

Manah-II Solar PV IPP Sultanate of Oman

Environmental & Social Impact

Assessment:

Volume 1 – Non-Technical Summary



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1 INTRODUCTION

As part of its 2040 Strategy for economic diversification, the Sultanate of Oman has been successfully restructuring and developing private sector involvement in the electricity and water sectors to enhance the delivery of these services across the nation. As a part of this initiative, the Oman Power and Water Procurement Company SAOC (“OPWP”) has awarded the development of the Manah II Solar Photovoltaic (PV) Independent Power Project (IPP) (“the Project”) to a joint venture between Sembcorp Utilities and Jinko Power Technology. The joint venture has since established a special purpose vehicle project company called ‘Sembcorp Jinko Shine SAOC’ (“Sembcorp” or “SJSS”).

SJSS has commissioned 5 Capitals Environmental & Management Consultancy (5 Capitals) alongside Yahya Engineering (YE) to undertake the Environmental & Social Impact Assessment (ESIA) for the Project, for the purpose of attaining the regulatory environmental permit from the Environment Authority (EA) of Oman, with a dual purpose of satisfying the prospective project lenders to enable project financing.

To date, an Environmental Scoping Report (ESR) has been prepared and was submitted by YE to the EA. The ESR received an in principle non-objection letter from the EA and hence this ESIA report has been prepared based on the stated terms of reference in the ESR.

This document presents the ESIA – ‘Non-Technical Summary’ for the proposed Manah II Solar PV IPP Project.

1.1 Objective of the ESIA

The objectives of this ESIA in relation to the project include the following:

- To provide an overview of the Project design, identification of sensitive receptors in the Project’s area of influence and assessment of Project alternatives;
- To assess baseline conditions prior to the development of the Project through review of available data and conducting surveys;
- To assess the project’s environmental & social impacts for the construction and operational phases;
- To review applicable project compliance obligations, including applicable Omani regulations and those requirements of the prospective international lenders;
- To engage with key stakeholders and project affected people to disclose certain Project information, study outcomes, gain lay knowledge about the local environmental & social context, seek feedback on proposal and to understand & map any resettlement requirements;

- To determine applicable mitigation and management measures including monitoring requirements to be implemented in order to avoid or minimise potential impacts and maximise potential environmental and social gains; and
- To consider reasonable and feasible alternatives that could be used by the Project to reduce impacts and/or seek greater environmental & social gains.

1.2 Structure of the ESIA

This ESIA has been prepared following a good practice methodology developed by 5 Capitals and used on other Solar PV projects in the region. The structure of this ESIA is presented as follows:

- **Volume 1:** Non-Technical Summary
- **Volume 2:** ESIA Main Text, Tables and Figures
- **Volume 3:** Framework for Environmental and Social Management
- **Volume 4:** Appendices

1.3 Related Project Environmental & Social Documents

Other Environmental & Social (E&S) documentation prepared for the Project at this stage includes:

- Stakeholder Engagement Plan (SEP);
 - Including an internal and a third-party grievance mechanism.
- E&S Policy;
- ESMS Manual;
- Construction Environmental & Social Management Plan (CESMP); and
- Operational Environmental & Social Management Plan (OESMP).

As documents for implementation during the construction and operational phases, these documents have been prepared separate to the ESIA.

1.4 Key Project Information

Table 1-1 Key Project Information

PROJECT TITLE	Manah II Solar PV IPP
PROJECT PROPONENT	The Oman Power and Water Procurement Company SAOC ("OPWP")
THE CLIENT	Sembcorp Jinko Shine SAOC (an Oman registered entity formed by Sembcorp Utilities and Jinko Power Technology)
PROJECT COMPANY	Sembcorp Jinko Shine SAOC ("SJSS")
EPC CONTRACTOR	China Energy Engineering Group Shanxi Electric Power Engineering SPC ("SEPEC"), an Oman registered subsidiary of China Energy Engineering Group Shanxi Electric Power Engineering Co. Limited
O&M COMPANY	To Be Confirmed <i>(Note: the EPC Contractor will be responsible for undertaking the first two years of O&M. Subsequently, the Project Company may take over operations – to be confirmed)</i>
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1.5 Project Timeline

