required, skills required, and qualifications for available positions.
- Coordinate with NUC and NRC on available positions and personnel to be hired.
- Organize a meeting to inform stakeholder and community groups about demand for workers and skills required.
- Provide public information on hiring procedures and workers benefits, including transportation and accommodation arrangements.
- Secure workers permit for expatriate work force, including clearances required, health insurance and emergency evacuation coverage.

- Upon completion of recruitment, prepare a table listing all workers, their duties/roles, their inputs (by hours, days or weeks), and wages. The information will be disaggregated by nationality, age and sex. The table will be updated on a monthly basis and will be included as an annex to the contractor's monthly reports.
- The contractor will pay equal wages for equal work irrespective of nationality, age or sex of the workers.
- The project will prohibit the employment of child or trafficked labor.

4. Water resources and supply management plan

304. Water to be used during construction will be likely sourced from the desalination plant. Water storage tanks for workers will be established at the site.[14] Potable water supply will be delivered to the site. The EPC contractor will determine water demand volumes, based on worker and construction activity requirements, and inform NUC of the volume required. NUC will confirm, or otherwise, adequacy of supply from the desalination plant. If the desalination plant is not suitable for water supply or the likelihood of the supply will create competition with local users, the contractor will identify a suitable alternative supply. The EPC contractor will explore rainwater harvesting for use in concrete batching, vehicle and plant cleaning and dust control measures (i.e. spraying of site and access roads).

5. Waste management plan

305. The EPC contractor will prepare a waste management plan (WMP) as part of the CEMP. For solid waste the WMP will include the following: (i) types and approximate volume of solid wastes to be generated at the site; (ii) procedures for segregation and temporary storage of solid wastes on site; (iii) method for recording volume of waste (by type) removed from the site and disposed of at the designated disposal site; (iv) means of transporting solid wastes to final disposal facility; and, (v) plan for utilizing the existing landfill or off-island disposal as discussed and agreed with NRC and NUC.

306. For liquid waste and wastewater, the WMP will include: (i) quantities of wastewater (or effluent) to be generated at the site; (ii) quantities of other liquid waste, (iii) design of wastewater treatment facilities at the site; (iv) procedures, as agreed, for disposal of treated effluent off-site (i.e. use of trucks to pump and haul treated effluent with quality within acceptable standard limits, and disposing it off into the sea or potential re-use of this water for spraying ground to control dust); (v) management procedures for disposing off sludge from wastewater treatment plant offsite (e.g. composting facility on the island of Nauru). In addition, the wastewater management plan shall include handling and disposal of wastes from the portable toilets.

[14] In discussion and agreement with NUC, these may be retained after completion of the construction activities to be used during operation for solar panel cleaning and other power facility requirements.

307. The plan will identify measures to ensure that: there will be no standing and open water (including puddles, ponds, drains etc) within the site, camp or office/yard to reduce possible disease vectors; and to reduce risk of ground contamination, wastewater effluent from contractors' workshops (if any) will be passed through gravel/sand beds or an oil separator and all oil/grease contaminants will be removed before discharging into drainage channels. Oil and grease residues shall be stored, handled and disposed of as per the agreed hazardous materials management plan (see below).

6. Hazardous materials management plan

308. The EPC contractor will develop the hazardous materials (hazmat) management plan (HMMP) as part of the CEMP. The plan will include the following: (i) identification of hazardous materials to be used and wastes to be generated at the site; (ii) allocation of temporary hazardous materials and waste storage facilities and method for secure storage; (iii) procedures for transport and disposal of hazardous wastes according to national regulations and the EHSG; (iv) procedures for transporting hazardous wastes off-shore if necessary, and if no treatment facility is available in Nauru, depending on nature of the hazardous wastes.

309. The HMMP will detail the management system and procedures for the following:

- Risk assessment to identify specific hazmat issues.
- Appropriate identification, labeling and storage of hazmat and chemicals (including bunds).
- Material safety data sheets to be posted on walls or on containers of such hazmat.
- Training of, or for, the EHSO in providing information to workers about the use and proper handling and storage of hazardous chemicals or materials.
- Hazmat training to prepare workers to recognize and respond to hazards.
- A hazmat treatment facility, as required, will be identified to treat and dispose of such hazmat (e.g. used oil from heavy equipment).
- If to be transported offshore, engage a registered hazardous wastes treatment facility with necessary documentations to move wastes from Nauru across point of disposal, following transboundary movement of wastes in Basel Convention Treaty and procedures.
- Process for monitoring and verifying exposure levels and comparison with applicable exposure standards.

7. Health and safety plan

310. The EPC contractor will prepare a health and safety plan (HSP) covering both workers and community and to demonstrate how the contractor will establish and maintain a safe working environment. The HSP will cover managing and reducing risks to workers and th community. The HSP will include: (i) safety protocols during construction activities; (ii) plan for informing workers about health and safety protocols during regular toolbox meetings; (iii) working schedule to avoid workers' fatigue; (iv) procedures for health check-ups for; (v) information about medical services to be provided by the contractor in case of accidents and emergency procedures in coordination with NUC, Department of Home Affairs and Nauru General Hospital (RONH); (vi) emergency response and evacuation procedures in case of emergency, disaster or serious illness or injury; and (vii) health insurance terms and conditions for workers.

311. The HSP will demonstrate how the following will be implemented:

- The contractor will demonstrate to the NUC they are properly resourced for managing and addressing health and safety risks through the designation of the EHSO, recruiting an approved service provider for delivery of communicable diseases awareness and prevention, and coordination and communication with RPH health center, medical services and the RONH. This will include statement of services and facilities to be provided on-site.
- Establishment of safety measures as required by law and by good international industry practice and provision of first aid facilities at work sites, in vehicles and establishment of a first aid/health post at the work site will be at the core of the HSP.
- Regular training for all workers on safety and environmental hygiene at no cost to the employees. The contractor will instruct workers in health and safety matters as required by law and by good engineering practice and provide first aid facilities.
- Instruction and induction of all workers shall be carried out for all operatives before they start work in health and safety matters, including transportation and road safety.
- The contractor will instruct and induct all workers in health and safety matters (induction course) including construction site rules and site agents will follow up with toolbox talks on a weekly basis. Workforce training for all workers starting on site will include safety and environmental hygiene.
- Workers shall be provided with appropriate personal protection equipment (PPE) and safety equipment appropriate to their tasks. PPE will include safety boots, helmets, reflector vest, gloves, protective clothes, dust mask, goggles, and ear protection at no cost to the workers.

- Scheduling of regular (e.g. weekly tool box talks) to orientate the workers on health and safety issues related to their activities as well as on proper use of PPE.
- Fencing will be installed on all areas of excavation greater than 1m deep and sides of temporary works.
- Reversing signals (visual and audible) shall be installed on all construction vehicles and plant.
- Provision of potable water supply shall be maintained at all times in all work locations sufficient for each worker to receive at least 2 liters per day.
- Where worker exposure to traffic cannot be eliminated, protective barriers and warning signs shall be provided to shield workers from passing vehicles. Another acceptable measure is to install channelling devices (e.g., traffic cones and barrels) to delineate the work zone and trained flag men at each end of the current working zone.
- Work sites shall be provided with men and women's toilets/sanitation facilities in accordance with local regulations to prevent any hazard to public health or contamination of land, surface or groundwater. These facilities shall be well maintained and cleaned regularly to encourage use and allow effective operation and emptied regularly so as never to overflow.
- The contractor will maintain an accidents and incidents register which will include documentation of near misses. All accidents will be fully documented to the NUC and CSC within 24 hours and a follow up report after investigation has been completed within three days of the accident.
- Designation of the EHSO to take responsibility of implementing the HSP.
- Workers will be provided with uniform and identification system will be implemented for controlled access to site.
- The site and vehicles will be equipped with fire extinguishing equipment. Electrical equipment and flammable materials will be properly stored onsite with labels.
- Fuel tanks for transportation vehicles will be installed with appropriately designed bund walls and equipped with spill kits and oil-water separator.
- No alcohol policy will be implemented at the site and at the camps.
- The EHSO, as part of CEMP compliance monitoring will conduct routine health and safety audits at the working areas.

