

Tuvalu

Energy Sector Development Project – Solar Array

Environmental and Social Management Plan

Tuvalu Energy Sector Development Project (ESDP) – Solar PV Array

Environmental and Social Management Plan

Quality Information

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Prepared by Kate Walker, PEECS

Revision History

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A	17 Dec 2018	Draft for Stakeholder Review
B	11 June 2019	Revised for changed installation location and WB Rev A review comments

Acronyms and Abbreviations

AP	Affected Persons
BESS	Battery Energy Storage System
CoP	Code of Practice
EE	Energy Efficiency
EPA	Environmental Protection Act
ESDP	Energy Sector Development Project
ESMF	Environmental and Social Management Framework
ESMP	Environmental and Social Management Plan
FNLTB	Funafuti Native Lands Trust Board
GBV	Gender Based Violence
GoT	Government of Tuvalu
GRM	Grievance Redress Mechanism
IDA	International Development Association
MESC	Ministry of Education, Sports and Culture
MoF	Ministry of Finance
MOA	Memorandum of Agreement
NGO	Non-Governmental Organisation
O&M	Operation and Maintenance
OHS	Operational Health and Safety
PCR	Physical Cultural Resources
PEAR	Preliminary Environmental Assessment Report
PIB	Public Information Brochure
PIU	Project Implementation Unit
PSC	Project Steering Committee
PV	Photovoltaic
RAP	Resettlement Action Plan
RE	Renewable Energy
RPF	Resettlement Policy Framework
SOP	Standard Operating Procedures
SPE	Secretariat for the Pacific Community
SWMP	Solid Waste Management Plan
TEC	Tuvalu Electricity Corporation
TMP	Traffic Management Plan
TNEP	Tuvalu National Energy Policy
TT	Task Team
TvAIP	Tuvalu Aviation Investment Project
WB	World Bank
WMD	Waste Management Department

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1 Introduction

Within Tuvalu, the major issues that the power sector currently faces include (a) high dependency on costly imported fuels; (b) the Tuvalu Electricity Corporation's (TEC) insufficient revenues from tariffs to meet operating and maintenance (O&M) costs; (c) the high maintenance cost of generation and distribution systems in a marine environment; and (d) the need for capital to finance the power infrastructure requirements of Funafuti and the outer islands.

Tuvalu is addressing these issues through the formulation of a long-term energy policy and a master plan for implementing the policy targets. The 2009 Tuvalu National Energy Policy (TNEP) highlights a target of 100% renewable energy (RE) by 2020. In order to help Tuvalu achieve this target, New Zealand and other donors have various activities already underway. Most of these activities are focused on the replacement of diesel generation with RE technologies. In support of the Government of Tuvalu's (GoT) goals in the energy sector the World Bank (WB) effort will provide additional energy generation from solar PV and will include investment in modest wind-power capacity through the Energy Sector Development Project (ESDP).

The solar PV investment will provide sufficient battery storage and a power-conditioning system to ensure grid stability. The scope of work includes design, engineering, planning, procurement, installation, testing, commissioning and two years of O&M support of a 750kW grid-connected Solar PV facility and 1MW/MWh Battery Energy Storage System (BESS) in Funafuti.

1.1 ESMP Purpose and Scope

Screening for the Solar PV array installation subproject was based on field investigations, stakeholder consultation and a review of potential options confirms an assessment of Category B for the Project. It finds that potential impacts are less than significant, site specific, mostly reversible and that a range of potential measures for mitigation can be readily designed in the majority of cases.

Subproject screening has identified that the solar array installation requires an ESMP as per the process outlined in the ESDP ESMF. Therefore, this ESMP has been produced to ensure the integration of environmental and social stewardship into the project as required by Tuvalu's relevant laws and regulations and the Environmental and Social Safeguards Policies of the Bank.

The ESMP provides the set of mitigations, monitoring, and institutional measures to be taken during the design, implementation and operation of the SEDP to eliminate adverse environmental and social impacts, offset them or reduce them to acceptable levels. The ESMP also includes the actions needed to implement these measures.

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Specifically, this ESMP includes the following components:

Consultations: Measures are detailed to ensure adequate ongoing consultations are held and affected people especially are involved in discussing how they are affected and the range of measures for reducing identified impacts.

Mitigation: The ESMP identifies feasible and cost-effective measures that may reduce potentially significant adverse environmental impacts to acceptable levels. The plan includes compensatory measures if mitigation measures are not feasible, cost-effective or sufficient.

Monitoring: The ESMP identifies monitoring objectives and specifies the type of monitoring, with linkages to identified impact and mitigation measure. For all monitoring requirements, the technical parameters are defined along with appropriate responsibilities and reporting procedures.

Grievance Redress Mechanism: The ESDP GRM is the established mechanism for receiving and addressing all grievances and complaints related to this subproject is set out in the ESMP. It seeks to resolve all complaints as quickly as possible to the satisfaction of the aggrieved party.

Implementation Arrangements, Schedule and Costs: The ESMP includes a description of implementation arrangements, including the roles and responsibilities of the Project Management Unit and Contractor. The ESMP also builds scheduling of measures into its planning including phasing and coordination with overall Project implementation plans. Where appropriate, capital and recurrent costs estimate and sources of funds for implementation of the ESMP have been estimated.

1.2 Integration of ESMP

It is the responsibility of the Project Implementation Unit under the TEC to ensure that this ESMP is fully integrated into the installation, commissioning and operation of the solar aspects of the project. The ESMP is based on the ESMF which formed part of the tender requirements and will be part of the Contractor's Contract and will be compulsory that they implement the ESMP throughout the entire duration of their contract. It shall be TEC's responsibility to supervise the Contractor's implementation of the ESMP during design and construction phases, and then ensure that this ESMP continues to be implemented by TEC during the commissioning and operation of the solar array system.

In this way, the ESMP will be fully integrated within the solar array subproject so that the required measures will be fully appreciated by all responsible parties and successful implementation will be achieved.

1.3 Disclosure

As part of the requirements of Tuvalu law and World Bank policy, the ESMP is to be publicly disclosed by TEC as the agency responsible for ESDP. A radio advertisement will alert the public to the disclosure of the solar array project and where to find the ESMP. Likewise, TEC will ensure that several copies of all prepared safeguard instruments are available locally at the TEC and Department of Energy office and easily accessible to affected groups and local NGOs.

The ESMP is a dynamic document and will be reviewed, updated and approved as necessary throughout the implementation of the Project. For each approved updated version of this ESMP, the PIU will be responsible for disclosure through the above channels.

2 Project Description

2.1 Overview of Works

The scope of work for the ESDP Solar PV Array includes design, engineering, planning, procurement, installation, testing, commissioning and two years of O&M support of a 750kW grid-connected Solar PV facility and 1MW/MWh Battery Energy Storage System (BESS) in Funafuti. The PV arrays are to be mounted as appropriate on at least 3m elevated shed structures allowing for car parking or storage underneath.

The Contractor is required to provide a turnkey development which shall include, but are not limited to:

- Basic project planning, sequencing and scheduling, site condition assessment, solar resource assessment, energy yield predictions for project life cycle, basic and detailed designing, engineering (including layout of the Facility), project equipment and component selection (subject to owners approval), preparing engineering and construction drawings with a well-established classification and identification system in standard (SI) units, availing planning permissions, and all other requirements as required for commissioning, and interconnecting the facility to the TEC grid.
- Arranging for power and electricity required for construction of the facility, obtaining permits and approvals from all local stakeholders, government statutory bodies, obtaining permissions from electrical inspectorate, liaising with TEC for evacuation infrastructure, relay testing and charging of interconnection lines as required for completion and commission of the facility.
- Site preparation (including additional geotechnical investigations if necessary) and land levelling, providing construction infrastructure like site office, internal roads, workshop etc., assembly and construction of the entire facility, all pre-construction tests, site management and supervision, labor provision, testing and commissioning of all the equipment in steps and commissioning and interconnection of the Facility to TEC grid.
- Occupational health and safety for construction and operation of the Facility complying with local standards & laws, the World Bank Group Environmental, Health, and Safety guidelines.
- Environment and social protection complying with local standards & laws and the World Bank Group safeguards instruments including the TESDP Environment and Social Management Framework (ESMF) and specifically this Environment and Social Management Plan (ESMP).
- Operations and Maintenance Service (O&M) of the Facility for a period of two years, commencing from the date of official acceptance by TEC. In the first month of O&M, at least one personnel from the contractor shall stay in Funafuti to provide on-site operation service. From the second month of O&M, the contractor may remotely provide operation service from abroad, but shall visit the project sites at least quarterly basis to monitor the facility and have necessary meetings with TEC personnel.
- Training to the owner's personnel from the beginning of operation and maintenance, handing over the Facility to owner, provision of all the documentation necessary for the correct performance and maintenance for the life cycle time of the Facility.
- The Facility shall be designed, engineered, manufactured, erected and configured in such a way that it will achieve high life expectancy, high availability and reliability with minimum power generation costs.

2.2 Project Sites

2.2.1 Solar PV Sites

There are three proposed PV plant sites centered around the Funafuti runway area, all are on government leased lands and all are close to the TEC power station. All three sites have been approved by the GoT's Cabinet for this project. The three sites are described below.

SITE 1: TUVALU SPORTS GROUND

This site is located within the Ministry of Education, sports and Culture (MESC) leased grounds of the Tuvalu Sports Ground among a commercial area of Funafuti (Figure 1). The stadium is a multi-use facility and holds about 1,500 people. It is the only stadium in Tuvalu, so all sporting events are played there (Figure 2). A 40kW solar array was installed on the roof of the stadium's stands in 2008 and connected to the TEC compound 350m to the southwest of the stadium.