Table 1-2 Anticipated Project Timeline

MILESTONE	SCHEDULED DATE
Limited Notice to Proceed (NTP)	23 May 2023 (Completed)
Expected Construction Start Date / Notice to Proceed	18 September 2023
Plant	
Initial Commercial Operation Date (ICOD) (100% generation capacity)	01 October 2024
Expected Commercial Operation Date (COD)	01 May 2025

2 PROJECT OVERVIEW

2.1 Project Location

The Manah II Solar PV IPP Project is located in the Al Dakhiliyah Governorate in the Sultanate of Oman, approximately 130 km south-west of Muscat. The solar PV field covers an area of approximately 680 hectares. The national context of the Project is shown in the following figure. The nearest populated area is the town of Manah, located approximately 20 km to the east.

An unpaved ancillary road, which is used by the Ministry of Defence (MOD) and the local community, passes through the proposed project area. As a result, the project will require the realignment of this ancillary road, which extends for approximately 6 km. The realigned ancillary road ("Ancillary Road") to be constructed will be named as 'MOD 1 to MOD 5' in this report.

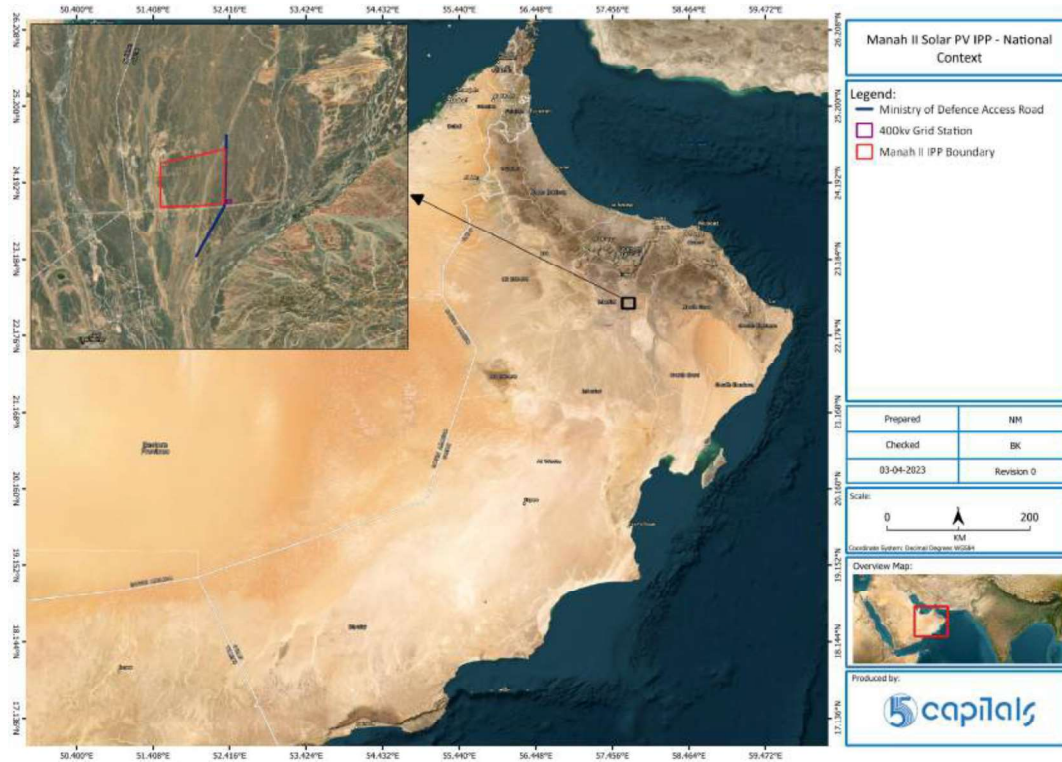


Figure 2-1 Location of the Project – National Context

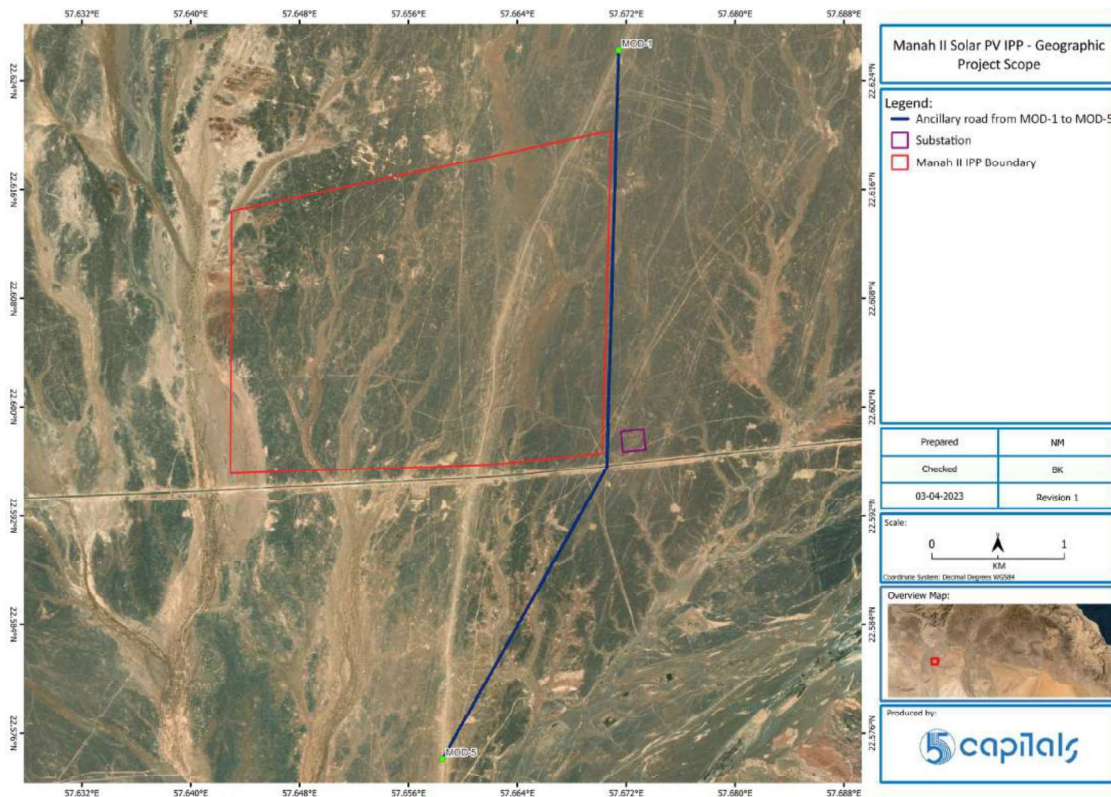


Figure 2-2 Proposed Project Site Layout (Red Polygon) and New Ancillary Road Alignment (Blue Line)

2.2 Land Ownership

The Ministry of Housing and Urban Planning (MHUP) owns the proposed site for the solar PV field and MOD 1 to MOD 5 roads, which was previously owned by the Ministry of Energy and Minerals. The MHUP has granted Sembcorp Jinko Shine SAOC a 25-year (extendable for another 25-years) Usufruct Agreement for the project development.

2.3 Project Summary