312. The HSP will include measures for protecting the community and will address the following: (i) identification of risks and control measures during transport of materials from the port to the site; (ii) safety protocols on use of public areas to be shared with communities (i.e. public access roads, port area, area near RPC Camp No. 1): (iii) public information materials to inform the general public and stakeholder groups of the schedule of the use of these shared facilities.

313. The community section of the HSP will demonstrate how the following measures will be implemented:

- Coordination with the Police, NUC and NRC on use of public roads and safety procedures to avoid road accidents.
- Control measures to reduce noise and dust generation on public roads and the road adjacent to RPC Camp No. 1.
- Public information on key activities at the site and when using public roads for haulage of materials and transport of spoil.
- Coordination with RNOH for emergency medical services.
- The EHSO will address community health and safety concerns and liaise with the NUC and community leaders within the project area.
- Barriers (e.g., temporary and permanent fencing) and signs shall be installed at the site and will restrict public access. Adequate signage and security will be provided at the site office and works yard and prevention of unauthorized people (including children) entering work areas. Warning signs In Nauruan and English will be provided at the periphery of the site warning the public not to enter.
- The public/residents shall not be allowed in high-risk areas, e.g., excavation sites and areas where heavy equipment is in operation.
- Speed restrictions shall be imposed on project vehicles and equipment traveling within 50m of RPC facilities, schools and other sensitive receptors (e.g. residential, places of worship, etc.).
- Drivers will be educated on safe driving practices to minimize accidents and to prevent spill of spoil, hazardous substances (fuel and oil) and other construction materials during transport.
- Measures to prevent proliferation of mosquitoes shall be implemented e.g., provision of insecticide treated mosquito nets to workers, installation of proper drainage to avoid formation of stagnant water. Standing water will not be allowed to accumulate in temporary drainage or anywhere on the site.
- The contractor will engage an approved service provider to deliver the communicable diseases awareness and prevention program. The training will commence prior to contractor mobilization for communities in the project area and during initial mobilization of the contractor's workforce prior to commencement of civil works and will continue throughout the project implementation.
- The contractor will agree a code of conduct with community leaders and women's committees. Workers will be required to comply with the agreed code of conduct. Workers will also undergo training on gender-based violence in the workplace and construction site.

8. Traffic management plan

314. The EPC contractor will develop a traffic management plan (TMP) as part of the CEMP. during project implementation. The TMP will include the following: (i) port of entry of construction materials, plant, equipment and any food or beverage supplies; (ii) location of temporary laydown and materials storage facilities; (iii) number of vehicles and heavy equipment to be used during construction and their capacity (e.g. tonnage); (iv) location of motor-pool or equipment maintenance area within the site; (v) number of trips required to transport materials from port of entry to project site; (vi) map showing the access roads to be used for delivery of materials; (vii) schedule (date and time) of delivery of materials at the port and use of public roads, as agreed with the police; (viii) speed limit of vehicles; (ix) protocol for escort vehicles when delivering large equipment (BESS, substation components, solar panels and inverters, etc.); and (x) public information on schedule of delivery and procedures to avoid road accidents during use of public roads.

315. The TMP will demonstrate how the following measures will be implemented:

- NUC will be informed of the details of the traffic management plan to be able to assist in disclosing public information (i.e. schedule of delivery and frequency of vehicle transport) with stakeholder groups.
- EPC Contractor will present to stakeholder groups the plan for use of public road and safety protocols to be implemented during project construction phase.
- The vehicle will maintain a speed limit of not more than 40 km per hour on public roads.
- Dust control measures will be implemented on unpaved roads especially during the dry season.
- Drivers of transport fleet should have a valid driver’s license in Nauru.
- Strict implementation of the no alcohol policy for workers, including drivers, during working hours.
- When transporting spoils which may contribute to dust generation, vehicles will be covered with tarpaulin to avoid resuspension of dust when transiting public roads and nearby houses.
- Vehicles, including trucks and heavy machineries, should be well maintained (i.e. emissions are within acceptable standards, no oil leaks, mufflers on exhaust are provided).
- Transport vehicles should avoid taking “hitch hikers” or those non-workers who would request for a free ride.

- A suitable motor-pool and heavy machineries parking area will be established within the project area, which will be equipped with maintenance and car wash bay with proper drainage and oil-water separator.
- Regular inspection of vehicles will be carried out throughout the construction phase. The inspections will be recorded on checklists and results included in the monitoring reports.

9. Chance finds procedures

316. There is a possibility that project activities may result in damage to other physical cultural resources unless identified early. Cultural property includes monuments, structures, works of art, or sites of significance, view or vista points having archaeological, historical, architectural, or religious significance, and natural sites with cultural values. This includes cemeteries, graveyards and graves. If during construction activities resources of cultural value are found, the following procedures for identification, protection (including from theft), and treatment of discovered sites or artefacts will be detailed in the CEMP and followed during construction.

317. A chance finds procedure will be detailed in the including: (i) identification of and consultation with the appropriate authorities, community leaders, residents and communities to identify known or possible sites; (ii) siting of proposed activities to avoid identified sites (including protected areas and zones); (iii) the cessation of work until the significance until the significance of a 'find' has been determined by authorities or relevant experts; and (iv) mitigation and management measures (e.g. buffer zones) for chance find procedures. The chance find procedures will be undertaken as follows:

- Stop the construction activities in the area of the chance find.
- Delineate the discovered site or area.
- Secure the site to prevent any damage or loss of removable objects.
- Notify the Engineer who in turn will notify the responsible authority.
- Responsible authority will be in charge of protecting and preserving the asset/site before deciding on subsequent appropriate procedures.
- Decisions on how to handle the finding shall be taken by the responsible and relevant authority. This could include changes in the layout (such as when finding an irremovable remain of cultural or archaeological importance) conservation, preservation, restoration and salvage.
- Implementation for the authority decision concerning the management of the finding shall be communicated in writing by the relevant authority.

- Construction work should resume only after permission is given from the responsible local authorities and the relevant authority concerning safeguard of the heritage.

F. Operation and Maintenance Plans

1. General site annual inspection

318. A general site annual inspection of the solar farm at least once a year will be conducted by the operation and maintenance (O&M) personnel to check the requirements listed below. This will ensure identifying existing problems and preventing future problems on site.

- Vegetation growth or other new obstructions that may cause shading.
- Ground erosion near the footings of the mounting system.
- Proper system signage.
- Cable management.
- Corrosion on the equipment, such as the mounting structure, equipment structures, etc.
- Cleanliness throughout the site.
- Any signs of animal infestation.

2. Routine panel cleaning due to Soiling

319. The O&M contractor will be responsible in routine cleaning of the PV panels. The contractor is expected to consider the following activities in determining routine schedule of the panel cleaning:

- Environmental and human factors (for instance, soiling from local adjacent land activities, such as RPC operations, and secondary mining activities).
- Weather patterns – cleaning during rainy periods is less likely to be required.
- Dust caused by vehicular traffic, especially if adjacent road will be kept unpaved.
- Site accessibility based on weather predictions.
- Availability of water and cleaning materials.

