



ESIA Study for 300 MW Solar Power Project at Bikaner District, Rajasthan



March 2023

Submitted to:

serentica

Submitted by:



EPMCind

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**Environmental & Social Impact Assessment Study for 300 MW
Solar Power Project at Jaimalsar Village, Bikaner District, Rajasthan**

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EXECUTIVE SUMMARY

Project Background

Serentica Renewables 4 India Pvt Limited (SRIPL-4) is in the process of developing a 300 MW Solar Power Project located at Jaimalsar village in Bikaner District of Rajasthan State. The coordinate of the site is 28°6'36" N and 73°1'12" E. The nearest city is Bikaner, situated at an aerial distance of 30.17 km (approx.) east, railway station is Nal Halt which is situated at an aerial distance of 19.78km (approx.) south-east, and nearest airport is Civil Airport Bikaner, situated at an aerial distance of approx. 17.78 km (approx.), south-east from the project site.

Approximately 1100 acres of land is estimated to be required for this project. At the time of ESIA study, approximately 500 acres of land has already been leased. The land is privately owned, predominantly open scrub land with few patches of agriculture at Jaimalsar Village. The proposed area for the development of a 300 MW solar plant is moderately plain. Installation of solar panels will be easy and reduce the cost of technical modifications required to adjust for undulations at the ground. Land requirements for transmission lines will be limited to the area required for the foundation of pylons.

Power from the solar photovoltaic plant of 300 MW capacity will be connected to the proposed PSS (located within the site) and to the GSS (Bikaner-2 substation) at a distance of approx. 4.87 km.

Applicable Regulations, Required Permits and Approvals

SRIPL-4 will follow all the legal permissions and procedures and will comply with the obligations mentioned therein for the Solar Project site at Kolayat tehsil for the 300 MW Solar Power Plant.

Environmental Impact Assessment (EIA) Notification 2006 & and subsequent amendments is not applicable for this project. No forest land is involved for the development of this project; thus, Forest Act is also not applicable. **SRIPL-4** shall ensure that no child labour will be engaged at site for construction or operation works either directly or by the sub-contractors. Consent to Establish from Rajasthan Pollution Control Board is not required.

The International Finance Corporation has laid down a set of eight Performance Standards (PS) and project developers need to comply with applicable PS while establishing the project. IFC PS 1, PS 2, PS 3, PS 4 and PS 6 are applicable for this project.

The Equator Principles comprise of a group of ten principles adopted by the Equator Principle Financial Institutions (EPFIs) to ensure that the projects funded by them are developed in a manner that is socially responsible and reflect sound environmental management practices. Compliance to all the 10 principles has been assessed in the ESIA.

Baseline Environment

To understand and assess the environmental, ecological, and social risks associated with the project, baseline data were collected within the study area considering:

- 1) core area covering the project site and it's surrounding up to 500 m and

2) buffer area covering 5 km radius around the project site.

The proposed area for the development of 300 MW solar plant has moderately plain land. Land type is predominantly open scrub land with few patches of agriculture.

The Bikaner district has no major river system except for a few short intermittent and ephemeral channels near Kolayat. A few natural lakes or depressions are observed near Gajner, Kolayat, Nal and Lunkaransar. Indira Gandhi canal is present in the district. During site assessment (conducted during January 2023), no waterbody has been observed at the proposed site and a seasonal water body is observed at SE about 2 Km from the proposed site. The soil type of the district is predominantly light textured, weak structured, sand to sandy loam with clay content. The dunes and associated sandy plains lack evidence of pedogenesis. Arid climate with low rainfall, high temperature and high evaporation losses has resulted in physical and mechanical disintegration of the parent material giving rise to predominance of coarse fraction in the soil. Very little chemical weathering has taken place and the development of soil is mostly indistinct. Soils are generally of desertic type with poor fertility status and very low water retention capacity. The colour of the soil here is pale-brown to yellowish-brown in colour, structureless, very friable and slightly calcareous. The proposed project site is located in seismic zone III as per the seismic zoning map of India (IS 1893–2002). The topography of the project site is an open area which is moderately plain.

The district is situated in the middle of the Thar desert and has a ‘hot desert type’ climate (As per “Köppen climate classification”) with large variations of temperature and scanty rainfall. Hot wind blow in summer, sweeping away and creating new sand dunes. Summers are very hot and dry with scorching sun during the daytime. As per IMD station at Bikaner, (1991-2020) data, the average maximum temperature of the district is 42.2°C and average minimum temperature of the district is 7.7°C. The maximum relative humidity is 72% and minimum relative humidity is 16%. The average annual rainfall (1991-2020) is 285.9 mm.

Baseline environmental monitoring for ambient air quality, ambient noise level and water quality have been carried out at project study area (from 04/01/2023 to 05/01/2023) as per the applicable standard methods & analysis.

Ambient Air Quality Monitoring has been carried out at 2 locations (viz. plant site and village Jaimalsar). The monitoring results are observed well within the permissible limit of National Ambient Air Quality (NAAQ) Standards.