The Project will be developed as an Independent Power Project (IPP) utilizing photovoltaic technology to generate electricity. The scope of the Project works includes the development, design, engineering, construction, commissioning, financing, operations and maintenance of the Manah II Solar PV Plant.

The proposed Project will utilize bifacial dual glass type Solar PV Panels that generate energy from both top and rear sides. The PV will comprise of PV cells within modules arranged in arrays upon single axis tracking system/ mounting structures. The PV modules will be designed and

arranged to ensure the most efficient alignment for the capture of solar radiation. Mounting structures will be established within shallow foundations set into the underlying soils.

The PV for the Project will make use of slightly more than 1 million modules, almost 500 inverters and 60+ transformers of the different capacity in order to generate a maximum of 500MWac into the grid.

In addition, other key items will include cables and accessories, lighting system, lightning protection and earthing system, SCADA system, metering system, CCTV, fire protection system, weather station, foundation system & support pillars, 33kV switchgear cabinet (in Manah II substation), PV module cleaning system, and 400kV Grid Station.

The Project scope includes the Ancillary Road (realigned to MOD1-5), designed and planned in accordance with local requirements and the most recent standards and norms. The Ancillary Road's approximate length is 6km.

2.3.1 Construction

Construction will be the responsibility of the EPC Contractor, with the Project primarily being constructed in three stages for the separate solar fields. All temporary construction working areas, laydown areas and project offices will be located within the Project footprint.