320. The frequency to clean panels will be dictated by factors such as site and surrounding area ground covering, the type of installation, e.g. fixed tilt vs tracking, and the cost of cleaning. Unpaved access road adjacent to the site is likely to result in accumulation of dust. In addition, if RONPHOS will proceed with planned secondary mining of adjacent areas, dust particles are likely to be resuspended on air, and deposited on solar panel surface, which then needs to be cleaned.

321. The O&M operator will develop the water resource management plan to include the following information: (i) demand for water during routine cleaning of panels and maintaining the site office of O&M personnel, (ii) source of water for routine maintenance (e.g. desalination plant) and option for rainwater harvesting, (iii) water storage facilities at the site.

3. Routine vegetation management

322. Vegetation management is particularly important in ground mount systems and is used to reduce problems with array wiring and shading, reduce fire load within the solar farm, reduce impact on production and reduce damage to an operating system. Vegetation should be controlled around the PV array, inverter and other electrical equipment areas. Frequency of vegetation cleaning and removal will depend on the growth of the vegetation. Presence of creeping vines in the project area will be unwanted for solar power operation, hence control of such vines using manual weeding would need to be routinely done.

323. The O&M operator will develop the vegetation management plan to include the following information: (i) identification of species of weeds, grass, creeping vines onsite, (ii) schedule of routine vegetation clearing, (iii) management of grass and vegetation cutting including potential for establishing compost plots to process green wastes.

4. Management of wastes and wastewater

324. Site office for O&M personnel and possibility of creating an education center for solar power will require installation of toilets. Site personnel and visitors to the facility will also generate a small volume of waste. Similarly, routine solar power facility maintenance will generate used oil from vehicles and lubricants classified as hazardous wastes. The O&M operator will develop the waste management plan to include the following information: (i) type and quantities of solid wastes to be generated, (ii) segregation and storage of these wastes onsite, (iii) management procedures for disposing off and transporting the wastes to existing landfill in coordination with NRC and NUC.

325. The O&M operator will also develop the hazardous waste management plan to include: (i) identification of hazardous wastes and their quantities, (ii) procedures for properly storing the material on site, (iii) if required, procedures for hauling and treating the hazardous materials onshore (if facility for treatment is available), (iv) procedures for transboundary movement of hazardous wastes offshore according to Basel Convention Treaty between Nauru and receiving country.

326. The plan will include procedures for handling effluent including: (i) sources and quantities of wastewater/effluent, (ii) collection and treatment of effluent onsite, (iii) management procedures for collecting treated effluent (within acceptable standard limits) and disposing of to a body of water, or possibly re-using the treated water for watering roads and open areas, (iv) management procedures for collecting and treating sludge and using as compost material.

327. If a septic tank will be installed instead of a wastewater treatment facility, management procedures for de-sludging the tank will be defined in the plan, including routine maintenance of the septic tank.

5. Decommissioning and recycling plan

25. The solar power development project has a defined useful life of 25 years. Within this period, it is expected that solar panels and batteries would have to be decommissioned and replaced. The batteries need to be replaced after 10 years of service, while the solar panels can be replaced after 25 years. The O&M operator will develop the decommissioning and recycling plan for solar panels, inverters, batteries, and equipment parts that need to be replaced.

26. The plan will include the following information: (i) identification of equipment parts to be decommissioned or replaced, (ii) handling of materials and equipment to be decommissioned or replaced onsite, including temporary storage and labelling, (iii) management procedures for collecting, transporting, shipping offshore of solar panels and batteries according to procedures under Basel Convention Treaty between Nauru and receiving country. The plan and management procedures will be developed and defined at least one year prior to decommissioning or replacement of parts.

G. Grievance Redress Mechanism

328. **Background**. The grievance redress mechanism (GRM) serves to address complaints or concerns by persons that may be impacted by the project, including landowners. The GRM is project-wide and establishes the procedures for management of any grievance or concern about the project including its environmental or social performance. The GRM incorporates, as far as practicable, the traditional and government grievance mechanisms already existing in Nauru.

329. The objective of the GRM is to establish guidelines for accepting, assessing, resolving, monitoring and evaluating grievances concerning the projects. It is intended for NUC employees who will process grievance claims, as well as persons wishing to file grievances. A grievance is an issue, concern, problem or claim (perceived or actual) that an individual or group wants NUC or one of its contractors to address and resolve related to the project. The GRM outlines the procedures in which grievances concerning the performance or behavior of NUC, its employees or contractors will be accepted, assessed and resolved. The GRM aims to reduce impacts and risks of the project and promote mutually constructive and trust-based relationships with project affected landowners and communities in Nauru.

330. **Principles**. The GRM has been developed in accordance with NUC policies and procedures, as well as international standards for stakeholder engagement. The GRM is designed to work within existing legal and cultural frameworks, providing an opportunity to resolve grievances at the project level. Specifically, the project GRM has been designed to:

- Be understandable, culturally appropriate and accessible to project-affected persons, with its availability communicated.
- Address a wide range of grievances and concerns – both those based in factual data and those arising from perceptions or misperceptions.
- Be transparent and allow persons to submit a grievance at no cost and without retribution to the party that expressed the issue or concern.
- Protect the identity of the persons raising the grievance.
- Resolve concerns in a timely manner, via consultation with stakeholders, or forward any unresolved cases to the relevant authority.
- Report back to the community (through the Project Steering Committee) periodically on the types of cases and how they were resolved.
- Be revised if it is not working effectively.

331. **Confidentiality**. All NUC employees, contractor and subcontractor personnel involved in the registering and resolution of grievances are required to keep confidential the nature of the grievance and the outcomes of the resolution process. In addition, if the complainant wishes their identify to not be disclosed, this will be honoured. NUC will periodically report back to the Project Steering Committee on the types of issues raised and how they were resolved, but this reporting will not feature the names of the aggrieved person/s or claimants, nor provide specific details of the issue/s. All grievances made directly to the NRC or EPC contractor will be recorded, registered and resolved in a similar manner and will be reported to NUC on a monthly basis.

332. **Procedures**. NUC will establish the GRM upon the no objection for site clearance activities to commence. Implementing the GRM involves five steps, which are described below.

- **Step 1: receive the grievance –** individual or community grievances, complaints, issues are received either by NRC, EPC contractor or by NUC through the Renewable Energy Manager or by calling NUC's hotlines (phone or text): 557 4010 or 557 4072. In some cases, the Chief Executive Officer of NUC also receives complaints by community, particularly when it involves tariff rates and reliability of supply. Because the population of Nauru is small, issues and concerns raised are easily heard, received, and addressed.
- **Step 2: register/record and acknowledge the grievance** - any person receiving the grievance will notify either the EHSO (or focal) of NRC or EPC contractor or the NUC Renewable Energy Manager who will log it on the grievance log sheet and assign a reference number or identifier and complete a grievance reporting form. The EHSO (or focal) of NRC or EPC contractor or NUC Renewable Energy Manager will provide the claimant with information about the process, their assigned reference number and the timeframe in which a response can be expected.