Land has been allocated around the perimeter of the site, approximately 875m², (Figure 2) for installation either on top of existing structures, or on a framework structure or a combination of both. Any framework structures shall newly be constructed under this project and shall have at least 3m height to allow for multi-purpose use (car parking, shade, picnic areas, etc) the purpose of which will be developed in consultation with the appropriate sporting associations and government departments.

The land surrounding the sports field itself is mixture of flat and mild gradient type and does not have significant undulations; however, some portion of land may require leveling and potentially clearance of quite a lot of scrub vegetation which is all on the government property, this shall be part of the Contractors scope.



Figure 1: Site 1 of PV plant (red) and the location of the TEC compound (yellow)



Figure 2: Land allocated for installation of Solar PV Array under TESDP

SITE 2: LAGOON SIDE

This site is located on government leased land on the lagoon side of Funafuti, to the southwest of runway end 03 (Figure 3). The area is currently used as a recreational park. It is located between a residential area and hotel/commercial area on a piece of land which previously housed a solar PV array. There are existing buildings on the site (including a recreational picnic table) (Figure 5) and the installation will either be on top of existing structures, or on a high framework shade-providing structure or a combination of both. The recreation use of this site will be increased by the introduction of new shaded areas.

The entire site, approximately 750m², has been allocated for use by the TESDP (Figure 4), however the exact scope of installation works under this project at this site will be confirmed at a later date.

The land surrounding the site is relatively flat without significant undulations; however, the site is bounded on the north by the sandy coastline of the Funafuti Lagoon. The northeastern end of the site has some non-food bearing tree specimens whose root systems are likely to be providing stability to the shoreline. These trees will not be removed for the installation of any PV structures.



Figure 3: Site 2 of the PV plant (red) and the location of the TEC compound (yellow)



Figure 4: Land allocated for solar installation at Site 2 under TESDP



Figure 5: Public picnic table at Site 2

SITE 3: SHORELINE AT FORMER SATELLITE STATION

This site is located at the rear of a stretch of commercial buildings including the Tuvalu Telecommunication Corporation's (TTC) disused satellite base station, the prison and some

donor funded agricultural gardens (Figure 6). Sections of this site have fallen into a state of neglect and is not currently used by the government. A large number of informal piggeries have been constructed on the site, primarily behind the old telecom station and stretching back to the coastline. These piggeries belong to several different farmers, are poorly maintained and have no drainage meaning that the site is contaminated by effluent from the sties as close as 10m from the abandoned TTC building. The site also crosses the proposed landing site of the upcoming fibre optic cable, which is currently proposed to land behind the prison. Access to the Beach Man Hole for the cable at the landing site will be maintained as a requirement of this project.

The coastline of this site is a rocky beach and leads to a reef flat of approximately 150m in length. The wave energy is high and the reef flat is underwater at low tide.

The area allocated to the TESDP (Figure 7) is along the length of the property, approximately 400m², however, as the TESDP will not be undertaking any resettlement of piggeries or any other assets, the majority of this site is unsuitable for installation of solar PV arrays. It has been determined that installations will instead take place over a smaller section of this site which be surveyed to avoid any impacts on piggeries. World Bank safeguard Operating Policies consider the informal piggeries to have rights to fair and just compensation or alternatives as the user of the resource (in this case land) in question. They are considered to be affected persons (AP) regardless of their legal rights to the resource and therefore they will not be subject to any resettlement or relocation and use of areas within this site will be carefully designed as to not impact on the functioning of the piggeries.



Figure 6: Site 3 of the PV plant (red) and the location of the TEC compound (yellow)



Figure 7: Land allocated for solar installation at Site 3 under TESDP

2.2.2 Battery Energy Storage Site

The BESS is to be located in Funafuti at the TEC power station (Figure 8) under the existing 350kW PV array. Batteries and inverters are to be collocated. As there are existing concrete footings and pillars in the proposed location, maneuvering the BESS equipment into its final location will require planning.



Figure 8: The existing TEC power station site

2.3 Project Components

It is expected that there will be ancillary works associated with the installation of the solar PV and BESS systems on Funafuti. The final scope of these works will be confirmed during the detailed design phase, but it is expected to include the following:

CABLING AND TRENCHING: All cabling is to be installed in accordance with internationally recognized standards and codes such as AS/NZS 3000:2007. 11kV Cabling is to be installed underground. Contractors have been advised that any cabling installed underground will be subject to salt water immersion at times. Selection and protection of cables must account for this.

For each of the 3 sites, sections of short trenching works will be needed to connect the solar array to the nearest grid connection point at the TEC compound. Site 2 would require longer sections of trenching unless the TESDP can utilize existing cable conduit which crosses underneath the runway. The trenching will require the clearing of an approximately 1-meter wide corridor of low growth vegetation either alongside the access tracks around the runway at the front of the properties or along the rear fence line of the properties (for Sites 1 and 3 only). The BESS site will require approximately 200m within the TEC compound.

AGGREGATES: It is anticipated that sand and aggregates will be required for the civil works at the solar array site and the BESS installation site. There are aggregate stockpiles held by the Public Works Department on Funafuti which may be suitable for use on this project. If these stockpiles are not utilized, then it is expected that all sand and aggregates will be imported from regional sources (typically Fiji). No sand or new aggregate extraction will be undertaken within Tuvalu for this project.

HAULAGE: Equipment and materials will need to be transported from the Funafuti Port and/or TEC compound to the project sites. At this stage, the volume of imported items is unknown but possibly involves sections of pre-cast concrete and aggregates to cast any other concrete in situ.

Transportation between the port, the project sites and TEC site passes through villages and the dense Funafuti urban and administrative center before crossing the runway to the TEC compound. The roads are in relatively good condition and are wide enough to accommodate heavy vehicles, however the road between the port and Funafuti is heavily trafficked with pedestrians, motorbikes, cars and vans.

LAYDOWN SITE: A laydown site (or sites) will be required for the storage of equipment and staging of construction works for the solar array and BESS installations. The number and location of the site(s) has yet to be confirmed but one will likely be close to the solar array installation sites, possibly using sites which have previously been used as the laydown site for other projects, such as the TvAIP air traffic control tower construction. It is anticipated that the site(s) will be used for the storage of machinery and equipment as well as pre-cast concrete structures, a first aid station and storage of portable generator. It may be necessary to produce concrete in situ during installation of the array and energy storage pads. Concrete batch compounds will be installed in close proximity to the sites, either at the solar array site or in close proximity to the TEC compound. There is likely also a need for stockpile sites to store aggregate and to store any excavated materials from levelling activities at the solar array site.

Laydown sites, stockpile sites and concrete batching compounds will only be installed either on government land, or on sites which are already subject to leases for government project works. TEC will identify suitable sites for the Contract to choose from.

WASTE: Waste is expected to be generated in the form of excess concrete, packaging materials, general construction waste, excess excavated materials and used oil. Tuvalu has a municipal landfill however, it is operating at capacity and is only suitable for disposal of general office waste. It is not suitable for any other type of project waste. All other wastes will be disposed of offshore at a licensed facility. There are no facilities on Tuvalu to dispose of hazardous materials, however the Waste Management Department (WMD) has provisions in place to support the disposal of hazardous materials off shore. The WMD also runs the islands recycling export program and should be consulted on the disposal of any recyclable materials. Reduction and reuse should be waste management strategies employed by the Contractor.

HAZARDOUS SUBSTANCES: If concrete is produced in-situ at the solar array sites, it will be in a coastal environment which increases the environmental risk to the marine environment from concrete waste water and slurry. For any levelling works at the solar array sites, an excavator will be needed, which also increases the environmental risk from the fuel and oil needed for the excavator. As there is no electricity at the solar array site, the Contractor will need to provide their own power and diesel will be used at the solar array site and stored at the laydown site(s).

CONSTRUCTION WATER: There is no reticulated water supply available at the identified sites. Contractors are required to make their own arrangement for sourcing this. On Funafuti potable water is also provided by one of three desalination plants. Water is not reticulated. Droughts have led to severe drinking water shortages on the islands in recent times.

The groundwater lens on Funafuti is contaminated with sea water. In 1972, Cyclone Bebe, a large storm event, caused sea water to flood the island and infiltrate the groundwater¹. It is no longer a potable water supply.

2.4 Land Acquisition

The solar array installation site is within the three identified sites and the BESS site is within the TEC compound all of which are leased by the Government of Tuvalu. The Cabinet of the GoT has approved the sites for use by the TESDP and has determined the maximum footprint which may be used for solar array installation under the Project.

The trenching routes between the solar array site and the TEC compound point do not pass through any villages or residences. Temporary access to the trench corridor will be required. Site visits have established that no food crops or otherwise cultivated areas will be disturbed during the trenching works. Only low-level vegetation will be cleared and then replaced. Consultations with users of the areas along the trenching route to ensure that any disturbance will be kept to a minimum.

There will be no resettlement or livelihood impacts (involuntary or otherwise) of any persons associated with the implementation of the TESDP.

¹ www.wikipedia.org/wiki/Tuvalu. Accessed 30 August 2013.

3 Environmental and Social Context

The ESDP ESMF describes the general natural and social environment of Tuvalu in some detail. The sections below refer only to the subproject footprint.

3.1 Land Use

Land availability on Funafuti is limited and informal land uses such as piggeries and gardens have encroached on idle government lease land.