Ambient noise level monitoring has been carried out at 2 locations (viz. plant site and village Jaimalsar). The ambient noise levels at Project site (NL1) both during the day & night time are found to be within permissible limits of CPCB as compared to the industrial area standard. The ambient noise levels at village Jaimalsar (NL2) both during the day & night time are found borderline compared with the permissible limits of CPCB as compared to the residential area standard.

Representative samples of ground and surface water have been collected from Jaimalsar village. The nearest canal water sample has been analyzed based on CPCB classification. The pH value of the surface water has been found within normal range (8.07). The DO and BOD levels have been found as 6.3 mg/l and <2.0 mg/l respectively. TDS value have been found as 811 mg/l. The value of Oil and grease has been found a little on the higher side (0.5 mg/l), whereas, as per IS:2296 Class C specification, the maximum permissible limit is 0.1 mg/l. All other parameters are within the specified limit in the sample collected from Indira Gandhi Canal.

Ground water sample have been collected from single location at Jaimalsar village as well and analysed for all essential characteristics and for most of the desirable characteristics specified in IS 10500: 2012. The value of few parameters such as, TDS, total hardness, total alkalinity, calcium, magnesium found to deviate the

‘Acceptable limit’ specified in IS 10500: 2012, which concludes that the ground water is unsafe for drinking purpose.

The proposed project site has 3 protected areas within 100km area. The project site is around 40 km from Diyatra Closed Area, 37 km from Jorbeer Conservation Reserve area, and 17 km from Gajner Wildlife Sanctuary. These conservation reserve hosts a number of migratory as well as resident bird species. The protected areas also nourish important medicinal plants and herbs.

The proposed site is approx. 137.54 km (NE) away from GIB priority area and approx. 660.69m (NE) away from GIB potential area of Rajasthan (Refer Fig 5-5). The predominant habitat of the study area is open scrubland along with agricultural land.

During primary survey 34 bird species belonging to 19 families were identified and recorded from the study area. Among this 34 bird species 18 species were recorded in vantage point survey, 13 species were recorded in point count survey and 3 species were recorded during line transect surveys.

The proposed solar project is not recognized as a critical habitat but IFC PS6 will be applicable due to the area providing habitat to endangered birds and schedule I birds during the project life cycle.

The impact of site clearance will be low on vegetation and ground breeding birds and reptiles. With robust mitigation measures these impacts can be further reduced to insignificant. Overall impact anticipated is low.

Project Impacts & Mitigation

- ❑ During construction, land clearing, levelling, excavation, grading activities, vehicle movement and DG set operation and other activities will be required, which in turn will increase the emission in ambient air. However, most of these project activities are expected to be restricted within the project boundary. SRIPL-4 will implement all the mitigation measures like water sprinkling, covered transportation, etc. Solar energy technologies and power plants do not produce air pollution or greenhouse gases when operating. Therefore, impact on ambient air will be insignificant during operation phase.
- ❑ The project site is located amongst open scrubland with no continuous noise generating sources in the vicinity of the project site. The major noise generating sources in the project are operation of vehicular traffic, and construction equipment like dozer, scrapers, concrete mixers, generators, pumps, compressors, rock drills, pneumatic tools, and vibrators, which may slightly increase the ambient noise level. SRIPL-4 will implement all the mitigation measures like use of PPE, etc. During operation phase, no impact is envisaged on ambient noise.
- ❑ In the construction phase, water will be required for foundation and building work (estimated about 79.2 KLD) and domestic purpose for migratory labours in rented house (estimated about 27.3 KLD). The required water for construction phase will be supplied by the contractor. The project proponent has stated that contractors will use the Indira Gandhi canal water and also confirmed that if necessary borewell will be used. According to the CGWB Report, 2021-2022, the project site comes under “Safe” zone. Therefore, impact on groundwater is assessed as “Low”.
- ❑ The excavated material generated will be reused for site filling and levelling to the maximum extent possible. The broken solar panels will be properly packed and will be sent back to manufacturer/approved vendors. Any hazardous waste generated will be disposed as per “The Hazardous & Other Waste (Management & Transboundary Movement) Second Amendment Rules, 2021”

- ❑ During primary survey 34 bird species belonging to 19 families were identified and recorded from the study area. Among this 34 bird species 18 species were recorded in vantage point survey, 13 species were recorded in point count survey, and 3 species were recorded during line transect surveys. Of these recorded 34 birds, 4 are listed as Vulnerable in the IUCN Red List of threatened species, which are Indian Spotted Eagle, Greater Spotted Eagle, Tawny Eagle and Eastern Imperial Eagle; and Egyptian Vulture and Steppe Eagle are listed as endangered of IUCN Red List. Six bird species are listed in the Schedule I of the WPA, 1972, which are the Long-legged Buzzard, Black-winged Kite, Shikra, Egyptian Vulture, Shaheen Falcon, and Eurasian Griffon.
- ❑ Risk of Electrocution of birds is anticipated in the operational phase of the project, which could be mitigated through boundary wall and restricted entry in project site. Use of reflectors and bird flappers to be used at suitable intervals to avoid easy visibility of transmission wires and the risk of electrocution.
- ❑ There is potential for avian distraction due to glare/reflection from solar panels. Solar panels shall have an anti-reflective coating to minimize the light reflecting off of the panels so that there is very less impact due to glare from the panels.