The EPC Contractor will engage several Sub-Contractors and there will be a peak workforce of approximately 700-900 workers.

The location of the Manah II accommodation camp has not yet been finalised by the EPC Contractor.

2.3.2 Operations

The EPC Contractor will be responsible for undertaking the first two years of Operations & Maintenance (O&M). Subsequently, the Project Company may take over operation. This potential transition will be confirmed at a later stage.

Day-to-day project operations will include general planned and unplanned maintenance activities, panel cleaning (using dry cleaning) and control room operations. There will be ancillary facilities and services related to electrical dispatch, operations & maintenance, administration, worker welfare and security amongst others.

2.4 Project Associated Facilities

Associated facilities are those which are not funded by Project Lenders as part of the Project, but without which (or without their expansion) the Project would not be viable.

Separate to the project, a 400kV substation is being developed by the responsible institutions adjacent to the Project site.

3 OVERVIEW OF ENVIRONMENT & SOCIAL CONTEXT

3.1 Site Surveys

The process of undertaking the ESIA included several visits to the Project site to conduct familiarisation and baseline surveys. These included:

Table 3-1 Environmental and Social Baseline Surveys

SITE SURVEYS	PERIOD
Landscape Survey	April 2, 2023
Terrestrial Ecology Survey & Track Cameras	29 – 31 May, 2023
Noise Monitoring Survey	30 - 31 May and 14 – 15 June 2023
Ambient Air Quality Monitoring	May 25 – June 1, 2023
Soil Sampling	May 30, 2023
Socio Economic Survey & Household Surveys	30 - 31May, 2023
Site visit for Archaeological	April 2 and 24, 2023

3.2 Site Condition and Land Use

The site condition is undeveloped and in greenfield. The topography of the Project site is predominantly flat with gravel plains and some evidence of runoff water flows/collection has been observed found in some parts of the project areas. The gravel plains were noted to lack vegetation and the gravels vary in size; from fine gravels in some areas to medium/large size gravel in other areas. The lower-lying areas were observed to be sandy and are typically in drainage or wadi area. Such areas were noted to have more abundant vegetation.

During site visits conducted in April, May and June 2023, certain features were observed on or close to the site and included an old meteorological station (fenced), wadis, road sign boards (from Ministries), MOD 1-5 Ancillary Road within and near the project boundary, trees above two or three-meter heights were observed. No permanent or temporary settlements were observed within the Project site.

During the site visits, a small number of camels and goats were observed to be traversing the project site and the surrounding area. In addition, numerous camel and goat droppings were observed in close proximity to the trees and bushes during the biodiversity survey.

Besides what has been outlined above, there does not appear to be other specific or dedicated uses on-going at the site, besides that for camel herding that may have occurred. For instance, there is no evidence of other development, industry or commerce, in what is a relatively natural landscape.

3.3 Local Receptors

Based on the site observations and review of satellite imagery, there are no human receptors e.g., farm, settlements, or farming community observed within the proposed project site.

Externally, within a 5km radius from the Project site, receptors include mosques, animal farms, herder camps, residential areas, agricultural areas, labour camps, transmission lines, seasonal touristic hotels, abandoned farms/camps, and a grid station.

4 SUMMARY OF MAIN ENVIRONMENTAL IMPACTS

4.1 Air Quality

The Project site is located in a remote desert area of Manah away from primary pollution sources, with no known point sources of pollution locally. In addition, there are no identifiable diffuse emission sources, with limited mobile sources (i.e. emissions from off-road vehicles within the area, and those using the existing ancillary road and paved Jawaher Street). This is reflected in the result obtained during Air Quality monitoring conducted in late May 2023 where all measured parameter was found to be well within the Omani and WHO ambient air quality standards, indicating a non-degraded airshed.

As a solar PV plant there will not be operational air emissions during normal activities. There is the possibility of temporary impacts during the construction phase, primarily related to dust generation and the gaseous emissions from temporary and mobile equipment. Due to the lack of receptors locally, such impacts are not expected to be of key significance and can be managed via good construction practices.

4.2 Noise and Vibration

No major noise sources were identified during the initial site visit. Road traffic noise from adjacent Jawaher Street is considered to be the principal source of noise locally, but is limited. It is noted that Jawaher Street is a surfaced thoroughfare, and its vehicular traffic density is very low, as observed by the presence of approximately five cars over a four-hour period during site visits.