- The following details will be recorded when receiving grievances:
  - date
  - manner in which the grievance claim was received (phone, email, letter, in-person
  - name and role of the person who received the grievance
  - summary of the grievance/nature of the grievance
  - name and contact details of the complainant/s (or acknowledgement if they did not want their identify disclosed).
- All grievances will be acknowledged within three working days, by the quickest method available. If the claim is received in person or verbally over the telephone, it will be acknowledged on the spot. If the claim is in writing, then an email, telephone call or text message will be returned acknowledging that the grievance has been received, with details of the process and timeframe in which a response can be expected.
- **Step 3: screen and assess grievance** - received grievances are then screened, assessed and investigated (if required) to verify validity. The complainant can choose to be involved in this process. This includes establishing the nature of the grievance to determine the measures needed for review and investigation. The EHSO (or focal) of NRC or EPC contractor or NUC Renewable Energy Manager will either: (i) assign personnel (including themselves) to complete actions to resolve the grievance, or (ii) elevate the claim directly to the Chief Executive Officer / General Manager of Operations to resolve or facilitate the resolution of the grievance. Depending on the nature of the grievance, the Project Steering Committee may also be called upon to provide support in the resolution. Grievances which do not apply to the project will be referred to the appropriate entity, and the complainant notified that this has occurred. The grievance reporting form will be kept up-to-date regarding the status of the grievance and the actions required and completed.
- **Step 4: decide on a response or resolution and monitor issues** - the EHSO (or focal) of NRC or EPC contractor or NUC Renewable Energy Manager will act on the response or resolution of the grievance and notify the complainant within 20 working days. The response will be in the form of a letter or email so that the exact response may be logged accurately. The grievance reporting form will be updated to reflect the closure of the grievance (including reference to the letter or email) and future dates for monitoring. All documentation will be filed according to the reference number assigned and remain confidential.

- Where an agreement or resolution cannot be reached or if the complainant is not satisfied with the resolution, the complainant will be provided with the details of the Minister's office or of the complainant chooses to resort to legal action. This action and date will be updated on the grievance reporting form.
- **Step 5: Evaluate the GRM and report periodically** - on a periodic basis, the NUC Renewable Energy Manager will publish an evaluation report on the types of grievances that were received and how they were resolved and submit this to the Project Steering Committee. The evaluation will include a report on the: (i) number and types of grievance claims received, (ii) number of claims that have been resolved/reached agreement, (iii) number of claims that have gone to mediation, (iv) and number of claims unresolved. The report should also include an assessment of the effectiveness of the GRM and NUC in responding to the grievances. This information will be summarized in the semi-annual safeguards monitoring reports to be submitted to MFSD and ADB.

333. **Communication of the GRM**. It is the responsibility of NUC to ensure stakeholders, beneficiaries and landowners are informed of the GRM. A summary information sheet about the GRM will be translated into Nauruan and distributed within the project area. The project information boards required to be installed by the NRC and EPC contractor will contain information about the GRM including contact numbers and details.

334. **Budget**. Financial resources to cover the costs of the GRM are included as project costs covered by NUC's project management, and are built into the bids of the CSC, NRC and EPC contractor for implementation of their respective responsibilities for GRM.

335. **Other measures available.** ADB's Accountability Mechanism will also apply to the project. While the project level GRM is the responsibility of NUC, the Accountability Mechanism is the responsibility of ADB. The accountability mechanism provides opportunities for people (two or more complainants) that are adversely affected by ADB-financed projects to express their grievances, seek solutions, and report alleged violations of ADB's operational policies and procedures, including safeguard policies.

336. The accountability mechanism comprises: (i) consultation led by ADB's Special Project Facilitator to assist people adversely affected by ADB-assisted projects in finding solutions to their concerns; and (ii) providing a process through which those affected by projects can file requests for review by ADB's Compliance Review Panel. Details of the Accountability Mechanism can be found at: https://www.adb.org/documents/accountability-mechanism-policy-2012.

H. Monitoring and Reporting

337. Monitoring will be carried as per the type, frequency and purpose established in the EMP. The monitoring plan is included in the EMP table (Table 7.2) and identifies the responsibility for undertaking the monitoring, the parameters to be monitored, the types of verification and frequency of the monitoring. Apart from NRC and the EPC contractor being required to have noise measurement devices and to establish noise baselines prior to commencement of activities, no other specialty monitoring is required. Monitoring will be conducted through visual inspections and observation. The NRC and EPC contractor are required to identify their detailed monitoring plans including checklists to be used as part of their SEMP and CEMP respectively.

338. Reporting of environmental monitoring will be completed regularly during project implementation and will include:

- Monthly reports prepared by the NRC and EPC contractor and submitted to NUC and CSC. The monthly report will contain a section on safeguards and will summarize actions taken to implement the CCP and GRM, compliance with the approved SEMP and CEMP, results of monitoring conducted by the EHSO and include tables of corrective actions requested.
- Quarterly progress reports (QPR) prepared by the CSC and submitted to NUC, MFSD and ADB. The QPR will contain a section on safeguards including CCP and GRM implementation, training and capacity development, a summary of the monthly reports received from the contractor, summarize results of inspections and audits undertaken by the CSC environmental specialist and include tables of corrective actions requested and status of close-out.
- Semi-annual safeguards monitoring reports which will summarize the QPR and will be prepared by NUC and submitted to MFSD and ADB. The semi-annual safeguards monitoring reports will be disclosed.

339. Any complaints received from the public will be addressed as per the GRM. NUC will compile, periodically, a report summarizing he number and type of grievances, status of resolution, and evaluating the effectiveness of the GRM.

8. FINDINGS AND CONCLUSIONS

340. The NUC is the implementing agency for the Solar Power Development Project and MFSD is the executing agency. The project will deliver a 6 MW solar PV plant with BESS which will be constructed on a site already leased by NUC. NUC will contract NRC to undertake site clearance and preparation and an EPC contractor to construct the plant and facility. The NUC will be supported by a CSC which will include an environmental specialist.

341. The project will occupy 5.89ha of a total of 10.55ha leased by NUC for solar power development. The area was previously mined for phosphate. Adjacent to the project site is an area of land (1ha) already cleared and prepared for the construction of the 1.0 MW MFAT financed solar power facility.

342. The IEE confirms the project will have no significant impacts on environmental and social attributes of the project area, including the haulage routes between the port and the site.

343. Trees and vegetation cover exist within the site which need to be permanently removed. A detailed inventory and survey will be undertaken to identify species and determine whether there are bird nests in these areas. The remaining pinnacles are expected to be removed using rock breaking and blasting. The method and approach to the activities will be detailed by NRC in their SEMP.

344. Construction activities will create a range of usually anticipated impacts—noise, dust, traffic, health and safety—within the site and along the haulage routes. There are few sensitive receptors and impacts will be localised and temporary and intermittent in nature. The main activities will be limited to the areas within the site where the solar panels and batteries will be installed. project. There will be traffic and movement of trucks during delivery of the materials and plant. The impacts are readily mitigatable through implementation of the measures outlined in the EMP and which will be further detailed in the CEMP prepared and submitted by the EPC contractor prior to start of construction activities.

345. During operation, the project is not expected to generate any adverse environmental and social impacts and is expected to benefit the people of Nauru by providing lower costs to produce electricity and long-term benefits to the environment by substantially reducing carbon emissions by about 71%.

346. After serving a useful life of 25 years, the solar panels need to be replaced, while the BESS needs to be replaced after 10 years, according to Decommissioning and Recycling Plan to be developed by the O&M operator. Transboundary movement of hazardous wastes will be governed by national regulations and Basel Convention Treaty between Nauru and receiving country of hazardous wastes.