Environment and Social Management Plan

SR IPL-4 is committed to execute all construction and operation related activities for the proposed Solar PV Project as per the best established environmental, health and safety standards and also it will be aligned with upcoming project. Mitigation measures are proposed for impacts which are identified and quantified. Some residual impact will however persist after all mitigation measures are employed, the Environmental and Social Management Plan intends to delineate monitoring and management measures to minimize such impacts by allocating management responsibility and suggesting skill requirement for implementation of these measures during construction and operational phase.

Project Categorizations and Justification

The IFC criteria for the project categorization are based on the assessment of environmental impacts of the project and the Project has been categorized as **Category B** based on the following reasoning:

- ❑ Environmental and social impacts of the project are anticipated during the construction phase and will encompass changes in land-use, increased noise levels, changes in air quality, use and changes in water quality, impacts on terrestrial ecology, occupational health & safety, etc.;
- ❑ Environmental Impact Assessment (EIA) Notification 2006 and subsequent amendments is not applicable for this project as the project is White Category of Industry. No forest land is involved for the development of this project; thus, Forest Act is also not applicable.
- ❑ The site location of the project does not involve any anticipated settlements and physical displacement; No child labour is engaged at site for construction or operation works.
- ❑ Consent to establish from Rajasthan State Pollution Control Board (RPCB) before operation of the project.
- ❑ IFC PS 1, PS 2, PS 3, PS 4, and PS 6 are applicable for this project, PS 5 applicability could not be determined in this project as land procurement is in progress during the site assessment and rest PS

7 and PS 8 are not applicable.

- ❑ Solar based energy development is a non-polluting source of energy and thus is not likely to lead to any adverse impacts on the baseline environment during the operation phase.

Conclusion

In reference to IFCs categorization of projects the proposed project can be categorized as Category B, which specifies that the project can cause potential and limited adverse social or environmental impacts which are generally site-specific, largely reversible and readily addressed through mitigation measures. The project shall be constructed and operated as per the latest legal regulation.

There is no adverse impact on the nature of habitat, any natural existing land resources and effect in the regular life of people. Most impacts are expected to occur during the construction phase which are considered to be of a temporary nature. The main project impacts are associated with clearing of shrub vegetation, waste management and excavation and movement of soils. From this perspective, the project is expected to have a small "environmental footprint". Adequate provisions have been made for the environmental mitigation and monitoring of predicted impacts.

The project will throw opportunities to local people for both direct and indirect employment. The project will provide impetus to industrialization of the area. Ribbon development will increase the economy and revenue potential of the region. It is expected that project development will also be helpful in development of facilities like education, health, housing, water, electricity etc.

1 Introduction

India's Nationally Determined Contributions (NDC) under Paris Agreement for the Period 2021-2030 include: to reduce the emissions intensity of its GDP by 33 to 35 percent by 2030 from 2005 level; and to achieve about 40 percent cumulative electric power installed capacity from non-fossil fuel-based energy resources by 2030 with the help of transfer of technology and low-cost international finance.

India intends to achieve net zero carbon emissions by 2070 and to meet 50% of its electricity needs from renewable sources by 2030 marks a historic point in the global effort to combat climate change.

India has achieved a cumulative installed renewable energy capacity (excluding large hydro) of 121549.52 MW out of which 11664.17 MW was added in the period April 2022 till January 2023.

The Indian renewable energy sector is the fourth most attractive renewable energy market in the world. India was ranked fourth in wind power, fifth in solar power and fourth in renewable power installed capacity, as of 2020. Installed renewable power generation capacity has gained pace over the past few years, posting a CAGR of 15.92% between FY16-22. India is the market with the fastest growth in renewable electricity, and by 2026, new capacity additions are expected to double.

1.1 Role of Solar Energy

The promotion of solar energy in India should be seen from a broader and long-term perspective. Harnessing the solar energy offers energy security & environmental benefits and other benefits namely:

- ❑ Contribute to enhancing power availability, reducing the energy shortage, stabilization of tail-end grid & addressing the peak demand deficit faced by the state of Rajasthan.
- ❑ Enhancing energy security by developing a diverse energy mix: Solar energy can contribute towards diversifying the energy base to reduce dependence on conventional energy sources.
- ❑ Providing clean & reliable energy: Solar energy helps in meeting the energy requirements of people in remote rural areas.
- ❑ Leads to sustainable development: Promotion of solar energy will contribute directly towards the overall improvement of living standard of rural populace. It will also help maintain ecological balance, replacing conventional energy use, generate additional employment opportunities, improve health and increase access to education to rural children.

1.2 Project Background

Serentica Renewables 4 India Pvt Limited (SRIPL-4) provides round-the-clock renewable energy enabling the transition of large-scale, energy-intensive industries to clean energy. The company is focused on industrial decarbonization, by making renewables the primary source of energy for the commercial & industrial segment which consumes more than 50% of the electricity generated in India. *Serentica* aims to provide assured renewable energy through a combination of solar, wind, energy storage and balancing solutions.