Site 1: The Tuvalu Sports Ground is regularly used and there is no evidence of any informal piggeries between the stadium and the coastline. The stadium is on government leased land with commercial enterprises on both sides of the site. The site is immediately to the east of the runway and is accessed by an unpaved road. To the east of the stadium site is the open ocean coastline of the Funafuti atoll.

Site 2: The site is currently mostly an undeveloped open space which is used as a recreational park. It used to house a solar array, however this has since been removed and a few small buildings are now at the site. To the east of the site are official residences and guesthouses, while to the west of the site is the start of the residential surrounds to Funafuti. The land immediately to the south is the main road that connects the west of the island to Funafuti and to the immediate north is a sandy section of beach which fronts the internal Funafuti lagoon.

The Funafuti Lagoon itself has a sandy substrate with between 25 – 40m depth and scattered outcrops as indicated on the marine navigational chart. The approach to the proposed landing site 6 is gently sloping from 25m to the shore across a rocky intertidal zone habitat and a coarse sandy beach. The wave climate within the lagoon is generally calm and sheltered with chop and fetch experienced during storm or cyclone event. The beach itself is impacted from ongoing development activity and the intertidal zone of the beach is devoid of any notable marine life (corals or macroalgae).

Site 3: This site is on the south eastern side of the islands runway and the site is government led land with the meteorological service, Public Works Department compound, the prison, the TEC compound, the abandoned TTC satellite station and demonstration gardens (funded by The Peoples Republic of China (Taiwan)) and informal and formal piggeries.

Along the length of this site the beach is rocky and leads to a reef flat, of approximately 150m in length. The reef flat is, again, undulating and uneven but devoid of any significant marine life. The wave energy is high at all tide levels and the reef flat is underwater at low tide.

3.2 Terrestrial Environment

Funafuti is a narrow, densely populated landmass which has undergone significant anthropogenic changes. Coconut, breadfruit and pandanus dominates the landscape as do pawpaw and other food crops. The vegetation has been affected by the contamination of the freshwater lens with salt water and subsistence crops require careful cultivation and application of compost and nutrients to sustain the crops. In Tuvalu nearly 65% of the flora is not native.

The land surrounding the stadium is highly modified and developed. The vegetation is characterized by large grassy areas with scattered coastal trees and low lying scattered vegetation amongst the existing infrastructure along the shoreline.



Figure 9: Vegetation at the stadium site

Site 2 on the lagoon side transitions from sand to grass and low lying scrub with a small area of trees between the sand and road. The trees are mostly pandanus specimens and are not food crop bearing.

Oceanside, site 3 is characterized by scattered coastal trees and low lying scattered vegetation amongst the existing infrastructure along the shoreline.

3.3 Marine Environment

The marine environment immediately behind Sites 1 and 3 consists of upper intertidal rocky beaches (Figure 10), intertidal reef flat and sub-tidally, the reef slope. The intertidal reef flat is rocky and undulating with several peaks and troughs across its width. The habitat is bare rock with sporadic coral species adapted to the high energy environment and some sparse patches of low growing coralline and turf algae. Benthic invertebrates are observed infrequently.



Figure 10: Coastline immediately behind stadium area

The marine environment of Site 2 consists of upper intertidal sandy beach, intertidal sand flats and the subtidal deeper sandy lagoon floor. The upper sandy beach is currently impacted by infrastructure development activities of the neighbouring land reclamation works. An excavator was observed driving along the beach during the site survey. The intertidal zone is scattered with occasional rock where collections of small gastropod species can be observed. The sandy lagoon floor is populated with scattered coral bommies and outcrops.

3.4 Climate Change Threats

Tuvalu is extremely vulnerable to climate change. As sea level rises, inundation events will become more common, and it is expected that many islets will eventually be submerged. Climate change predictions are for increased intensity and frequency of intense rainfall days, increase in annual and seasonal mean rainfall, and less frequent droughts. The frequency of cyclones is predicted to decrease².

Increases in sea temperatures and ocean acidification will continue to cause coral bleaching in the reefs. This has a catastrophic effect on the reef ecosystem, and the ability of the reef to protect the lagoon from swells and storm surges.

3.5 Waste Management

There is one 'landfill' on Funafuti where all collected waste goes. Waste is not covered or buried; it is a health and safety risk and is likely to be polluting the ground and marine environment. Due to a lack of space on Funafuti, this solution to waste management is not sustainable. Litter is also a big

² Australia Government. Pacific Climate Change Science Program. 2011. Climate Change in the Pacific: Volume 2: Country Reports. Chapter 15. Tuvalu.

problem on the island. There are no facilities for recycling and no facilities for hazardous waste treatment or disposal.

4 Environmental Legislation

4.1 Tuvalu Environment Protection Act 2008 and 2014 EIA Regulations

The Act covers impact assessment, international and regional environmental obligations, biodiversity protection, climate change strategy and waste management.

Under Section 18, the Department of Environment (DoE) has the power to create regulations to provide for a system of environmental impact assessment to be applied in Tuvalu.

4.1.1 EIA Regulations 2014

The 2014 Tuvalu Environment Protection (Environmental Impact Assessment) Regulations prescribes, under Schedule 1 Development Activities Section 9(n), that an electricity generating station is considered a development activity. All development activities require a development consent, issued by the Department of Environment. As part of the consent process, a Preliminary Environmental Assessment Report (PEAR) must be prepared by the developer (TEC).

The process, as prescribed by the 2014 regulations, is as follows:

1. All persons proposing to undertake any development activity to which these regulations apply must, prior to the commencement of the activity, – (a) notify the Department of Environment of the proposed activity; and (b) apply for a development consent under these regulations. All notifications must be accompanied by an application fee of \$500.00.
2. A PEAR shall contain the following particulars
 - a. a brief description of the development proposal;
 - b. a brief description of the area to be affected and the nature of the proposed change to the area (including a location map and site plan);
 - c. a brief justification for the development proposal;
 - d. an assessment of all reasonably foreseeable adverse and positive impacts, including long-term and short-term, primary and secondary consequences;
 - e. an indication of possible alternatives to mitigate any identified adverse impacts; and
 - f. an indication of measures that the proponent intends to take to mitigate or avoid identified adverse impacts.

The Department of Environment will approve the development consent, unless the Minister decides that, due to the potential risks of the project, a full Environmental Impact Assessment is required.

4.1.2 Schedule 1 of the Environment Protection Act 2006

Schedule 1 provides a list international convention to which Tuvalu has signed. This includes:

- United Nations Framework Convention on Climate Change (Adopted at New York on 9 May 1992).
- Cartagena Protocol to the Convention on Biological Diversity (Adopted at Montreal on 29 January 2000).
- Convention to Ban the Importation into Forum Island Countries of Hazardous and Radioactive Waste and to Control the Trans-boundary Movement and Management of Hazardous Waste within the South Pacific Region (Waigani, PNG, 16 Sept 1995).

4.2 Comparison of Environmental Assessment Requirements

The comparison table below demonstrates that the World Bank Safeguard requirements for an ESMP match or exceed the Tuvalu Environmental Protection Act EIA Regulations for the PEAR. Therefore, this ESMP will meet both the World Bank and the PEAR requirements.

Table 1 Comparison of Environmental Assessment Documentation Requirements

Contents of Assessment Report	Environmental Protection Act EIA Regulations	World Bank Safeguard Policies
Report type / title	Preliminary Environmental Assessment Report (PEAR)	Environmental Management Plan (EMP) The World Bank policies are flexible. Use of in-country report type / title is acceptable to the Bank, as long as the EMP requirements are included.
Policy, legal and administrative framework		Yes
Description of development proposal	Yes	Yes
Description of area to be affected (environment and social)	Yes	Yes
Nature of proposed changes	Yes	Yes
Location Map / Site Plan	Yes	Yes
Justification for the proposal	Yes	Yes
Assessment of impacts	Yes	Yes (significant only)
Mitigation of impacts	Yes	Yes (significant only)
Alternatives	Yes	Yes
Public consultation		Required, and a summary provided in the report.
Public disclosure of the document		Yes
Institutional arrangements		Yes
Capacity building		Yes
Relevant actions from the Gender Action Plan		Yes
Budget		Yes

5 Impacts and Mitigation Plan

The ESDP has the potential to create a variety of impacts through the installation, commissioning and operation of the solar array and BESS. These potential impacts can be either positive or negative depending on the receptors involved and the activity. The impact of this project on the physical, biological and social environment has been assessed to determine likelihood and identify effective mitigation measures.

There are site-specific and component specific impacts which have been identified and the significant impacts requiring specific mitigation are discussed below.

All impacts below are presented under the associated impact generating activity.

5.1 Key Identified Impacts

Section 5.2 describes all of the identified impacts for the solar array and BESS components of the project. The table also lists the key mitigation measures, the residual impacts following mitigation, the responsible party and the predicted cost of the measures. The tables include the applicable management requirements stipulated in the Solar PV Array Code of Practice, the Battery Code of Practice and the Construction and Earthworks Code of Practice in the TESDP ESMF.

In the sections below, some of the key impacts are discussed in more detail and are also included in the table.

5.1.1 Environmental Impacts During Construction Phase

5.1.1.1 Concrete Production

Environmental impacts associated with concrete production is water pollution. Waste water and slurry from concrete production will have a high pH level making it alkaline and contains chromium. Highly alkaline water can result in the death of marine organisms should it enter the marine environment. There are also impacts associated with concrete waste water leaching into the groundwater and causing contamination.