The results of the baseline noise level measurement surveys at all sampling locations were well below the Oman and WHO noise standards.

Temporary noise impacts will result from the construction phase and will primarily be associated with heavy plant/equipment and construction vehicle movements. Key noisy works will largely be during the earthworks phases, for processes including levelling and ground-breaking. These temporary impacts related to construction processes on the site are not expected to be discernible at identified receptors outside of the solar PV Plant due to distance attenuation. Mitigation has been stated in the ESIA (Volume 2) to ensure noise (and vibration) impacts are reduced where possible.

As a solar PV project, there are not expected to be noise impacts during operations.

4.3 Geology, Soils, Surface Water and Groundwater Quality

SOILS

Specific instances of pollution were not identified on-site during site visits, which is consistent with the greenfield nature of the site.

As a precautionary approach, soil samples were collected and analysed for the presence of Oils & Greases, TPH and a suite of heavy metals. Although there are not established soil quality standards in Oman, all parameters were found to be within the benchmark intervention values of the Dutch Standards. This is with the exception of Nickel concentrations, which were found to be higher than the referenced intervention value in all samples. This can likely be attributed to Nickel weathering of ultramafic or nickel laterites and is a characteristic of northern Oman soils.

Minor impacts to soil quality may occur during construction in the event of accidental leaks and spills, or mismanagement of any hazardous materials or wastes (expected in very small quantities). Impacts on groundwater are not expected throughout the construction or operational phases of the Project. All such impacts can be easily avoided and managed via the implementation of good practice working methods, that have been outlined as mitigation and management practices in the ESIA and will be incorporated to the CESMP and OESMP.

SURFACE WATER

There are several wadi branches passing through from the Project layout. Based on satellite imagery it is understood that the wadis mainly seem to flow external to the south-western and north-western extents of the solar PV field. There are also some small Wadi branches passing through from the middle of the project area.

OPWP has already undertaken a flood risk assessment of the Project site, however this will also be undertaken by the EPC Contractor so that it is specific to the detailed design to ensure that flood protection mechanisms are incorporated to the design of the project.

GROUNDWATER

A geotechnical survey was undertaken by OPWP in 2021, which only encountered perched groundwater at certain locations, where pockets of gravel and sand sit on top of impervious material.

4.4 Terrestrial Ecology

The Project site consists of two principal habitat types; (i) Gravely Plains Devoid of Vegetation in the study area; and Wadi Lowlands with sparse vegetation. The habitats can be classified as a combination of "Natural and Modified habitat". The habitats in the wider area outside of the site are similar and are largely greenfield (i.e. undeveloped and unaffected by anthropogenic activity, with a few exceptions).

Critical habitat screening has been undertaken in line with IFC PS6 criteria for critical habitats reveals no triggers for critical habitats such as designated/protected areas, endangered species, unique ecosystems, or other critically threatened habitats within the project site or area of influence. The habitat in the project area does not appear to support migratory species and/or congregatory species nor is the area associated with any known key evolutionary processes. The Project area does not overlap with any legally protected area or any IBA nor it overlaps with any migratory flyways as per the analysis and assessment carried out in the present study.

Primary data was collected by a terrestrial ecology survey including line transects coupled with quadrat method and opportunist counts of flora & fauna. Further four (4) track cameras were established on and around the site to capture fauna. Based on the survey results, the species observed on-site are considered to be common and widely distributed in the region, and the habitat represents a typical regional ecosystem.

Construction work including site preparation, foundations, excavations for below ground infrastructures, trenching and back filling for cables, etc. will result in the direct loss of the existing habitats within the project site. This will include the complete removal of all vegetation within the site. Ground dwelling fauna and smaller invertebrates may be directly impacted by earthworks during construction and will be impacted by removal of flora habitat. The fencing of the perimeter of the site can also result in habitat fragmentation and disturb animals who use the site area as a passage between habitats.

Certain mitigation measures are in place to limit impacts to the site area only during construction.

Further to construction and on the basis of sound E&S management, there are not anticipated to be further impacts to ecology. Due to the fencing of the project and prevention of larger mammals from accessing the site, the site may provide suitable and safe habitat to support small invertebrates, reptiles and certain avifauna species, potentially providing a net benefit for these species due to a lack of predators.