In the medium-term, *Serentica* aims to install 5000MW of carbon-free generation capacity coupled with different storage technologies. Eventually, it aims to supply over 15 billion units of clean energy annually and

displace 20 million tonnes of CO₂ emissions.

As India looks to meet its energy demand on its own, which is expected to reach 15,820 TWh by 2040, renewable energy is set to play an important role. Serentica Renewables and its 300 MW solar power also play an important role in it.

Environmental Planning Management Consultancy (EPMC) has been appointed by **M/s Serentica Renewables 4 India Pvt Ltd (SRIPL-4)** to undertake the Environmental and Social Impact Assessment (ESIA) study for 300 MW SPP in Bikaner district of Rajasthan. The ESIA was conducted to assess any potential impacts (both negative and positive) that may arise from the construction, operation and decommissioning of the SPP. Environmental sustainability in relation to the solar power project will be enhanced by designing the power plant that gives competitive advantage over existing energy resources. The overall benefits of the solar power system are expected to outweigh the potential negative impacts. The ESIA study for the project has been undertaken in accordance with terms of reference as approved by IFC's Performance Standard. These are a compilation of - Environmental, Health, and Safety General Guidelines.

1.3 Brief of Project

Bikaner is blessed with maximum solar radiation intensity of about 6-7 KWhr/sqm/day with mean yearly insolation of 2084 KW/m² which is a good potential for harnessing solar energy. The proposed project location receives the annual global mean horizontal radiation of 1954 KW/m² sunlight throughout the year.

Approximately 1100 acres of land is estimated to be required for this project. At the time of site assessment, approximately 500 acres of land has been taken on Lease under rent agreement. The land is privately owned, open scrub land with few patches of agriculture. Negotiation is under process for remaining plots of land, as well as, for RoW (right of way) of transmission line.

1.4 Purpose of ESIA Study

The main purpose of the ESIA study is to identify, evaluate and manage environmental and social impacts that may arise due to implementation and operation of the project. The document has been made to comply with the requirements of IFC's Performance Standards, IFC's general guidelines of Environment, Health, and Safety; Equator principles, Relevant IFC guideline covering labour standards, as well as applicable local and national regulations. The objectives of ESIA study are:

- ❑ To identify and establish the baseline environmental and socioeconomic conditions, to analyse the environmental and social risk and impacts of the project and its associated components (facilities like transmission line, access road etc.)
- ❑ To prepare an inventory of biodiversity (flora and fauna) of project site prior to implementation of the project to evaluate the possible impacts on flora and fauna.
- ❑ Review of the land lease process to assess any legacy or current/existing issues (like informal settlers, livelihood dependence, other usage etc.) on the purchased/ leased land through suitable survey using acceptable socioeconomic tools. This will help in assessing the impact of the project on the community/ villagers.
- ❑ Socio-economic survey involving consultation with local community, stakeholders, household surveys to identify the needs and problems of the community with respect to the project activities.

- ❑ To suggest appropriate safeguards for the associated environmental and social risk, which will save the project investment and activities from any risk.

1.4.1 Approach and Methodology of the ESIA Study

Preliminary documentation review was undertaken prior to mobilization for site visit. During site visit, potential environmental and social risks associated with the project were assessed. Mitigation measures / further studies were proposed based on the assessment. A approach and methodology adopted to conduct ESIA for the project incorporated (i) Preliminary Discussion with project proponent, (ii) Desktop Review of the project area, (iii) Community Consultations, (iv) Consultation with project developer, (v) Identification of Potential Environmental and Social Impacts, (vi) Environmental Baseline collection, (vii) Ecological Assessment, (viii) Development of Project Specific Environmental and Social Management Plan.

1.4.2 Limitations of the study

The study is based on the project planning information and document provided by the project proponent, community consultation and observation recorded during site survey. The baseline condition is an extrapolation of surrounding areas to site. Any significant change in the proposed activities may result in variation of outcomes. Key limitations are listed below:

- ❑ Household survey data has been obtained from the Census of India, 2011 report.
- ❑ The study has been conducted in the absence of vital information relating to transmission line route regarding land details.

1.4.3 ESIA Team

EPMC has mobilized a diverse team of experts for conducting the ESIA study. The experts have been continuously working with funding agency and understand the modalities and procedures of evaluating and addressing environment and social risk associated with large scale investment.

2 Project Description

SRIPL-4 with responsibility for the development and generation of renewable energy and establishing, commissioning, setting up, operating, and maintaining electric power generating stations based on conventional / non-conventional resources, is engaged in the development of 300 MW solar PV power Plant at Jaimalsar village at Kolayat tehsil in Bikaner district of Rajasthan.

The accessibility to the project site is via NH-11 and is directly connected via Chilla Road. The salient features of the project are summarized in **Table 2-1**.

2.1 Present Status of Project

The project site is in the pre-construction phase. The private land has been leased under rent agreement process for the development of the proposed 300 MW solar project. The land procurement is under process. Approximately, 500 acres of land has already been leased in the time of site assessment. The proposed land is moderately plain, sufficient to install requisite modules for 300 MW of Solar Power Generation.