5.1.1.2 Importation of Equipment and Materials

Solar panels and all associated structures and equipment will need to be imported into Tuvalu. Additionally, sand and/or aggregates may be imported for the concrete works. If imported consignments are not properly treated and/or washed before shipping, there is the risk of introducing non-native and potentially invasive plants, animals and disease. The introduction of harmful species to small island nations such as Tuvalu, who have a naturally low level of biodiversity, can be devastating to the local ecosystems, flora and fauna. It is also possible to import diseases such as foot and mouth disease which would have devastating impacts on local livestock.

Invasive marine organisms can also be introduced to the marine environment by unregulated discharge of cargo ship ballast water.

5.1.1.3 Handling and Storage of Hazardous Materials

Works at the solar array installation site will be undertaken in close proximity to the coastal marine environments. Works will include the use and storage of hydrocarbons (fuel and oil) for the operation of machinery and power generation.

There is a risk of significant spills contaminating the marine environment adjacent to the solar array site if the appropriate management measures are not effectively implemented.

5.1.2 Social Impacts During Construction Phase

5.1.2.1 *Installation in Recreational Spaces*

During construction, it can be expected that there will be some pedestrian and traffic management required at the stadium solar array installation site. It can be expected that the recreational use of the stadium and beach front areas would be limited to some degree and therefore cause an impact to the recreational public. Traffic management during installation may mean temporary reduced access to areas such as parking spaces and shaded stands which may have an impact on local traffic movements and personal comfort of spectators. These impacts are expected to be short term and will cease completely once installation is complete.

5.1.2.2 *Haulage of Materials and Equipment*

The haulage routes will pass through residential communities and past other sensitive social receptors (schools, hospitals, churches, etc) the increased level of noise, dust and vibration is likely to impact on the quality of their daily activities. This impact will be short term and will cease completely once haulage is completed.

There is also the possibility of damage to the existing road surface associated with haulage of heavy loads. Damages to road surfaces can cause a traffic hazard and can also lead to a faster rate of overall road surface degradation in the long term. At the exact haulage route between the port and TEC compound is unknown at this stage, the existing road surface condition cannot be assessed. The area of the highest risk will be between the port and Funafuti where the traffic and pedestrian levels are much higher, and the sensitive receptors are densely located.

5.1.2.3 *HIV/AIDS and Gender Based Violence*

Impacts are associated with personnel recruited from outside the local community such as increased instances of HIV/AIDs. Additionally, the Contractor accepts that gender based violence (GBV) might occur as an unintended consequence of increased income through employment and / or foreign workers taking advantage of locals. As such the contractor will responsibility for implementing actions to prevent instances of HIV/AIDs and GBV.

5.2 Mitigation Tables

Solar PV Installation Design and Pre-Construction Phase Management Plan

Environmental or social impact	Design and Pre-Construction Mitigation Actions	When	Costs	Responsible
General / all impacts	<ul style="list-style-type: none"> Feasibility and detailed design studies to be informed by the ESMP. All impacts shall be avoided in the first instance or reduced through application of mitigation measures in this ESMP. 	During design process	Part of standard practices	Contractor
General / all impacts	<ul style="list-style-type: none"> Submit PEAR to the Tuvalu Department of Environment in accordance with the Environment Impact Regulation of the Tuvalu EPA 2008. Incorporate consent conditions into ESMP 	One month prior to commencement of civil works	AUD\$500 application fee	TEC PM and Safeguard Specialist
Design of Solar Array Installation Site	<ul style="list-style-type: none"> Undertake consultations with MESC and sporting organisations to integrate needs of stadium users into multi-benefit design of solar array. Undertake consultations with community regarding the installation of solar arrays on site 2. Undertake studies in compliance with this ESMP. Site will be designed to include protective locks, fences, signage, etc to protect the public from hazards Supplier/Manufacturer contract clause to provide for removal of spent solar panels from Tuvalu. Avoid installations impacting on informal piggeries. Avoid design which requires removal of shore stabilizing trees at Site 2 Cable laying to be designed to maximize use of existing conduit where possible. 	During design process, prior to final design approval	Minor, part of standard practices	Contractor
Design of Energy Storage System	<ul style="list-style-type: none"> ESS will be designed to ensure worker safety – this can include fencing and signage for battery storage area. Select batteries from manufacturer or suppliers that will agree to a contract condition ensuring that the batteries will be removed from the islands and recycled or disposed of at an approved landfill facility at the end of its working life, as part of the contract for supply. Protect public health and safety by preventing unauthorized access to batteries by providing locked facilities. Protect the environment by housing batteries in covered structure, with concrete floors. Floors should be bunded to contain any acid spills. 	During design process, prior to final design approval	Minor, part of tender requirements	Contractor

Solar PV Installation Design and Pre-Construction Phase Management Plan

Environmental or social impact	Design and Pre-Construction Mitigation Actions	When	Costs	Responsible
Waste Management	<ul style="list-style-type: none"> The Contractor shall develop a Solid Waste Management Plan in accordance with the guidelines included in Annex E of the ESMP. SWMP plan will stipulate removal of all solid and hazardous waste off Tuvalu, compost or local disposal of vegetation. All Project staff will be trained on this plan and attendance will be recorded. It is a requirement to dispose of spent batteries or solar panels off Tuvalu during the operational phase of the project. The SWMP should provide TEC with a procedure for this during O&M 	Prior to commencement of works	Minor, part of standard practices	Contractor
Water Supply and Management	<ul style="list-style-type: none"> Contractor to design water catchment and/or storage at the solar array installation site to supply water for construction needs. Contractor to make provision for potable water for workers at solar array installation site. Any sanitation facilities supplied for the workers by the Contractor at the solar array installation site must be temporary and must include a self-contained septic system or be a composting toilet. Water sourcing shall only be through rainwater catchment or purchased from the desalination plants. 	Prior to commencement of works	Minor, part of standard practices	Contractor
Traffic Management	<ul style="list-style-type: none"> The Contractor shall develop a Traffic Management Plan. The TMP shall also include requirements that are in accordance with the stipulations of this ESMP 	Prior to commencement of works	Minor, part of standard practices	Contractor

Solar PV Installation Design and Pre-Construction Phase Management Plan

Environmental or social impact	Design and Pre-Construction Mitigation Actions	When	Costs	Responsible
Spill Prevention and Emergency Response	<ul style="list-style-type: none"> • The Contractor will have a spill prevention and emergency response plan in place to account for all potential instances. • The plan will include: <ul style="list-style-type: none"> - Measures to avoid spill in the first instance including use of drip trays for refueling, use of hard stand for maintenance and repair, covered and bunded storage areas for hazardous substances, etc - The person who has identified the leakage/spillage shall immediately check if anyone is injured and shall then inform the Supervisor. - In such cases, all personnel shall take immediate action to stop and contain the spillage / leakage; - The Contractor shall arrange maintenance staff with appropriate protective clothing to clean up the chemicals/chemical waste. This may be achieved through soaking with sawdust (if the quantity of spillage/leakage is small), or sand bags (if the quantity is large); and/or using a shovel to remove the sand / topsoil (if the spillage/leakage occurs on bare ground); - Contaminated sand and materials must be handled as hazardous waste (see above). - The Contractor shall prepare a report on the incident detailing the accident, clean-up actions taken, any pollution problems and suggested measures to prevent similar accidents from happening again in future. The incident report shall then be submitted to TEC for review and submit to the Department of Environment. • All Project staff will be trained on this plan and attendance will be recorded. 	Prior to commencement of works	Minor, part of standard practices	Contractor

Solar PV Installation Design and Pre-Construction Phase Management Plan

Environmental or social impact	Design and Pre-Construction Mitigation Actions	When	Costs	Responsible
Recruitment and management of workers	<ul style="list-style-type: none"> The Contractor will engage locals in work wherever possible, and prioritise local spending for food and services wherever possible. Ensure equitable access for men and women. All imported project staff will abide by Tuvalu immigration policy and provide all required documentation, including health checks. Overseas workers will undergo cultural familiarisation induction upon arrival and sign a code of conduct applicable for the duration of their contract. Overseas workers will have the technical skills and experience for solar PV array installation. 	During worker recruitment process	Minor, part of standard practices	Contractor
HIV/AIDs & GBV Training	<ul style="list-style-type: none"> Maximise recruitment from within the local community All project staff will undergo training by local services providers identified by the TEC PIU on prevention of HIV/AID and GBV. Attendance will be recorded. The Contractor will develop a Code of Conduct (following the template provided in Appendix A) for all workers (local and overseas) to sign detailing the expected behaviours of Project staff, ESHS requirements, Cultural respect, OHS requirements, Community Health and Safety considerations 	On mobilization, prior to commencement of civil works	Included as part of provisional sum	Contractor and TEC
Sourcing of aggregate	<ul style="list-style-type: none"> All overseas sourced sand and aggregate will be imported from an offshore source. The identified source must have an existing permit for extraction and have been operational for at least 12 months prior to award of contract. Imported aggregates must be fumigated prior to arrival and from a country approved by Tuvalu Biosecurity. Reuse waste aggregates from roading or runway projects. If permissible, use PWD stockpiled sand. No coral or sand aggregates from local sources shall be used. All imported aggregate will be subject to customs and quarantine clearance by GoT. Additional treatment of aggregate will be undertaken should this be required by the GoT. Any leftover natural or engineered aggregate should be made available for reuse by other parties or stockpiled in Tuvalu for later use (with the permission of the Department of Environment). 	Prior to finalization of aggregate sales agreement	Minor, part of BoQ	Contractor and ME