4.5 Landscape and Visual Impacts

It is anticipated that the majority of the landscape and visual impacts are expected to occur during the construction phase. One of the first stages of construction will result in the levelling, grading and preparation of the site. However, given the existing flat nature of the site, grading and levelling activities are not expected to be significant. The proliferation of other activities such as the subsequent construction of small new buildings and installation of PV Panels which will take place steadily over the construction period and across the site will eventually transform the landscape resulting in major land use changes. One significant alteration will be the loss of the characteristic view of brown sands and gravel, replaced by a sight of dark-coloured flat PV panels.

Impacts to the visual envelope of surrounding receptors will also occur at night where the addition of lighting during construction will illuminate working areas. Impacts from lighting are anticipated to be minimised by the implementation of mitigation measures stated in the ESIA.

During the operational phase, due to sun tracking, it is possible that glint and glare may be noticeable to individuals in the vicinity and drivers on the nearby roads.

Where possible certain mitigation and management measures are proposed, however, it is noted that mitigation measures for landscape and visual impacts are limited.

4.6 Solid and Liquid Waste Management

The EPC Contractor has advised that the cut/fill balance will be managed on-site within the working area. As such, there is not expected to be rubble waste for removal off-site.

Construction of the project will likely result in large volumes of recyclable PV module packaging wastes (wooden containers, pallets, cardboard and plastic ties), and very small quantities of hazardous wastes (such as used fuel containers, spent paint cans, lubricant cans and oil cans, vehicle/plant maintenance wastes).

During operations, there will be relatively few waste streams, although defective PV panels and other maintenance wastes may be generated in small quantities on a continued basis. Other wastes will be minimal but may contain small quantities of hazardous components.

Wastewater will be collected in on-site septic tank(s) (construction and operations) for removal off-site by licensed contractors to licensed treatment facilities. The Volume 2: ESIA outlines appropriate mitigation and management measures that can be implemented to suitably manage wastes during both project phases.

4.7 Archaeological and Cultural Heritage

There are around seven forts and castle in Ad'Dakhliyah governorate. Built and Urban Heritage, Traditional/Living Heritage are managed and maintained by the Ministry of Heritage and Tourism (MOHT). All UNESCO World heritage Sites in Oman are not in proximity to the Project area.

Based on the site visits and consultations conducted in April and May 2023, no archaeological or cultural sites of interest were identified within the project boundaries. The ESIA sets requirements for a 'Chance Finds Procedure' to be prepared and implemented during the construction phase of the Project.

4.8 Socio-Economics

The primary economic impact during the construction phase of this project is anticipated to stem from the creation of temporary employment opportunities, primarily for unskilled and suitably skilled workers. A secondary impact is expected to come from spending on both local and foreign goods and services, though the project's specialised requirements suggest that many materials will be sourced internationally, aside from certain construction supplies like concrete and cabling.

The construction period will result in an increase of vehicles entering the Project site. Construction vehicles will include a variety of vehicle classifications, e.g. HGV's, LGV's, trucks, pick-up trucks, excavators and other heavy/light equipment. A Traffic Management Plan will be developed to map out accident and traffic hotspots for project access vehicles.

The Project Company will adhere to relevant local regulations concerning the employment of foreign individuals. Site visits carried out in April and May 2023, coupled with a review of satellite imagery, found no evidence of permanent or temporary settlements within the Project site. Therefore, no impacts are expected concerning land usage, eliminating the need for a resettlement action plan for the Project.

The operational phase will require significantly less staff than construction. Besides management and technical operators, the majority of staff will be security teams, panel cleaners and other office-based support staff. Local recruitment and investment in the local workforce will enhance skills dissemination and provide economic benefits.

4.9 Community Health, Safety and Security

There are few communities or other residential receptors in the proximity of the Project, which are not considered to be in the direct Project area of influence. Given the nature of the Project, associated construction and operational activities and distance from the Project site, the receptors over 1km from the Project site will not be directly affected by the Project and

therefore are not considered 'Affected Communities'. Impacts relating to the local community in terms of air quality, noise, wastewater, waste etc., have been addressed in specific chapters elsewhere in this ESIA.