2.2 Connectivity

The nearest airport to the site is Civil Airport Bikaner (located at an aerial distance of 17.78 km approximately). The accessibility to the site is via NH-11 (15 km approx. South-east from the project site) and is directly connected to the village road (Chilla Road). Nearest railway station is Nal Halt, located at an aerial distance of 19.78 km approximately. Nearest town is Bikaner located at an aerial distance of 30 kms (approx.). Power from the solar photovoltaic plant of 300 MW capacity will be connected to the proposed PSS (located within the site) and to the GSS (Bikaner-2 substation) at a distance of approx. 4.87 km.

Table 2-1: Salient Features of Project

| S. N. | Salient Features | Details |
|-------|--|---|
| 1 | Project Owner | Serentica Renewables 4 India Pvt Limited |
| 2 | Total Project Capacity | 300 MW |
| 3 | Location of Site | Jaimalsar village |
| 4 | Tehsil/ Mandal | Kolayat |
| 5 | District | Bikaner |
| 6 | State | Rajasthan |
| 7 | Project Coordinates | 28°6'36" N, 73°1'12" E |
| 8 | Nearest Town | Bikaner |
| 9 | Total Land Area required | 1100 acres |
| 10 | Ownership of land | Serentica Renewables 4 India Pvt Limited (SRIPL-4) |
| 11 | Land holding type | Entire land in the project constitutes of Private lands |
| 12 | Type of Land use (5 km radius from site) | The land is privately owned, predominantly open scrub land with few patches of agriculture land |
| 13 | Present status of the project | Project is at preconstruction phase |
| 14 | Power evacuation | 33/220 KV Pooling substation |
| 15 | Project Life | 25 years |

2.2.1 Transmission route

The GSS (Bikaner 2 Sub- station) is connected with the PSS (proposed within the project boundary in village Jaimalsar) through an approx. 4.87 km transmission line.

2.3 Project Phases and Activities

The project is at pre-construction stage. There were no construction activities at solar plant site observed during the time of this ESIA study. The Project lifecycle can be broadly divided into four phases as follows:

- ☐ Planning and Pre-construction Phase
- ☐ Construction Phase
- ☐ Operation and Maintenance Phase
- ☐ Decommissioning Phase

2.4 Site Suitability and Justification of Project

Following analysis describes the site suitability for a Solar PV power plant development:

- ☐ **Solar radiation at the site:** The state of Rajasthan is blessed with abundant solar energy and receives maximum solar radiation intensity in India with very limited rainfall. According to Solar radiation map of India, Rajasthan receives a global horizontal irradiation (GHI) in the range of 5.5 to 6.0 kWh/m²/day. The proposed location receives GHI of 1954 kWh/m².
- ☐ **Topography:** The proposed area for the development of 300 MW solar plants has mix terrain (moderately plain land). Land type is open scrub land with few patches of agricultural land found at Jaimalsar village. Installation of solar panel will be easy and reduce the cost of technical modifications require to adjust for undulations at the ground.
- ☐ **Settlement:** The site was devoid of any dense habitation.
- ☐ **Substation proximity:** Power from the solar photovoltaic plant of 300 MW capacity will be connected to the proposed PSS (located within the site) and to the GSS (Bikaner-2 substation) at a distance of approx. 4.87 km.
- ☐ **Accessibility:** The accessibility to the site is via NH-11 and is directly connected to the village Road (Chilla Road). Bikaner Junction Railway station is the nearest railway station located at an aerial distance of 33 km (east) from the site, and Bikaner is the nearest city located at an aerial distance of 33 km (east) from the site, and nearest airport is Jodhpur located at an aerial distance of approx. 205 km (south) from project site.

2.5 Environmental acceptability:

- ☐ **Near and far shading effect:** There are no shading elements such as hillock etc. near to the project site.
- ☐ **Forest Area:** No forest land is required for this proposed project.
- ☐ **Water bodies:** There is no water body present in the project area, only few are located outside the project area, Gajner Lift canal, part of Indira Gandhi Canal stage II, is flowing at a distance of 100m away from the west boundary of the project site towards south..
- ☐ No protected area or important bird area lies within 5 km radius of the project site.

- ❑ The transmission line between regarding Right of Way (RoW) for the transmission route proposed to pass through the scrub and agricultural land.
- ❑ There are no residential/ commercial structures within the project site.

2.6 Resource Requirement

2.6.1 Land Requirement

The proposed 300 MW SPP is required approx. 1100 acres of land parcels covering in Jaimalsar village in Kolayat taluka of Bikaner district. The land area which is designated as private land and the procurement process is based on lease rent agreement. Land procurement process of this solar power project was initiated from January 2022 and will be completed by March 2023 as confirmed by the project proponent.

- ❑ **Land for Solar Panel:** Out of the total land requirement of 1100 acres, lease rent agreement for a period of 29 years 11 months was already signed for around 500 acres of private land on the date of site assessment.
- ❑ **Land for PSS:** In order to construct the pooling substation (PSS), which is intended in Jaimalsar village of Koyalat taluka.
- ❑ **Land Requirement for Transmission Line:** Power from the solar photovoltaic plant of 300 MW capacity will be connected to the GSS (Bikaner 2 Sub- station) from the PSS (proposed within the project boundary in village Jaimalsar) through an approx. 4.87 km transmission line.