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Annex A – International Agreements and Treaties

Convention/Agreement	Ratified
The International Plant Protection Convention (IPPC)	1951
Treaty on the Non-Proliferation of Nuclear Weapons	1970
Convention on the Prevention of Marine Pollution by dumping of Waste and other Matter.	1972
South Pacific Forum Fisheries Agency Convention	1979
Party to the Nauru Agreement	1982
Palau Arrangement	1992
United Nations Framework Convention on Climate Change (FCCC)	1992
United Nations Convention on Biological Diversity (CBD)	1993
FSM Arrangement	1994
Kyoto Protocol to the United Nations Framework Convention on Climate Change	2001
United Nations Convention to Combat Desertification (UNCCD)	1998
United Nations Convention on the Law of the Sea (UNCLOS)	1996
Agreement on Straddling Fish Stocks and Highly Migratory Species	1997
Convention of the Protection of Natural Resources and Environment of the South Pacific Region and related Protocols.	1995
Convention for Prohibition of fishing with long driftnets in the South Pacific (Wellington Convention).	1992
Convention on Hazardous and Toxic Wastes (Waigani Convention)	Signed 1995, not ratified
UNESCO member	1996
United Nations Charter	1999
Cartagena Protocol on Biosafety to the Convention on Biological Diversity	2001
Convention to Wetlands of International Importance esp. as Waterfowl habitats (RAMSAR)	Not signed
Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES)	Not signed
Conservation on Migratory Species (CMS) of Wild Animals	Not signed
Basel Convention on Control of Transboundary Movement of Hazardous Waste and Disposal	2001 accession
Stockholm Convention for the Persistent Organic Pollutants (POPs)	2002
Vienna Convention for the protection of the Ozone Layer, Vienna, 22 March 1985	2001
Montreal Protocol on Substance that Deplete the Ozone Layer, Montreal, 16 September 1987.	2001
London Amendment to the Montreal Protocol, London, 29 June 1990.	2004
Copenhagen Amendment to the Montreal Protocol, Copenhagen, 25 November, 1992	2004
Beijing Amendment to The Montreal Protocol, Beijing 3 December 1999	2007

Annex B – Key sources of environmental and social information used in the IEE

Key environmental aspects	Proposed methodology	Sources / References / Remarks
Physical environment		
Land use	Physical site observation and photo-documentation. Key informant interviews. Review of secondary information. GIS mapping.	National Integrated Environment Policy (SPREP, 2018). Interview with Director of Lands. Interview with senior members of the Nauru Rehabilitation Corporation. Land use planning in Nauru is currently underway. Available GIS maps. GHD land use specialist.
Site topography	Physical site observation. Review of secondary information. GIS mapping	Nauru Rehabilitation Corporation. Available GIS maps from NUC, NRC and DCIE.
Geology	Physical site observation and photo-documentation. Secondary information. Previous studies for the MFAT funded 1 MW Solar Power Project.	New Zealand Ministry of Foreign Affairs and Trade Geotechnical Report. GHD geology specialist.
Weather and climate	Review of secondary information. Pacific islands weather monitoring data	Bureau of Meteorology of the Australian Government Nauru Port Project IEE Report. Meteonorm used in the Feasibility Study Report.
Vulnerability to flood	Review of secondary information	Nauru Port Project IEE Report
Occurrence of natural hazards	Review of secondary information	Nauru Port Project IEE Report
Air quality and noise	Physical site observations. Project feasibility study report.	Sources of emissions and inventory of equipment to be used during construction, operation and decommissioning phases. Air quality sampling and noise level measurements were not undertaken at the time of writing this IEE, since the anticipated impact during construction is anticipated to be localized and will be negligible during operation phase. However, once the methodology of site preparation is confirmed (rock breaking with

Key environmental aspects	Proposed methodology	Sources / References / Remarks
		minimal explosives), NUC may need to undertake actual monitoring of noise levels and air quality within the nearby receptor (RPC Camp) to serve as baseline information prior to project implementation.
Water resources	Review of secondary sources and site observations. Project feasibility study report on water availability	The project feasibility study team quantified the volume of water required for construction, operation and decommissioning phases. The potential source of water has been determined, and potential impact on existing water sources was assessed on the basis of this project information.
Waste management	Review of secondary sources and site observations. Project feasibility study report	Study on waste management in Nauru (see Section 4.C.3).
Biological environment		
Terrestrial vegetation	Site walk-through and photo-documentation. Review of secondary references and available GIS maps. Species listing only	The site is not a critical habitat. Although, it is understood permanent removal of vegetation is required within a three-hectare land. Nauru Port Project IEE Report.
Terrestrial fauna	Review of secondary references.	The site is not a critical habitat of terrestrial fauna. It has limited vegetation cover consisting of regeneration or regrowth. Grass and shrubs have regrown due to inactivity in the area. Typical species of birds in Nauru were identified using secondary references (Nauru Port Project IEE Report) and the potential impact of solar rays to these birds will be assessed using available literature (after survey is completed).
Sensitive habitats	Review of secondary references. Use of available GIS maps.	The presence of sensitive habitats and their location in relation to the project development will be marked on the map (e.g. Buada Lagoon). The (unlikely) risks of solar power development to these sensitive habitats has been determined and assessed as part of the IEE.
Social environment		
Population and demographics	Review and secondary sources. Use of available census (outdated). Key	Nauru Port Development IEE Report. Bureau of Statistics in Nauru. Home Affairs Unit. Nauru Utilities Corporation electricity usage. There is no need to undertake a detailed census since the inhabited land is located at least one kilometer away from the

Key environmental aspects	Proposed methodology	Sources / References / Remarks
	informant interview with Home Affairs Unit.	solar power development. The nearest receptor is a Regional Processing Centre facility located 300 meters from the site access road. The project will not disturb or displace any household or infrastructure during construction phase. The households in Nauru will benefit from supply of renewable energy at relatively reduced rates in the long-term and reduced greenhouse emissions by displacing diesel power generation.
Socio-economic parameters and existing assets, industrial, and commercial facilities	Review of secondary sources	Data on household electrification from NUC. Nauru Port Project IEE Report. The IEE specialists believe that a detailed census is not required since the habitats are located considerably far from the project site. The project will not disturb or displace any household or infrastructure during construction phase. The households of Nauru will benefit from supply of energy using renewable energy sources. The data on household electrification is available from NUC. Based on interview with Bureau of Statistics, available census is outdated; hence the information from Bureau of Statistics was not used in this IEE report.
Food security and water supply	Review of secondary references	Nauru Port Project IEE Report. Government of Nauru. Food supply is commonly imported due to limited availability of raw food sources on the island. Food supply for construction workers will be arranged through third party contract. Water supply sources of local communities is unlikely to be affected by the proposed project.
Electricity supply and power demand	Review of available secondary data. Solar Power Expansion Plan Report. Project feasibility study report.	NUC data on household electrification
Cultural heritage sites	Review of secondary sources. Available GIS maps.	Nauru Port Project IEE Report. The (unlikely) risks of the project to these cultural heritage sites are determined and assessed as part of the IEE.
Unexploded ordnance (UXO)	Review of secondary sources. Key informant interview with Nauru Rehabilitation Corporation.	Nauru Rehabilitation Corporation, interview. The procedure on site clearing and preparation will be discussed with the Nauru Rehabilitation Corporation, particularly in relation to handling UXO. Nauru Port Project IEE Report.