Solar PV Installation Design and Pre-Construction Phase Management Plan

Environmental or social impact	Design and Pre-Construction Mitigation Actions	When	Costs	Responsible
Community relations	<ul style="list-style-type: none"> Undertake meetings with sporting associations and communities prior to construction at the solar array site. Prior to installation, TEC (or their contractors) are to speak with nearby community members on the function and features of the panels, to try to reduce the potential for vandalism, and to allay any health and safety concerns. Key messages are: <ul style="list-style-type: none"> Noise and disruptions to access to the sports field during construction. Benefits of increased shaded areas for public use under solar framework. How this will (or won't) affect their power bill. 	After mobilization and prior to commencement of civil works.	Minor, part of standard practices	TEC Project Manager and Safeguard Specialist

Solar PV Installation Construction Phase Mitigation Plan

Environmental or social impact	Construction Mitigation Actions	When	Costs	Responsible
Non-toxic solid wastes (metal, packing, etc.)	<ul style="list-style-type: none"> Solid Waste Management Plan will be fully implemented. Metal, cardboard and plastic will be recycled, where local facilities exist. Waste that cannot be recycled will be collected and securely stored prior to offshore disposal at a licensed facility. 	For the duration of mobilization	Moderate but included in tender requirements	Contractor
Hazardous wastes	<ul style="list-style-type: none"> Hazardous wastes such as damaged solar panels and batteries that contain heavy metals shall be collected and stored prior to disposal offshore at a licensed facility as per the requirements of the Solid Waste Management Plan. Should the PWD hazardous storage are not be available for subproject use, the Contractor will provide a secure and covered structure in a location determined by TEC for the storage of hazardous waste 	For the duration of mobilization	Moderate but included in tender requirements	Contractor

Solar PV Installation Construction Phase Mitigation Plan

Environmental or social impact	Construction Mitigation Actions	When	Costs	Responsible
Sourcing of aggregate	<ul style="list-style-type: none"> Any overseas sourced sand and aggregate will be imported from an offshore source. The identified source must have an existing permit for extraction and have been operational for at least 12 months prior to award of contract. Imported aggregates must be from a country approved by Tuvalu Biosecurity. Reuse waste aggregates from roading or runway projects. If permissible, use PWD stockpiled sand. No coral or sand aggregates from local sources shall be used. All imported aggregate must be fumigated prior to arrival and will be subject to customs and quarantine clearance by GoT. Additional treatment of aggregate will be undertaken should this be required by the GoT. Any leftover natural or engineered aggregate should be made available for reuse by other parties or stockpiled in Tuvalu for later use (with the permission of the Department of Environment). 	Prior to shipment of imported aggregates	Minor, part of standard practices	Contractor and TEC
Importation of equipment and materials	<ul style="list-style-type: none"> All imported equipment and materials will be subject to customs and quarantine clearance by GoT. Additional treatment or cargo will be undertaken should this be required by the GoT. 	Prior to shipment	Minor, part of standard practices	Contractor
Earthworks, Erosion and Sedimentation	<ul style="list-style-type: none"> Minimise vegetation removal and site levelling activities. Revegetate cleared areas after trenching and on decommissioning of laydown areas (where applicable) Wherever possible nearby residents or landowners should be allowed to benefit from cut vegetation. Trap sediment onsite using brush fences or silt fences. No shore stabilizing vegetation at the immediate coastline at Site 2 shall be removed. Divert water around construction sites or disturbed areas with ditches. Stockpiles of excavated materials will be bunded to prevent run off into the marine environment. 	During civil works	Minor, part of standard practices	Contractor

Solar PV Installation Construction Phase Mitigation Plan

Environmental or social impact	Construction Mitigation Actions	When	Costs	Responsible
Water Management	<ul style="list-style-type: none"> Ensure sufficient supply of rain water (or purchased desalination water) for construction and potable water for worker needs is at the solar array site at all times. 	During civil works	Minor, part of tender requirements	Contractor
Concrete waste water and slurry	<ul style="list-style-type: none"> Concrete will be prepared on bunded and covered hard stand surface of laydown areas. All waste water from concrete production will be collected and treated in a concrete-lined pit to lower the pH and allow particulates to settle out before being recycled for construction purposes. Treated and tested waste water may be discharged for absorption into the ground. Discharge will be at a rate to allow absorption without causing surface flooding. Slurry from concrete production will be collected and treated. Treatment can vary depending on viscosity of slurry but can include the same measures described for treating concrete waste water or can be by curing and solidifying into an inert concrete product, which can be used as hard fill. Solid and cured concrete waste is considered safe to be reused by the community or the GoT for infrastructure maintenance. The Contractor's will have a spill response plan in place to manage accidental spills or leakages of concrete waste water or slurry. 	During civil works	Minor, part of standard practices	Contractor

Solar PV Installation Construction Phase Mitigation Plan

Environmental or social impact	Construction Mitigation Actions	When	Costs	Responsible
Lay down areas	<ul style="list-style-type: none"> • Laydown areas will be sited on government or TEC leased land. • Areas will be securely fenced. • Bunded and covered areas will be installed for the storage and handling of hazardous materials and/or substances, the wash down of machinery, the preparation of concrete and the prefabrication of solar arrays. • Run off from these bunded areas will be collected, treated through an oil-water-separator and tested for the presence of hydrocarbons before being either reused for construction purposes or allowed to discharge into the ground, away from the marine environment. Discharge will be at a rate to allow absorption without causing surface flooding. Any contaminated run off will need to be contained and removed off shore. • Stock piles of sand or aggregates shall not be more than 2m high, shall be bunded at the base using sandbags or similar to prevent sediment laden run off and erosion of stock piled materials. • Segregated storage for solid waste will be provided. This area will be clearly marked and designed to ensure that as waste is secure. • Worker inductions will include a tour of the laydown area and required practices from workers. • Spill response kits will be available, and workers trained in their use. 	Prior to and for the duration of civil works	Minor, part of standard practices	Contractor
Hazardous Substances, Fuel Storage and Maintenance Activities	<ul style="list-style-type: none"> • Any hazardous substances storage and equipment maintenance area at Site 2 will be located at least 20m away from the vegetation line. • Hazardous substances should be covered from rain and sun, in locked storage areas and have concrete floors. Concrete floors shall be bunded to capture spills. • Ensure that all equipment maintenance activities, including oil changes, are conducted within demarcated maintenance areas. • All refueling activities will take place over a metal drip tray with at least a 4-inch lip. • Never dispose spent oils on the ground or into the sea. • All spills and waste petroleum products shall be treated as hazardous waste. • No excavators will enter the marine environment. 	Prior to and for the duration of civil works	Minor, part of standard practices	Contractor

Solar PV Installation Construction Phase Mitigation Plan

Environmental or social impact	Construction Mitigation Actions	When	Costs	Responsible
Haulage of materials and Equipment	<ul style="list-style-type: none"> • Implement the TMP. • Haulage will be by existing roads only. • Where appropriate employ traffic control measures on the road to prevent traffic accidents. The workers shall have the relevant training and safety equipment. • Speed controls of 30km/h shall be in place when passing through residential areas or past schools and hospitals. • All vehicles will be well maintained and operated by experienced and licensed drivers. • Spill kits will be available on the vehicles and drivers will be trained in their use. • Any damage to road surface will be reported immediately to PIU. • Haulage will only take place between 6am and 6pm, Monday to Saturday to avoid impacting on home life after work hours. 	During haulage activities	Minor, part of standard practices	Contractor
Health and Safety	<ul style="list-style-type: none"> • The Contractor shall be responsible for complying with all Tuvalu safety requirements for working around electricity and at heights, and any other measures necessary to avoid accidents, including the following as a minimum: <ul style="list-style-type: none"> - Carefully and clearly mark pedestrian-safe access routes around the construction areas; - Conduct safety training for construction workers working at heights and around electricity, and driver safety training for heavy vehicle drivers, prior to beginning work; - Provide personal protective equipment and clothing (gloves, boots, etc.) for construction workers and enforce their use; - Post Material Safety Data Sheets for each chemical present on the worksite and ensure workers understand them. • General health and safety awareness for construction and maintenance workers will include: <ul style="list-style-type: none"> - Introduction to health and safety issues in construction sites by the Contractor; - Formal training on working with electricity and electrical equipment; - Education on basic hygienic practices to minimise spread of tropical diseases, 	For contract duration	Minor, part of standard practices	Contractor

Solar PV Installation Construction Phase Mitigation Plan

Environmental or social impact	Construction Mitigation Actions	When	Costs	Responsible
	including information on methods of transmission and protection; <ul style="list-style-type: none"> - Prohibition of drugs, kava and alcohol on construction sites; - Assure availability of medical assistance in emergency or non-emergency situations and availability of other health-related assistance; - Sun protection clothing and the continuous use of sunscreen. 			
Access to public areas during construction	<ul style="list-style-type: none"> • Identify key user groups for all sites. • Conduct consultation with user groups to advice of planned disruptions to access. • Ensure working area is securely fenced during construction. • Display notifications of predicted duration of disturbance of access and contact details for GRM 	Prior to and during construction	Minor, part of project cost	Contractor
Community Relations	<ul style="list-style-type: none"> • Inform the community about construction and work schedules, and the potential risks and harm from construction sites or maintenance work. • Inform local community as early as possible and repeat at least one day in advance of any interruption to electricity supply. Advise through postings at the project site, at public meeting places, and in affected homes/businesses. • Advise people of the complaint's mechanism under the EMSP that can be used to provide feedback and lodge complaints and how complaints will be addressed. 	For contract duration	Minor, part of project costs	Contractor and TEC PM