2.6.2 Water Requirement

During the project construction phase, water is required for preparing RCC foundations for module mounting structures, building control room and security rooms, and domestic purposes such as drinking and washing by the construction workers and staff.

During operation phase, water will be required mainly for domestic use of operational staffs. In this project, jet water spray method/ dry cloth wiping method will not be adopted, rather robotic cleaning method will be used to minimize the consumption of water. The estimated quantities of water required during the construction and operation phases are **(i) During construction-** 79.2 KLD for civil works & 27.3 KLD for Domestic use, **(ii) During operation-** 5.25 KLD for Domestic use.

2.6.3 Manpower Requirement

Construction Phase

The contractor workforce will be comprised of both skilled and unskilled labours. During the peak construction phase, 150 semi-skilled & skilled migrant labours and 375 local labours (total 525 labours) will be required for this project. Some workers will be sourced from the nearby villages depending on their skills and capabilities and will also be trained before induction to the project site.

These (both semi-skilled and unskilled) labours will be supervised and monitored by 50 skilled personnel from authorized Contractor in the peak construction phase.

Operational Phase

During operational phase, around 75 personnel is required onsite including security guards, cutting grass, cleaning of model, boundary maintenance and operation etc.

2.6.4 Raw Materials

The construction related materials viz. stone aggregates, sand and bricks etc. for the project are likely to be sourced from the vicinity area.

2.6.5 Wastewater Treatment and Disposal System

During the construction phase, the wastewater or sewage from site office toilets will be disposed in a septic tank. The domestic wastewater would be managed through septic tanks. Minimal wastewater will be generated during the operation phase if robotic cleaning of solar modules will be followed.

2.6.6 Logistic Arrangement

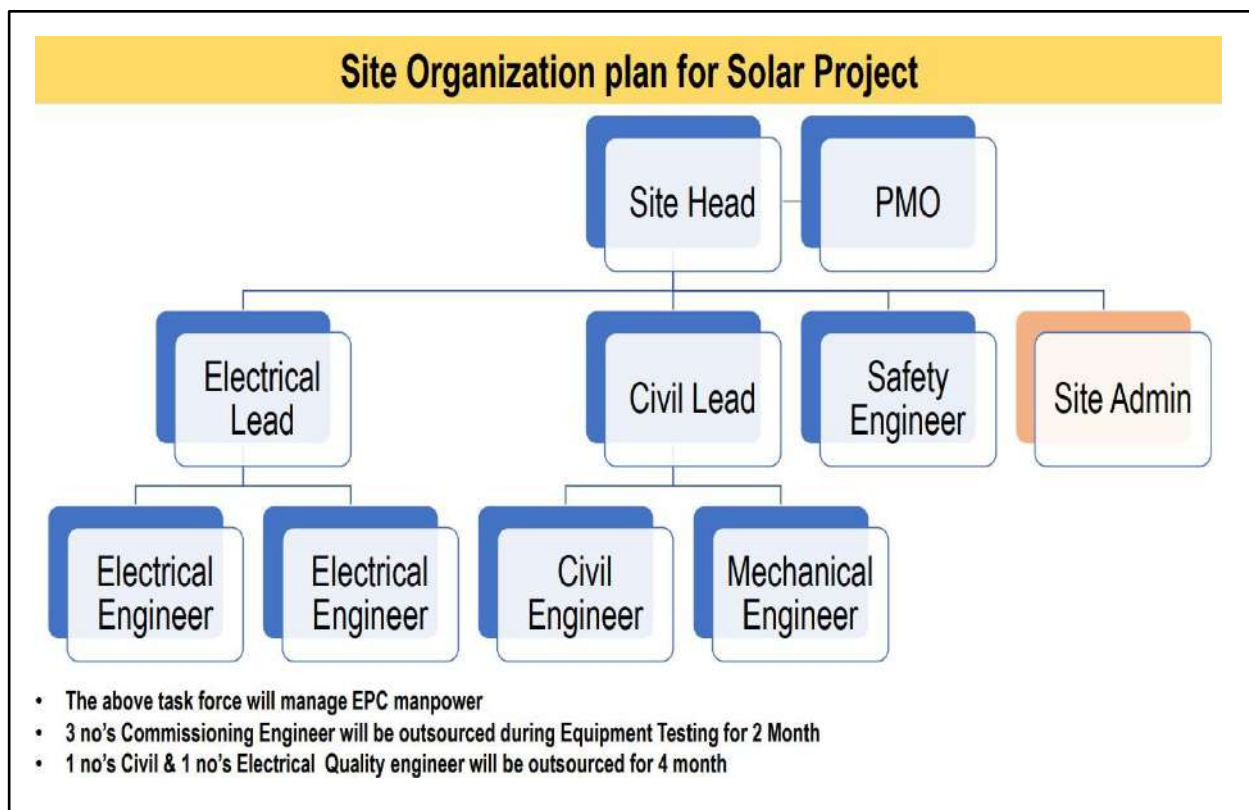
Labour Camp: The project is in the pre-construction stage during the preparation of ESIA report. The project proponent will hire maximum number of the unskilled labours locally for reducing the requirement of labour camp.