Key environmental aspects	Proposed methodology	Sources / References / Remarks
Glare risks	Secondary references on solar panels and albedo values.	Typical albedo values of solar PV panels: https://solarprofessional.com/articles/design-installation/evaluating-glare-from-roof-mounted-pv-arrays#.XDULS_ZuKrx

Annex C: Consequence evaluation criteria

Category	A	B	C	D	E
	Insignificant	Minor	Moderate	Major	Catastrophic
Physical Environment • Topography, geology and geomorphology, and natural hazards • Land use conflicts • Water quality • Air and noise • Contamination from wastes	No irreversible impacts. Low-level impacts on physical environment. Limited damage to minimal area of low significance. • No changes in topography and geomorphology. • No land use conflicts. • No alteration on water, air and noise quality. • Impacts associated with wastes disposal do not exist.	Minor reversible impacts on physical environment limited to project area. Minor short-term disturbance or damage to small area of limited significance. • Limited changes in topography and geomorphology within not resulting in associated impacts on existing environmental attributes. • Potential land use conflict may arise which could be discussed and readily resolved. • Alteration of water, air and noise quality due to project construction within small area of low environmental and social values. • Wastes disposal may exist but can be readily mitigated.	Moderate reversible, medium-term, widespread impacts existing over significant land area due to project development. • Changes in topography and geomorphology is significant but generally acceptable to local authority and communities. • Potential land use conflicts may arise, which require further discussion but can be resolved after negotiations. • Alteration on physical environment (air, water, noise quality is widespread and limited only within the project affected areas. • Wastes disposal may exist but would require	Major impacts associated with irreversible effects due to project development. • Widespread impacts causing long-term changes in topography and geomorphology. • Land use conflicts exist and are generally not acceptable to project affected communities but could be resolved through series of negotiations. • Serious environmental effects (e.g. water pollution, elevated noise levels and air quality beyond acceptable levels). • Contamination from generated wastes cannot be managed due to absence of technology or onshore facilities, requires special	Permanent irreversible impacts causing damage to existing environmental values such as elimination of endangered species. • Permanent changes in topography and geomorphology causing damage to nearby property or assets. • Land use conflicts exist which could not be resolved. • Environmental effects (e.g. water pollution, elevated noise levels, and air quality) are irreparable and results in catastrophic to existing environmental attributes such as spills. • Generation and disposal of wastes result in catastrophic damage to existing

Category	A	B	C	D	E
	Insignificant	Minor	Moderate	Major	Catastrophic
			establishment of additional onsite or offsite landfill or waste treatment facility to properly manage wastes.	treatment facility to treat wastes for safe disposal.	environmental attributes such as uncontained chemicals or radioactive wastes.
Biological Environment • Protected areas, ecologically sensitive areas, terrestrial flora and fauna, • Threatened or sensitive species and habitats, • Pest plants or weeds and animals	• Temporary disturbance of habitats which are limited and reversible. • Areas not declared as legally protected habitats.	• Localized displacement of vegetation, fauna habitats. • Displacement of < 25% of Key Biodiversity Areas, Important Bird Areas, Ramsar Sites, and Important Plant Areas. • Introduction of plant weeds and animal pests within a limited area.	• Localized displacement of vegetation, fauna habitats. • Displacement of 25% of Key Biodiversity Areas, Important Bird Areas, Ramsar Sites, and Important Plant Areas.	• Localized displacement of vegetation, fauna habitats • Displacement of 50% of Key Biodiversity Areas, Important Bird Areas, Ramsar Sites, and Important Plant Areas.	• Displacement of vegetation, fauna habitats, extending on secondary impact areas. • Displacement of 100% of Key Biodiversity Areas, Important Bird Areas, Ramsar Sites, and Important Plant Areas.
Socio-Economic Environment • Occupational and community health and safety • Land use conflicts • Socioeconomic impacts • Cultural heritage sites • Displacement of livelihood and threat to food security	• Low level impact on occupational and community health and safety. • No land use conflicts. • Low-level impacts on socio-economic activities. • No damage to existing social infrastructures.	• Reversible impairment and/or medical treatment injuries not needing hospitalization. • Potential land use conflict may arise which could be discussed and readily resolved.	• Moderate irreversible disability or impairment (<30%) to one or more persons. • Potential land use conflicts may arise, which require further discussion but can be	• Single fatality and/or severe irreversible disability or impairment (>30%) to one or more persons. • Land use conflicts exist and are generally not acceptable to project affected	• Health effects leading to multiple fatalities, or significant irreversible human health effects to >50 persons. • Land use conflicts exist which could not be resolved. • Serious widespread social

Category	A	B	C	D	E
	Insignificant	Minor	Moderate	Major	Catastrophic
	• No impact on livelihood and food security.	• Minor medium-term social impacts on local population. • Minor damage to structures/items of some significance, and mostly repairable. • Local food source competition threatening food security.	resolved after negotiations. • Ongoing unresolved social issues. • Damage to social infrastructures agreeable to local communities. • Irreversible impacts on livelihood activities and food sources but acceptable to communities	communities but could be resolved through series of negotiations. • Ongoing serious social issues. • Damage to social infrastructure and cultural heritage that cannot be offset. • Permanent impact on food sources, livelihood activities, not acceptable to communities.	impacts not reconcilable. • Irreparable damage to highly valued structures/ items/ locations of cultural significance. • Permanent impact on food sources, livelihood activities, resulting in widespread impacts to neighboring communities.

Annex D: Risk Assessment Tables

Table 1: Risk assessment and mitigation measures during pre-construction phase

Environmental aspect	Risk / Impact	Risk rating	Mitigation measures	Residual risk rating	Additional mitigation measures
Socio-economic	Social issues arising in relation to land use and lease agreements	HIGH	Gain additional consent and payment details from landowners	LOW	Continued consultations
Physical Biological Socio-economic	Impacts associated with site preparation without environmental permit approval and appropriate implementation of the environmental management plan (EMP)	HIGH	Engage Project Supervision Consultant to advise NUC on necessary approval and implementation of the EMP	LOW	Continuing engagement with NUC and NRC by Consultant to ensure environmental and social safeguards are reviewed and updated, and implemented during project construction phase.
Socio-economic environment	Gender sensitivities and lack of engagement with vulnerable groups such as women, youth, person with disabilities and disadvantaged groups or civil society organizations	MODERATE	Develop and implement Stakeholder Consultation and Engagement Plan, including vulnerable groups	LOW	Consistent inclusive implementation and monitoring of the Stakeholder Consultation and Engagement Plan throughout the project life cycle

Table 2:Risk assessment and mitigation measures during construction phase

Environmental Aspect	Risk / Impact	Risk rating	Mitigation measures	Residual risk rating	Additional mitigation measures
Physical Biological	Change in land use and landform causing conflicts in land use of adjacent properties	HIGH	Finalize conceptual plan and optimize land area by limiting the solar development to smaller area to minimize land clearing and land form.	MODERATE	Seek approval for land use from government authorities.
Physical	Improper disposal and handling of excess materials causing pollution	HIGH	Develop a rock/spoil disposal plan and allocate disposal area from rock breaking and limited blasting – note the Contractor shall establish quantities of rocks/spoils to be disposed of if any.	LOW	NUC to monitor implementation against the EMP.
Physical	Improper disposal, handling of debris and demolition materials of existing dilapidated structure causing pollution of harm to environment. Potential disturbance to physical cultural resources. Generation of construction wastes, including solid and hazardous, and wastewater from support facilities such as batching and crushing plants.	MODERATE	Develop and implement the Demolition and Debris Management Plan. Contractor to estimate the quantity of rock / spoils to be generated if any. Designate a disposal area to be operated according to environmental and social safeguards requirements. In the unlikely event of physical cultural resources (PCR), the Contractor shall develop and implement ADB guidelines on management of PCR. Proper management of solid, hazardous, sewage, and wastewater from construction activities.	LOW	NUC to monitor implementation against the EMP.
Physical	Potential localized ponding or accumulation of water in lower portion of the solar farm area.	MODERATE	Incorporate drainage in the solar power development plan. Contractor to implement the drainage plan during construction.	LOW	NUC to monitor implementation against the EMP.
Physical Socio-economic	Potential for competition in local water supply due to limited water resources in the island	HIGH	Implement the Water Resources and Supply Management Plan. Forecast water demand during construction and communicate volume demand to NUC, using water from the	MODERATE	NUC to monitor compliance against EMP, and impose fines if the EMP is not implemented i.e. pay premium if volume of water