Solar PV Installation Operational Phase Mitigation Plan

Environmental or social impact	Operation Mitigation Actions	When	Costs	Responsible
Disposal of hazardous materials (broken/ decommissioned solar panels, batteries)	<ul style="list-style-type: none"> • Batteries and solar panels must first be removed from the island and recycled or disposed of at an approved landfill facility in New Zealand, Australia or similar. The contract conditions with the manufacturer and/or supplier to ensure funding it available at the time of decommissioning. • Disposal requirements of the batteries and/or solar panels will be integrated into TEC O&M Manual. • Any solar panels or batteries removed from the array for disposal will first be collected and stored a secure covered area. • For final disposal, the TEC will ensure consultation with Department of Waste Management to ensure hazardous items are shipped offshore to a facility licensed to handle hazardous waste. 	For lifetime of hardware	Major for MEC – funding of offshore waste disposal will need to be secured	TEC
Solar Panel inspections	<ul style="list-style-type: none"> • MEC shall undertake at least weekly monitoring of the condition of the individual solar panels to detect any damage. • Damaged solar panels shall be immediately removed from the array. • Regular inspections, particularly following storm events to be carried out on solar array foundations by TEC. Any defects to the foundations must be immediately rectified. 	For lifetime of hardware	Minor unless repair works are needed to array foundations.	TEC

6 Monitoring Plan

Issue	What	Where	How	When	Responsibility
Design and Pre-Construction Phase					
Permits	PEAR has been submitted and approved	n/a	TEC sight DEC approval	Prior to commencement of works. One off	TEC PM
Solid and hazardous waste	SWMP plan of sufficient standard	n/a	SWMP reviewed and approved	Prior to commencement of works. One off	TEC Safeguard Specialist
Public health and safety	HIV/GBV/Code of Conduct training and acknowledgements have been conducted	n/a	Training attendance register supplied to TEC PM and signed copies of code of conduct submitted to TEC	Prior to commencement of civil works. One off	TEC PM
Soil and Water Pollution	Approved spill response plan in place	n/a	Spill response plan submitted to TEC PM	Prior to commencement to civil works. One off	TEC PM
Occupational Health and Safety	OHM Management Plan in place	n/a	OHS Management Plan submitted to TEC PM	Prior to commencement of works. One off	TEC PM
	All workers have undergone appropriate OHS training	n/a	Training attendance records submitted to TEC PM	Prior to commencement of works. One off.	TEC PM
Aggregate supply	Imported aggregate sourced from country approved by Tuvalu	n/a	Agreement between Contractor and aggregate supplier to be viewed prior to finalisation	Prior to final purchase of aggregate. One off	TEC PM
	All imported materials with appropriate biosecurity clearances	n/a	Biosecurity clearances submitted to TEC prior to offloading	Prior to offload of aggregates. One off	TEC PM and Biosecurity Tuvalu
Laydown area	Laydown and stockpile areas established on sites approved by TEC	Laydown Sites	Sites submitted to TEC for approval	Prior to commencement of civil works. One off.	TEC Safeguard Specialist
	Hazardous substances storage area and management systems in place and compliant with ESMP	Laydown Sites	Inspection at laydown site prior to approval	Prior to commencement of works. One off.	TEC PM
	Water catchment and storage systems	Laydown	Inspection at laydown site prior to	Prior to commencement	TEC PM

	in place	Sites	approval	of works. One off.	
Community Relations	TEC and Contractor consultations have been held with communities and sporting association	Funafuti	Minutes of consultations	Prior to commencement of works	TEC Safeguard Specialist
General Civil Works and Construction Phase					
Hazardous substances and storage	Substances stored in self bunded vessels or within bund on impermeable surface	All project sites	Supervision inspection	Weekly	TEC PM
	Spill kit complete and accessible	Hazardous substances storage and maintenance areas	Supervision Inspection	Weekly	TEC PM
	Spill refresher training completed	n/a	Training records	Monthly	TEC PM
	No evidence of spills on the ground	All project sites	Supervision Inspection	Weekly	TEC PM
Occupational Health and Safety	Workers have access to, and using, appropriate PPE	All project sites	Supervision Inspection	Daily	TEC PM
	All workers have undergone appropriate OHS training	n/a	Submission of training records	When new staff are recruited	TEC PM
Laydown Area	Laydown areas dust levels managed efficiently	Laydown areas	Supervision Inspection	Weekly	TEC PM
	Water supply is adequate	Laydown areas	Supervision Inspection	Weekly	TEC PM
	Waste water and surface water run off management systems operating correctly	Laydown areas and excavated areas	Supervision Inspection	Weekly	TEC PM

	Concrete production taking place correctly and in designated banded areas	Concrete batching site	Supervision Inspection	Weekly	TEC PM
	Stockpiles of sand, aggregates or excavated materials are placed in designated areas and banded	Laydown sites	Supervision Inspection	Weekly	TEC PM
Erosion and Sedimentation	Trenching areas are revegetated once infilled.	Trenching Route	Supervision Inspection	Weekly	TEC PM
	No stabilizing vegetation removed at shoreline of Site 2	Site 2	Supervision Inspection	Weekly	TEC PM
Haulage	Traffic Management Plan correctly implemented	Haulage route	Supervision Inspection	Daily for duration of haulage	TEC PM
	No community complaints	Haulage route	GRM Database	Daily for duration of haulage	TEC PM
Community Relations	GRM is maintained and complaints are resolved	All project site	GRM Database	Weekly	TEC PM
	Signage at solar array site provide information on GRM and contact information	Solar array site	Supervision Inspection	Weekly	TEC PM
Waste Management	SWMP is being correctly implemented	All project sites	Supervision Inspection	Weekly	TEC PM
	Bins are well signed, and sites are free from loose waste	All project sites	Supervision Inspection	Weekly	TEC PM

	Hazardous waste is stored in designated covered bunded area	Laydown areas	Supervision Inspection	Weekly	TEC PM
Operational Phase					
Solid and hazardous waste	SWMP relating to disposal of spent batteries or redundant solar panels will be incorporated into TEC O&M procedure	n/a	Process incorporated into O&M Manual	Prior to finalization of O&M Manual	TEC PM
	Hazardous waste collected and stored in covered bunded are	TEC Compound	Visual Inspection	As items are decommissioned.	TEC PM
	Hazardous waste transported offshore for disposal in licensed facility	n/a	WMD approved export paperwork	Prior to shipment	TEC PM

7 Consultations

The Consultation Plan and guidelines are designed to ensure that the project contributes to sustainable development, that individuals and environment are not harmed by any project activity, and that if there are adverse impacts, they are identified, avoided, minimised and mitigated to the maximum possible extent. Essential to this process is the informed participation in consultations of all stakeholders, especially the potential beneficiaries and any affected persons. Consultation is planned to be open, accessible and inclusive so that all sectors of the community can contribute to project planning, participate in benefits, and contribute if they wish to monitoring outcomes³.

7.1 Communication Plan

Communication and consultation are essential throughout the implementation of the solar array design and installation. The aim is to ensure that the general public and in particular those directly or indirectly affected are well informed, that the project is implemented responsibly, take account of social or environmental issues, and enjoy broad public understanding and acceptability.

The plan below outlines the actions needed to keep stakeholders informed of progress and to obtain feedback throughout the implementation of the ESMP.

Table 2: Consultation and Communication Plan during ESMP Implementation

Stakeholder	Content	Participants	Method and Responsibility	Timing	Outcome
Sporting organisations	Details of the project design and opportunities for multi-purpose benefits from design of solar array frames. Environmental and social risk identification and management;	Ministry of Education, Sports and Culture. Tuvalu National Football Association Tuvalu Athletics Association Tuvalu Association of Sports and Olympic Committee	Targeted consultation meetings; one on one meetings; participation in public consultations.	Prior to finalization of solar array site design.	Array design which is integrated with the needs of the stadium users to provide multi-benefits. Minimal impact on sporting events and activities during the construction phase.
Civil Society Organisations	Environmental and social risk identification and management	Tuvalu National Private Sector Organisation; Tuvalu Association of Non-Governmental Agencies and /or individual members as appropriate	Participation in public consultations; participation in implementation and monitoring of Frameworks/ Plans as appropriate	Prior to commencement of works	Relevant expertise captured; independence in administration and monitoring of safeguards

³ The consultation guidelines are consistent with the Gender Action Plan.

Stakeholder	Content	Participants	Method and Responsibility	Timing	Outcome
Communities that may be affected by civil works ⁴	Details of project benefits and impacts in the area; how and where to consult them and comment.	Men, women, youth, occupational groups in communities in impact areas	TEC to arrange consultations with a group of local leaders (Kaupule, other respected persons in the community, e.g. teacher, health officer, Ulu Alik, relevant NGO representatives) followed by public meeting in the local Meeting Hall with men, women, youth and occupational groups as appropriate; copies of the PIB; Goal is for women to make up at least 40% of the people participating in consultation. Consultation must be scheduled to enable working people, women and youth to attend. Consultations to be carried out with specific regard to the selection of site 2 as a project site due to recreational use of that site.	Prior to finalisation of design, during implementation of safeguards measures and civil works	Community can give informed comment on design options. Broad community support is obtained. Any potentially affected person knows where they can lodge comments and seek redress for any involuntary personal loss, or for damage to the environment. Mitigation/compensation measures are implemented
General public	Project Information Bulletins informing about the project, likely benefits and impacts, safeguards instruments, how and where to consult them and comment Project progress and public safety notifications; success stories, lessons learned	All members of the public at their option	TEC to release Project Information Bulletins (PIB) to local radio and press to provide information on the conduct and results of the project	2 x during construction phase	General public is aware of project; public acceptability and cooperation improved; complaints mechanism is known General public is informed; project and process enjoy public acceptability; successes celebrated

⁴ Persons affected by involuntary impacts on land or livelihoods will also be engaged in consultation of resettlement measures under the RPF or subsequent Plan

7.2 Consultation Guidelines

The mode of consultation will vary according to the participants, but in all cases will promote participation by ensuring that the venue is accessible, the timing convenient and the manner of conduct of the consultation socially and culturally appropriate. Consultations will be announced to give sufficient notice for participants to prepare.