If there are interactions with the public during the construction phase there are potential risks relating to public safety that could arise, particularly regarding the use of high-powered equipment, heavy construction plant, excavations, transportation amongst others, including fire and pollution releases. Risks to public safety will be appropriately addressed and prepared in the construction phase 'Emergency Preparedness and Response Plan' and training regarding this plan.

The construction phase of the Project will require site-based security at the gates and on patrol around the site to prevent non-authorized parties (including the public) from accessing the construction site. All security provisions will be guided by a security plan prepared based on a security risk assessment.

Processes for a third-party grievance mechanism are outlined in the standalone Stakeholder Engagement Plan (SEP) for public and other stakeholder complaints.

4.10 Labour and Working Conditions

There are not expected to be particular project risks and impacts relating to labour, assuming sound management in line with Oman Labour Law compliance, the ESIA mitigation measures and standard good practices.

During the construction and operational phases, Human Resource policies and procedures will guide labour management to ensure compliance with local labour laws and international ILO conventions. Factors such as occupational health and safety will be managed by applicable management systems, with applicable training, provision of safety equipment and competent staff.

Labour, Health & Safety, on-site working conditions, welfare facilities and off-site camp living conditions for all contractor and sub-contractor staff will be monitored during the construction phase of the project both internally. The relevant Omani standards will be applicable to the quality of the accommodation provided. Workers will have access to an internal grievance mechanism as set out in the SEP.

4.11 Climate Affairs

As a renewable energy project, there will not be operational Greenhouse Gas (GHGs) emissions during the generation of electricity. There will be minimal GHG emissions under abnormal operations (e.g. where emergency diesel generators are required), as well as a limited volume of consumption of liquid fuel by project vehicles and equipment that will result

in an amount GHG emissions. A key benefit of the Project is the resulting lowering of the carbon intensity from grid electricity produced in Oman and progress towards the Oman's obligations to the UNFCCC Paris Agreement.

The construction phase will result in some GHG emissions from on-site temporary equipment and vehicle usage, with minimal reduction in carbon sinks due to the small-scale vegetation removal. The total emissions, taking into account both Scope 1 and 2, as well as embodied carbon emissions (concrete), are estimated to be approximately 10,000 tonnes of CO₂E for the construction phase.

There are not expected to be significant climate physical risks due to the location, although there is a risk that instances of flash flooding (in wadis) and dust storms may increase, or increase in intensity over time. The EPC Contractor will be undertaking a hydrology and flood risk modelling study based on the detailed project design to confirm specific design mitigation against flooding. Dust storms may necessitate additional PV panel cleaning (dry cleaning) and could impact any outdoor workers. Mitigation for outdoor workers will be determined in the specific occupational health & safety management plan.

As a renewable energy project as part of national strategy, there are also not considered to be significant transition risks.

5 ENVIRONMENTAL & SOCIAL MANAGEMENT & MONITORING

Volume 3 of the ESIA provides a 'Framework for Environmental & Social Management', to guide implementation of the wider Environmental and Social Management System (ESMS) following on from the ESIA (Volume 2).

This framework has been informed by the outcomes of the ESIA and has been developed to establish structures for the management of Environmental and Social risks, impacts, opportunities and compliance associated with both the construction and operational phases of the Project. The Framework is intended to outline systematic structures and management programmes that will comprise the respective construction and operational phase Environmental and Social Management Systems (ESMS).

To implement the mitigation and management measures established in the ESIA (Volume 2), specific management programmes will be developed to incorporate these mechanisms, including the requirements of the Oman, other regulators such as Municipality, and the Project Lenders. Such documented information will be in the form of project-specific Construction Environmental and Social Management Plan (CESMP) and Operation Environmental and

Social Management Plan (OESMP) (and complimentary plans/procedures); to be developed before the commencement of construction and operations, respectively.

It should be noted that the Project ESMS documentation will be 'living' and will need to be updated concerning changes in project circumstances, activities, environmental sensitivities and future requirements defined by respective regulatory authorities and Project Lenders.

6 SIGNIFICANCE OF RESIDUAL IMPACTS

Following the implementation of the design-based and additional recommended mitigation measures as identified in the ESIA, residual impacts are primarily assessed to be of negligible or minor significance, with a small number of impacts of moderate significance.