Environmental Aspect	Risk / Impact	Risk rating	Mitigation measures	Residual risk rating	Additional mitigation measures
			desalination plant during construction phase.		demand exceeds forecasted amount.
Physical Biological	Permanent removal of few remaining vegetation within 6-hectare area	HIGH	Develop and implement Vegetation Clearing and Debris Management Plan. Conduct tree inventory to identify presence of important species. Avoid tree cutting during bird nesting period (i.e. consider breeding season of Noddy birds). Storage and final use of logs, and management of stumps, roots and branches to be managed by NRC and NUC.	HIGH	NUC and NRC will monitor and implement compliance against approved Project EMP during construction phase.
Biological Socio-economic	Introduction of pests and invasive weeds during transport of materials Threat to site security	MODERATE	Inspect materials brought from offshore to ensure no invasive species or pests are introduced. Security and inspection guards shall be deployed during construction phase, at the port and at the project construction areas. The site will be fenced, construction site will be off limits to the public.	LOW	Contractor to ensure no invasive weeds or pests are included in the shipment.
Socio-economic Biological	Elevated noise levels from use heavy equipment during rock breaking and limited blasting	HIGH	Develop and Implement Occupational Health and Safety Plan and Community Health and Safety Plan to avoid or minimize impacts of elevated noise levels to sensitive receptor residing in RPC Camp 1, which is located 300 meters from the construction areas	MODERATE	NUC to monitor implementation of the EMP. RPC Camp 1 residents are informed of the schedule of blasting. Rock breaking and blasting will be performed only during daytime.
Socio-economic Biological	Dust resuspension creating nuisance to nearby RPC Camp 1 refugee residence	HIGH	Develop and implement Occupational Health and Safety Plan, i.e. dust control measures are put in place to minimize dust resuspension.	MODERATE	NUC to monitor implementation of the EMP durng construction phase. RPC Camp 1 residents are informed of the schedule of construction activities and likely

Environmental Aspect	Risk / Impact	Risk rating	Mitigation measures	Residual risk rating	Additional mitigation measures
	Nuisance to vehicles passing through adjacent access road Leaves of plants in adjacent areas will accumulate dust affected photosynthesis.				impacts and mitigation measures to be implemented.
Socio-economic	Spread of communicable diseases such as HIV and STD as a result of influx of workers from offshore	HIGH	Develop and implement Occupational Health and Safety Plan, and Community Health and Safety Plan. Increase awareness by providing during toolbox talks		
Socio-economic	Potential road accident on existing public road during materials delivery	HIGH	Develop and implement traffic management plan	MODERATE	NUC to monitor implementation of the EMP. Community will be engaged to provide information on schedule of movement of trucks and heavy equipment on public roads.

Table 3: Risk assessment and mitigation measures during operation phase

Environmental Aspect	Risk / Impact	Risk rating	Mitigation measures	Residual risk rating	Additional mitigation measures
Physical Biological	Generation of vegetation wastes during routine maintenance that could not be properly disposed of by O&M contractor	LOW	Develop and implement routine Vegetation Management Plan during operation phase	LOW	NUC to monitor O&M Manual implementation throughout operational life of the project.
Physical environment	Generation of used oil, waste equipment parts, scrap metals, etc. during routine maintenance which may be disposed of improperly; including improper disposal of batteries after 10 years of useful life and solar panels after 25 years of operational life.	MODERATE	Develop and implement the Waste Management Plan during operation phase. Execute agreement with battery and solar panel supplier to manage the batteries and solar panels after servicing useful/operational life, including hauling offshore from point of manufacturing, recycling and disposal.	LOW	NUC to monitor implementation of O&M tasks including waste management throughout operation life, and ensure batteries and solar panels are disposed of offshore according to standard requirements of transboundary movement of wastes.
Socio-economic	Competition with local water supply when using water for routine solar panel cleaning	HIGH	Develop and implement Water Resources and Supply Management Plan during operation phase. Demand for water should be forecasted, and source of water for solar panel cleaning is identified – rainwater harvesting will be investigated and implemented.	LOW	NUC to monitor implementation of O&M tasks including waste management throughout operation life.

Table 4: Risk assessment of decommissioning phase

Environmental Aspect	Risk / Impact	Risk rating	Mitigation measures	Residual risk rating	Additional mitigation measures
Physical environment	Improper management of solar panels	MODERATE	Develop and implement Decommissioning and Recycling Plan. Execute agreement with recycling facility or manufacturer of the solar panels to properly manage the decommissioned panels, according to applicable guidelines on transboundary movement of wastes under Basel Convention.	LOW	NUC to continuously monitor implementation of the EMP during decommissioning phase.
Physical environment	Improper management of battery energy storage system (BESS)	MODERATE	Develop and implement Decommissioning and Recycling Plan. Execute agreement with recycling facility or manufacturer of the BESS to properly manage the decommissioned parts, according to applicable guidelines on transboundary movement of wastes under Basel Convention.	LOW	NUC to continuously monitor implementation of the EMP during decommissioning phase.
Physical environment	Improper management of equipment parts including cable, substation, inverters, etc	MODERATE	Develop and implement Decommissioning and Recycling Plan. Execute agreement with recycling facility or manufacturer of the respective equipment parts to be decommissioned, according to applicable guidelines on transboundary	LOW	NUC to continuously monitor implementation of the EMP during decommissioning phase.

Environmental Aspect	Risk / Impact	Risk rating	Mitigation measures	Residual risk rating	Additional mitigation measures
			movement of wastes under Basel Convention.		

Annex E: Stakeholders Consulted

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Table 2:Stakeholders identified and their interests

Stakeholder	Stakeholders interests	Perceived problems
Landowners	Lease and lease payments; site preparation works; lease extensions; environmental management; consultations.	Contract arrangements with the private sector to operate on the land; sale of rock debris following site preparations; environmental and social impacts; decreases in government set lease rates.
Project Steering Committee	Successful implementation of the project; adequate budget and funds; ability to attract private sector investments; project's adherence to Nauru laws and regulations.	Lack of coordination between Project Steering Committee members; absence of assistance from members; project implementation issues; community grievances.
Ministry of Finance and Sustainable Development (Executing Agency)	Reduced vulnerability to oil price shocks through reduced reliance on imported diesel; effective and efficient use of donor funds; successful project implementation.	Limited government resources and competing priorities.
Department of Commerce, Industry and Energy (regulatory and policy agency manages and oversees government activities in the energy sector and environmental monitoring)	Sustainability: less greenhouse gas emissions and oil pollution from burning diesel fuel; capacity building within NUC; improved policies and regulations; lower cost of generating electricity; optimal project development.	Environmental and social impacts; policy and regulation in-adherence; not meeting targets for renewable energy and GHG emissions.
Publicly elected members of Parliament	Strong community support for the project; good outcomes for constituents.	Community grievances; environmental and social impacts; increased tariffs for household customers.
Nauru Community Based Organization	Safe, efficient, and reliable access to grid electricity; affordable electricity tariffs; reduced noise and pollution from diesel power stations; ability to participate in the project design and implementation.	Electricity outages and interruptions; reliability of service; increases in tariffs; environmental and social impacts.
Households (electricity customers)	Safe, efficient, and reliable access to grid electricity; affordable electricity	Electricity outages and interruptions; reliability of service; increases in tariffs.