Public consultations will take account of the levels of education of participants, gender sensitivities with regards to consultations, be in the local language, and will avoid technical and bureaucratic jargon. All sectors of the public should be invited and encouraged to contribute. To get maximum input from women, their meetings should be held separately from men's meetings. The project goal is for women to make up at least 40% of the people consulted. Facilitators of meetings should engage with these participants at the conclusion of public meetings to ensure that their opinions on discussions and decisions are recorded if they have not spoken up out of respect for custom and seniority. Occupational groups such as farmers or fishers who may also have particular energy needs should be specifically invited to participate and contribute.

Separate meetings may be required to accommodate working people, women and others that may not be able to attend public meetings.

The Project requires at least one public consultation prior to the finalisation of the design process and the results of the consultation require documentation to be appended to the ESMP.

TEC is responsible for organizing, conducting and documenting public consultations.

The stakeholders, methods of communication, and timing are provided in the Consultation Plan in Section 7.1.

Following consultation, provide documentation of the following:

- Manner in which notification of the consultation was announced: media(s) used, date(s), description or copy of the announcement
- Date(s) consultation(s) was (were) held
- Location(s) consultation(s) was (were) held
- Measures taken to ensure participation of vulnerable groups/women
- Materials presented at consultations, e.g. information bulletins, maps, plans, photographs
- Who was invited and who attended: Name, gender, Organization or Occupation, Telephone/ e-mail /address (home and/or office)
- Meeting Program/Schedule
- Summary Meeting Minutes (Comments by gender, Questions by gender and Response by Presenters by gender)
- List of decisions reached, and any actions agreed upon with schedules and deadlines and responsibilities.
- How the project was amended to take into account the issues raised during the consultation.

The documentation will be included as an Appendix to this ESMP.

7.3 Grievance Redress Management

The complaints process relates to any work covered by this ESMP. All feedback on projects is welcomed by TEC. TEC will operate the following complaints process:

The complaints process will offer remedies appropriate to the scale of the grievance.

All complaints will be recorded by the TEC Project Manager, including details of the complaint (what, when, date(s), time(s) of day, gender, other observations), contact details of complainant, remedy/remedies, and date of close out.

Complaints or feedback that can be resolved by contractors or TEC operational staff during normal working operations will be undertaken immediately. The complaint will be recorded, along with the resolution.

Other project-related complaints that cannot be resolved immediately, or by contractors or TEC operational staff, will in the first instance be notified to the ESDP PIU Safeguard Specialist for mediation within a specified short time, preferably not more than ten working days. The project's Safeguards Officers will endeavour to arrange mediation hearings in open forum close to the place of residence of the affected person(s) or affected group. The complainant will be entitled to independent representation by a mediator of their choice and will be encouraged to be accompanied by supporters during the process. TEC will ensure that such negotiations are transparent.

If mediation is unsuccessful, or if the matter is substantive, affected parties can file written or verbal grievances at the High Court. The availability of redress, and information about how to access it, will be publicly disclosed in the Project Information Bulletins for the media, and during consultations with the public.

8 Institutional Arrangements

TEC is responsible for the preparation and supervision of the ESMP for the design and installation phase, including commissioning. The Contractor is responsible for the implementation of the ESMP and the preparation of specific implementation plans during these phases. TEC is responsible for implementation of the ESMP during the operational phase of the solar arrays.

TEC is responsible for preparing any PEAR/EMP and applying for any development consents required under the Environment Protection Act 2008 and the 2014 EIA Regulations. TEC will monitor the Contractors implementation of the ESMP.

8.1 Roles and Responsibilities

8.1.1 Safeguards Specialist and Project Implementation Unit under TEC

The ESDP PIU Safeguards Specialist will, in relation to this ESMP:

- Provide support to the PIU regarding instances of Contractor non-compliance and GRM responses
- Review the Implementation Plans prepared by the Contractor and clearing them prior to work starting.
- Updating the ESMP as necessary to reflect project changes. This includes the SWMP, Codes of Practice and Mitigation Tables.
- Complete application for all PEAR/EMP approvals and permits.
- Supporting PIU to enable effective citizen engagement into the project and provide meaningful input and direction into community consultations for projects
- Liaise with World Bank safeguards specialists for clearance of the ESMP and any updates.

To enable the implementation of this ESMP, the TEC Project Manager will be responsible for:

- Overall project coordination and technical guidance.
- Ensuring weekly inspections of project works are undertaken by TEC engineers as per the ESMP monitoring plan
- Maintain the GRM and seek input from the Safeguard Specialist on complaint resolution where necessary
- Facilitate community consultations with the Contractor with support from the ESDP Safeguard Specialist
- Support the Contractor to implement the ESMP and subplans such as the TMP and SWMP

To enable the implementation of this ESMP, the ESDP Project Manager will be responsible for:

- Overall project coordination and technical guidance.
- Undertake weekly inspections of project works as per the ESMP monitoring plan
- Maintain the GRM and seek input from the Safeguard Specialist on complaint resolution where necessary
- Facilitate community consultations with the Contractor
- Support the Contractor to implement their SWMP

8.1.2 Contractors

It is the Contractors responsibility to:

- Prepare and have cleared by the ESDP Safeguard Specialist any implementation plans required for the contract under this ESMP:

- Health and Safety Plan
- Waste Management Plan
- Traffic Management Plan
- Worker Code of Conduct
- Carry out contracted works in accordance with this ESMP and any required implementation plans
- Conduct daily and weekly safeguard inspections to ensure compliance with this ESMP and report the results to the contracts supervising body
- Provide meaningful input to any consultations required for the project
- Report all environmental and OHS incidents to the PIU for any action
- Respond to any reports of non-compliance within the directed timeframe

8.2 Monitoring, Evaluation and Reporting

TEC will supervise the ESMP to ensure:

1. All parties are trained in, and familiar with, the ESMP and GRM.
3. That the ESMP is being used and are complied with.
4. New risks and issues are being identified and the ESMP updated if necessary.
5. Environmental or social incidents are reported and resolved.
6. All complaints are recorded and addressed in accordance with the Complaints process.

TEC is to report to the World Bank through the project reports prepared as part of the Grant Agreement. Items to report are key actions carried out and incidents that occurred from the lists above. The World Bank is responsible for monitoring the performance of TEC with respect to the implementation of the ESMP, and working with TEC to remedy any shortcomings, under the project agreement.

9 Institutional Strengthening

9.1 Training

The Contractor will provide a maintenance schedule and include it in the system manual. Relevant maintenance staff are to be trained to properly perform the required maintenance tasks. Contractor led TEC staff training will be included throughout the installation and commissioning of the systems and incorporate comprehensive on-the-job training. In addition to on the job training, a formal training (minimum 5 days) will be undertaken with a completed O&M Manual as the training material so as to familiarize staff with location of supporting material. The formal training will be site-based troubleshooting of common faults in the system. The formal training plan is to be provided prior to the start of construction.

The PIU Safeguards Specialist shall provide training to the PIU Project Team and Contractors Project team after mobilisation but prior to commencement of works. The training shall take the form of a one-day workshop and will have the following objectives:

- Capacity building for TEC Project Manager to ensure they are equipped to carry out their responsibilities;
- World Bank Safeguard Standards;
- Key impacts and mitigation measures;
- GRM Management;
- How to monitor the ESMP for compliance.

9.2 Budget

The following is an approximate budget for implementing the EMSP, based on the tables in Section 5. These items are over and above those considered to be covered by normal operations.

Table 8: Indicative Budget for ESMP Implementation

Budget Item	Detail	Cost Estimate (AUD)
Stakeholder consultations	Catering, venue hire, media, materials, travel and accommodation, translation and interpretation services, etc.	10,000
Institutional Training	Venue, stationery, refreshments, training materials, travel and per diem for consultant	10,000
HIV/GBV Training	Costs of training by local organisations	5,000
	Estimated Total Budget	25,000

10 Appendix A: Workers Code of Conduct

Implementing ESHS and OHS Standards

Preventing Gender Based Violence

I, _____, acknowledge that adhering to environmental, social, health and safety (ESHS) standards, following the project’s occupational health and safety (OHS) requirements, and preventing Gender Based Violence (GBV) is important.

The Company considers that failure to follow ESHS and OHS standards, or to partake in activities constituting GBV—be it on the work site, the work site surroundings, at workers’ camps, or the surrounding communities—constitute acts of gross misconduct and are therefore grounds for sanctions, penalties or potential termination of employment. Prosecution by the Police of those who commit GBV may be pursued if appropriate.