Project Vehicles: Project vehicles such as water tanker, tractors, JCB, and cars will be engaged to support various activities during construction phase and further efforts will be made to hire vehicles. Validity of PUC and driver's license would be checked.

2.6.7 Organizational Structure

Organizational Structure for the proposed 300 MW Solar Power Plant is shown below-

Figure 2-6: Organisational Structure of 300 MW Solar Power Project at Jaimalsar Village, Bikaner, Rajasthan



3 Applicable Regulations, Guidelines and Standards

This section describes regulations, statutory guidelines and obligatory standards that are applicable to the social and environmental performance of the project.

3.1 News/ local notification about the project

Based on the secondary research and study of local news/channels, there is no negative information available either in print or electronic media about the proposed project and project area. At the time of stakeholders' consultation as well as field visit, no agitation against the project has been noticed or reported as confirmed by the Sarpanch of the project village. Consultation with Assistant Deputy commissioner & additional dist. Magistrate and Tehsildar of Bikaner district confirmed that they too have not received any agitation against the proposed project under their jurisdiction area. From the stakeholder consultations conducted by the consultant, it can be concluded that the perception of land contributors/ owners is positive about the proposed Solar PV Power Project. Villagers found satisfaction with land leasing procedure as it will help them to preserve their ownership rights on land. During consultation, villagers expressed their positive expectations with the proposed project. They are expecting employment opportunities, community development programs, facility of continuous quality power supply etc.

3.2 National Guidelines and Regulations

In India, the Ministry of Environment, Forests and Climate Change (MoEF&CC) is the apex administrative and regulatory body for (i) regulating and ensuring environmental protection; (ii) formulation of the environmental policy framework in the country; (iii) conservation of biological diversity and (iv) planning, promotion, coordination and overseeing the implementation of environmental and forestry programmes. Several laws have been framed for protection of environment and for Occupational Health & Safety in India by the Central Government.

3.2.1 Equator Principles

The Equator Principles comprises a group of ten principles adopted by the Equator Principle Financial Institutions (EPFIs) to ensure that the projects funded by them are developed in a manner that is socially responsible and reflect sound environmental management practices. The applicability of each of the principles with respect to proposed project is detailed as follows:

Table 3-1: Compliance to Equator Principles

| Equator Principle | Applicability | Project Information/Application |
|--|---|--|
| Principle 1: Review and Categorization | As the project is seeking financing from EPFIs, the project must be categorized based on the magnitude of its potential impacts and risks in accordance with the environmental and social screening criteria of IFC (Exhibit I). | Based on the IFC environmental and social screening criteria the proposed Solar power project is identified as a “Category B” project with potential limited adverse social or environmental impacts that are few, generally site-specific, largely reversible and can be readily addressed through mitigation measures. |
| Principle 2: Environmental and Social Assessment | An Environmental and Social Assessment must be carried out for the project that addresses relevant social and environmental impacts and risks of the proposed project (illustrative list of issues as found in Exhibit II) and propose mitigation and management measures relevant and appropriate to the nature and scale of the proposed project. | This report presents the Environmental and Social Impacts Assessment carried out for the proposed project. The project has not acquired any settlement land and hence does not trigger the requirement of Resettlement and Rehabilitation. |
| Principle 3: Applicable Environmental and Social Standards | This Principle requires the Environment and Social Assessment to refer to the applicable IFC Performance Standards and the then applicable Industry Specific EHS Guidelines including the project’s overall compliance with, or justified deviation from, the respective Performance Standards and EHS Guidelines. | The ESIA report has been prepared including the requirements of IFC performance standards, Environmental and Social Policy Statement, and EHS guidelines. |
| Principle 4: Environmental and Social management system and equator principles action plan | EP4 requires an assessment of potential adverse human rights impacts for every project regardless of whether the risk merits a full ESIA. EPFI borrowers should refer to the UNGPs when assessing human rights risks and impacts. The Preamble to EP4 recognizes that EPFIs have a role to play with respect to the 2015 Paris Agreement as well as efforts to improve the | SRIPL-4 will take responsibility to ensure respect human rights throughout the life cycle of the project. SRIPL-4 will ensure that there is no- <input type="checkbox"/> Forced labour, child labour and human trafficking <input type="checkbox"/> Poor or unsafe working conditions <input type="checkbox"/> Underpayment of workers |