Stakeholder	Stakeholders interests	Perceived problems
	tariffs; reduced noise and pollution from diesel power stations.	
Private businesses and government facilities and operations (electricity customers)	Safe, efficient, and reliable access to grid electricity; affordable electricity tariffs; more profitable businesses or more efficient services; opportunity to install rooftop solar	Electricity outages and interruptions; need for their own back-up generators; high tariffs, reliability of service and maintenance; increases in tariffs; road closures.
Refugee Processing Centers (sensitive receptor nearest the project site i.e. 300 m away)	Closeness of the project site to the Refugee Processing Centers.	Environmental and social impacts such as noise and dust during site preparations and road closures.

Table 3:Strategy for continuing communication with stakeholders

Project information to be communicated	Means of communication	Responsibility	Audience	Frequency
Project information while planning and designing	Discussions and stakeholder consultations	NUC, with support from the project implementation support consultants	Project Steering Committee, landowners, refugee processing centers, project affected people	Regular intervals during planning and design
Project approval	Nauru Bulletin, Nauru Radio, Nauru TV	NUC with support from the Government Information Office	Publicly elected Members of Parliament, householders and community members, businesses and industry	Once
Project progress and project information documents	ADB website	ADB with support from the project implementation support consultants	ADB, Government of Nauru, Executing and Implementing Agencies, Project Steering Committee, landowners, Nauru Community Based Organization, households and businesses in Nauru, general public.	Quarterly reports
Project site preparations works	Boards at site, Nauru Radio, meetings with landowners, Refugee Processing Centers and other road users (Ronphos, nearby residents), text message alerts	NUC with support from the Nauru Rehabilitation Corporation	People and businesses to be impacted by the site preparation works, landowners	Prior to site preparation works and on an ongoing basis during site preparations
Project works involving construction of the	Boards at site, Nauru Radio, meetings with	NUC with support from the EPC Contractors	People and businesses to be impacted by the construction and	Prior to construction and installation works and on an ongoing

Project information to be communicated	Means of communication	Responsibility	Audience	Frequency
buildings and equipment	landowners, Refugee Processing Centers and other road users (nearby residents, and Ronphos), text message alerts	and Independent Power Producer	installation works, landowners	basis during construction and installations
Project safeguard monitoring	ADB website	ADB with support from the project implementation support consultants	ADB, Government of Nauru, Executing and Implementing Agencies, Project Steering Committee, landowners, Nauru Community Based Organization, households and businesses in Nauru, general public.	Semi-annually
Project testing and commissioning (if there will be increased service interruptions/ outages)	Text message alerts, meetings with project affected people to ensure continuity of electricity	NUC with support from the EPC Contractors and Independent Power Producer	Households and businesses, government offices and services	Ongoing basis during project testing and commissioning
Project completion	ADB website (Completion report), media release to Nauru Bulletin, Nauru Radio, Nauru TV, boards at the site	ADB with support from the project implementation support consultants	ADB, landowners, Publicly elected members of Parliament, Nauru Community Based Organization, households and businesses general public	Once

Source: Modified from the Communications Strategy for the Nauru Solar Power Development,

Prepared by Ministry of Finance and Sustainable Development and the Nauru Utilities Corporation November 2018.

Annex F: Details Required for Blasting Management Plan

A. Magazines

A person specially appointed in writing by the quarry manager for the purpose shall be in charge of every magazine and shall have keys to one of the locks. That person shall be responsible for the safe storage of explosives contained therein, for the distribution of explosives there from, and for the keeping of accurate records of stocks and issues in a book provided for the purpose. A second person, appointed by the employer shall have keys to the second lock. Both persons shall be present to unlock the magazine and note the removal of stock and ensure both locks are subsequently secured.

- Detonators shall not be stored in the same magazine as other explosives.
- Explosives and detonators shall be stored in purpose-built magazines with two different locks.
- Explosives shall be used in the same order as that in which they were received into the magazine.
- Naked lights shall not be introduced into a magazine or into any working place in a quarry where explosives are temporarily stored.
- Explosives shall not be taken from a magazine in quantities exceeding that required for use during one shift, and any surplus explosives shall be returned to the magazine at the end of that shift.

B. Opening of Explosives Cases

- No case or carton containing explosives shall be opened in the storage area of any magazine.
- Instruments made solely of wood, brass, or copper shall be used in opening cases or cartons of explosives, and the contractor shall provide and keep suitable instruments for that purpose.
- Persons Allowed to Fire Shots - the preparation of charges and the charging, tamping, and firing of all explosive charges in or about a quarry shall be carried out under the personal supervision of the quarry manager.
- When a charge of ammonium nitrate/fuel oil mixture has misfired, an attempt may be made to wash out the mixture in addition to any stemming down to the primer. The mixture shall be collected for safe disposal.
- The stemming of a charge of gunpowder that has misfired may be withdrawn with a copper pricker and the charge re-primed and fired.

- A charge of any other compound which has misfired shall not be withdrawn but, if the charge is bottom primed, the stemming shall be carefully removed by the use of water passed through a copper, plastic, or rubber hose to the outer end of the charge and a sufficient charge or charges shall be inserted and fired for the purpose of exploding the original charge until it can be seen by a competent person, after the hole has been washed out, that no explosive remains. A thorough search shall be made for unexploded charges in the resulting rock piles.
- Where it is not possible to remove a misfire by re-firing, a relieving hole shall be drilled as nearly parallel as possible with the original hole in such a manner as will prevent it meeting the misfired hole. The relieving hole shall then be charged and fired.

C. Dust Suppression

Operation of any quarry shall incorporate dust suppression measures. Dust generation during blasting operations shall be minimised. All haul roads shall be regularly dampened by spray bars fitted to water tankers or similar systems in order to minimise dust generation by traffic movements. Crushers, screens and stockpiles shall be dampened by appropriate water sprays to minimise dust generation.

The contractor shall provide and operate plant and equipment for maintaining all surfaces in a damp condition and hence minimize the generation of dust. All haul roads shall be kept continually damp and appropriate water spray systems shall be available to dampen crushing and screening operations and stockpiled material as appropriate.

D. Reporting of Accidents or Emergencies

In the event of an accident or emergency, the contractor or nominated supervisor will:

- Report accidents to relevant local authorities and notify the NUC (or its delegated authority) immediately of any dangerous occurrences or accidents which result in death, or serious bodily harm or incapacity for more than three days. Reporting may be oral in first instance but will be followed by a comprehensive written report within 24 hours of the accident or occurrence;
- Notify the NUC (or its delegated authority) immediately of any dangerous occurrences or accidents which result in death, or serious bodily harm or incapacity for more than three days. Reporting may be oral in first instance but will be followed by a comprehensive written report within 24 hours of the accident or occurrence;
- Notify the NUC (or its delegated authority) of the resolution or treatment of accident or emergency.