I agree that while working on the project I will:

- Consent to Police background check.
- Attend and actively partake in training courses related to ESHS, OHS, and GBV as requested by my employer.
- Will wear my personal protective equipment (PPE) at all times when at the work site or engaged in project related activities.
- Take all practical steps to implement the environmental and social management plan (ESMP).
- Implement the OHS Management Plan.
- Adhere to a zero-alcohol policy during work activities, and refrain from the use of narcotics or other substances which can impair faculties at all times.
- Treat women, children (persons under the age of 18), and men with respect regardless of race, color, language, religion, political or other opinion, national, ethnic or social origin, property, disability, birth or other status.
- Not use language or behavior towards women, children or men that is inappropriate, harassing, abusive, sexually provocative, demeaning or culturally inappropriate.
- Not sexually exploit or abuse project beneficiaries and members of the surrounding communities.
- Not engage in sexual harassment of work personnel and staff—for instance, making unwelcome sexual advances, requests for sexual favors, and other verbal or physical conduct of a sexual nature is prohibited. E.g. looking somebody up and down; kissing, howling or smacking sounds; hanging around somebody; whistling and catcalls; in some instances, giving personal gifts.
- Not engage in sexual favors—for instance, making promises of favorable treatment (e.g. promotion), threats of unfavorable treatment (e.g. loss of job) or payments in kind or in cash, dependent on sexual acts—or other forms of humiliating, degrading or exploitative behavior.
- Not use prostitution in any form at any time.
- Not participate in sexual contact or activity with children under the age of 18—including grooming, or contact through digital media. Mistaken belief regarding the age of a child is not a defense. Consent from the child is also not a defense or excuse.

- Unless there is the full consent⁵ by all parties involved, I will not have sexual interactions with members of the surrounding communities. This includes relationships involving the withholding or promise of actual provision of benefit (monetary or non-monetary) to community members in exchange for sex (including prostitution). Such sexual activity is considered “non-consensual” within the scope of this Code.
- Consider reporting through the GRM or to my manager any suspected or actual GBV by a fellow worker, whether employed by my company or not, or any breaches of this Code of Conduct.

With regard to children under the age of 18:

- Bring to the attention of my manager the presence of any children on the construction site or engaged in hazardous activities.
- Wherever possible, ensure that another adult is present when working in the proximity of children.
- Not invite unaccompanied children unrelated to my family into my home, unless they are at immediate risk of injury or in physical danger.
- Not use any computers, mobile phones, video and digital cameras or any other medium to exploit or harass children or to access child pornography (see also “Use of children's images for work related purposes” below).
- Refrain from physical punishment or discipline of children.
- Refrain from hiring children for domestic or other labor below the minimum age of 14 unless national law specifies a higher age, or which places them at significant risk of injury.
- Comply with all relevant local legislation, including labor laws in relation to child labor and World Bank’s safeguard policies on child labor and minimum age.
- Take appropriate caution when photographing or filming children (See Annex 2 for details).

Use of children's images for work related purposes

When photographing or filming a child for work related purposes, I must:

- Before photographing or filming a child, assess and endeavor to comply with local traditions or restrictions for reproducing personal images.
- Before photographing or filming a child, obtain informed consent from the child and a parent or guardian of the child. As part of this I must explain how the photograph or film will be used.
- Ensure photographs, films, videos and DVDs present children in a dignified and respectful manner and not in a vulnerable or submissive manner. Children should be adequately clothed and not in poses that could be seen as sexually suggestive.
- Ensure images are honest representations of the context and the facts.
- Ensure file labels do not reveal identifying information about a child when sending images electronically.

Sanctions

I understand that if I breach this Individual Code of Conduct, my employer will take disciplinary action which could include:

⁵ **Consent** is defined as the informed choice underlying an individual’s free and voluntary intention, acceptance or agreement to do something. No consent can be found when such acceptance or agreement is obtained using threats, force or other forms of coercion, abduction, fraud, deception, or misrepresentation. In accordance with the United Nations Convention on the Rights of the Child, the World Bank considers that consent cannot be given by children under the age of 18, even if national legislation of the country into which the Code of Conduct is introduced has a lower age. Mistaken belief regarding the age of the child and consent from the child is not a defense.

1. Informal warning.
2. Formal warning.
3. Additional Training.
4. Loss of up to one week’s salary.
5. Suspension of employment (without payment of salary), for a minimum period of 1 month up to a maximum of 6 months.
6. Termination of employment.
7. Report to the Police if warranted.

I understand that it is my responsibility to ensure that the environmental, social, health and safety standards are met. That I will adhere to the occupational health and safety management plan. That I will avoid actions or behaviors that could be construed as GBV. Any such actions will be a breach this Individual Code of Conduct. I do hereby acknowledge that I have read the foregoing Individual Code of Conduct, do agree to comply with the standards contained therein and understand my roles and responsibilities to prevent and respond to ESHS, OHS, GBV issues. I understand that any action inconsistent with this Individual Code of Conduct or failure to act mandated by this Individual Code of Conduct may result in disciplinary action and may affect my ongoing employment.

Signature: _____

Printed Name: _____

Title: _____

Date: _____

11 Appendix B: Solid Waste Management Plan Requirements

Solid Waste Management Principles

At all times, the Contractor is responsible for the safe and sound storage and recycling or disposal of all solid waste.

Minimize the production of waste:

- Avoid over-ordering of materials imported to Tuvalu (don't over-specify);
- Prefabricate parts (such as frames) off-shore and transport to Tuvalu ready to install;
- Train staff to reduce mistakes and wastage of materials;
- Find local uses for left over materials;
- Select materials that are easily reused or recycled at the end of their life.

All workers to use Contractor installed or public toilets.

Store waste safely and securely on site. Separate hazardous waste, green waste, recycling, etc. Identify and demarcate storage areas clearly indicating the specific materials that can be stored in each.

Solid waste includes;

- Inorganic non-recyclable waste = waste that cannot decompose / break down easily and which cannot be recycled
- Hazardous waste, examples such as asbestos, waste oil etc.
- Recyclable waste = waste that can be recycled, i.e. plastics, metals, timber, paper.

Except for small quantities of general office waste, all solid waste that cannot be reused locally is to be removed from Tuvalu for safe recycling or disposal in another country with suitable facilities; preferably to New Zealand or Fiji.

Hazardous wastes such as used oil, batteries, etc. must be stored safely and securely and removed from Tuvalu prior to the end of the construction period. The export of hazardous waste must be in compliance with the Waigani Convention and any relevant laws enacted by Tuvalu and the recipient country. The removal of hazardous waste will be managed in consultation with the WMD.

Permissions in the form of official documentation must be received for receipt of waste from Tuvalu into another country.

Green (organic) waste (i.e. waste that will decay / break down in a reasonable amount of time, such as plant waste and food waste) maybe left on the island, in designated dumping or composting areas. Land owners and occupiers should have access to any tree trimmings and other materials that may be of use for firewood or other purposes.

Natural or engineered aggregates (such as concrete or paving) that are suitable for reuse shall be stored safely on land in a manner that does not contribute silt or sediments to the marine environment. Natural or engineered aggregates that are not reusable shall be removed from Tuvalu as solid waste (see above).

No waste is to be left on site after the work is completed.

Solid Waste Management Plan Content:

1. Waste streams: identify which waste streams are likely to be generated and estimate the approximate amounts of materials

Undertake inventory of materials that can be reused, recycled or recovered from the project:

- Specific types of materials: a full list of options is provided in the assessment table below
- Amount of material expected
- Possible contamination by hazardous materials like asbestos or lead: these materials will limit reuse/recycling options and require special disposal.

Waste and/or Recyclable Materials		Destination		
		Reuse and recycling		Disposal
Possible Materials Generated (Add or Delete as necessary)	Estimated Volume (m3) or Area (m2) or weight (t)	On-site (How will materials be reused and/or recycled on site)	Off-site (Specify the proposed destination and/or recycling facility)	Specify the off-island disposal site and the process for collection, storage and eventual disposal
Timber (specify type)				
Wood waste (e.g. MDF, plywood)				
Cardboard				
Ferrous materials (e.g. iron, steel)				
Nonferrous materials (e.g. copper wiring)				
Concrete				
Roofing tiles				
Ceramic tiles				
Gravel				
Gypsum board (e.g. drywall)				
Plaster				
Plumbing fixtures and fittings				

Carpet and underlay				
Stone				
Asphalt				
Glass				
Sand/fill				
Topsoil				
Green waste				
Asbestos				
Fluorescent light bulbs				
Hydrocarbons and fuel				
Damaged solar panels				
Batteries				
Plastics				
PVC				
Co-mingled recyclables (e.g. paper, cans, glass and plastic bottles, carboard, etc)				
General waste (e.g. food waste, contaminated food packaging, non- recyclable plastics)				
Mixed waste				

2. Collection ,Storage and Disposal: How and where will the difference waste streams be collected and stored prior to their disposal locally or offshore. Detail the types of containers to be used and the storage areas that will be created for this waste. Differentiate between regular, bulk and hazardous waste. This must be compliant with the minimum standards detailed in the ESMP and with the Solid Waste Management Principles above.
3. On-site: understand how the waste management system (housekeeping, sorting and storage) will work on-site, including bin placement and access.

Determine storage requirements (separate bins or co-mingled), things to consider include:

- Ease of use: ensure that containers are easily accessible by workers and that storage areas are clearly sign posted

- Safety: ensure that the containers and storage can be managed safely, including limiting public access to the storage areas
 - Hazardous waste materials storage
 - Aesthetics: ensure that the project sites and storage area appears orderly and will not raise concern from local residents or businesses – for example screening for dust and litter containment and daily collection of windblown material
 - Establish a collection/delivery plan in collaboration with waste contractors for waste and recyclable materials generated on-site.
4. Clearly assign and communicate responsibilities.
 5. Monitor: to ensure the plan is being implemented, monitor on-site as per the ESMP monitoring plan.