| Equator Principle | Applicability | Project Information/Application |
|-------------------------------------|--|--|
| | <p>availability of climate-related information (referencing the recommendations of the Task Force on Climate-related Financial Disclosures (the TCFD)).</p> <p>The Climate Change Risk Assessment undertaken for Category A and Category B projects must analyze climate “physical” risks, including those arising from changes in acute or long-term climate patterns. For projects expected to exceed the cap on greenhouse gas emissions, the Climate Change Risk Assessment must review climate “transition” risks, such as those arising from a move to a low carbon economy and evaluate potential alternatives to the project that are less greenhouse gas intensive. EP4 also indicates that ESIA’s must consider project compatibility with the relevant climate and energy policies of the host country, including its NDCs.</p> <p>EP4 indicates that EPFIs must require borrowers to report annually on greenhouse gas emission levels and provide a greenhouse gas efficiency ratio where appropriate</p> | <ul style="list-style-type: none"> <input type="checkbox"/> Discrimination against employees (e.g., by race, gender or sexuality) <input type="checkbox"/> Breaching workers’ rights to freedom of association and collective bargaining <input type="checkbox"/> Forced or involuntary displacement of communities, including indigenous communities <input type="checkbox"/> Damage to people’s health through pollution, environmental accidents and health and safety failures <input type="checkbox"/> Depletion or contamination of water sources that local communities depend. <input type="checkbox"/> Failure to provide workers and communities with access to grievance mechanisms <input type="checkbox"/> Discrimination against employees <input type="checkbox"/> Use of excessive force by private and public security guards protecting assets etc. <p>Assessment on Climate Change Risk assessment is included along with this ESIA report under section Impact Assessment.</p> |
| Principle 5: Stakeholder Engagement | <p>It is required to demonstrate effective Stakeholder Engagement, as an ongoing process in a structured and culturally appropriate manner, with Affected Communities, Workers and, where relevant, Other Stakeholders including indigenous people (if any).</p> <p>For Projects with potentially significant adverse impacts on Affected Communities, an Informed Consultation and Participation process to be conducted.</p> | <p>Stakeholder consultation has been carried out during site visit of 300 MW Solar power Plant and all collected details have been incorporated in this ESIA report for disclosure.</p> |
| Principle 6: Grievance Mechanism | <p>As part of this Principle, it is imperative that the proponent maintains regular dialogue with communities through implementation of focused CSR programmes / initiatives.</p> | <p>Grievance Redressal Mechanism is available and the same shall be adopted for this project. SRIPL-4 will ensure that all grievances raised by locals related to the project are addressed by the contractor through grievance redressal process during construction.</p> |
| Principle 7: Independent review | <p>An independent social or environmental expert not directly associated with SRIPL-4 is required to review the Assessment, action plans and consultation process documentation to assist EPFI's due diligence and assess Equator Principles compliance.</p> | <p>EPMC has been appointed as a third-party expert to assess the environment and social impact of the project as per IFC safeguards through ESIA study.</p> |

| Equator Principle | Applicability | Project Information/Application |
|---|---|---|
| Principle 8: Covenants | The covenants would be a part of the contract documents between SRIPL-4 and financing agencies as well as contractors and technology suppliers. | E&S Covenants should be embedded within the contracts drawn between SRIPL and the contractors hired for construction activities and technology providers and waste handlers. Periodic reporting to the project developers and management. |
| | EPFIs will, for all Category A Projects, and as appropriate, for Category B projects, require appointment of an independent environmental and/or social expert, or require that the borrower retain qualified and experienced external experts to verify its monitoring information which would be shared with EPFIs. | EPMC has been appointed as third-party expert to assess the environment and social impact of the project as per IFC safeguards as ESIA study. The requirements of the principle are also met by adhering to requirements of PS 1. |
| | This should be prepared by the SRIPL-4 | Based on the audit and monitoring reports submitted by independent agencies the SRIPL-4 will report the findings publicly at least once a year. |
| Principle 9: Independent Monitoring and Reporting | To ensure ongoing monitoring and reporting over the life of loan, EPFIs will, for all Category A projects and, as appropriate for Category B projects, require appointment of an independent environmental and/or social expert, or require that the proponent retain qualified and experienced external experts to verify its monitoring information which would be shared with EPFIs. | The project will fall under Category B and the periodic reporting mechanism will be done as agreed between EPFI and Project Proponent. |

4 Description of Baseline Environment

This chapter describes the existing environmental settings of the project site and its immediate surroundings. This includes physical environment comprising ambient air and noise, water and land components, biological environment, and socio-economic environment. Attributes of the physical environment in and around the project area were assessed primarily through monitoring and analysis of samples collected from the area. Primary monitoring was conducted by a NABL certified laboratory.

4.1 Study Area

The project site for the 300 MW solar power plant is located in Jaimalsar village, Koyalat Taluka, Bikaner district, Rajasthan. To understand and assess the environmental, ecological and social risks associated with the proposed project, the study area was divided into core area (i.e., Project area and its surrounding up to 500 m) and buffer area (5 km around the project site).

4.2 Baseline Conditions

Baseline refers to the physical, biological, cultural and human conditions that will prevail in the absence of the project, including interactions amongst them. Establishing a baseline helps in understanding the prevailing environmental, ecological and socio-economic status of the study area. It provides requisite information of the biophysical and social environment for decision makers to take appropriate measures regarding the project.

4.3 Environmental Monitoring

The project is in the preconstruction stage during ESIA study. Baseline environmental monitoring has been carried out within the project study area for ambient air quality, ambient noise level and water quality. Monitoring has been conducted by IRCLASS Systems and Solutions Pvt. Ltd. (a NABL accredited laboratory) as per the applicable standard methods and analysis from 04/01/2023 to 05/01/2023. The monitoring locations for all the attributes has been shown on a map (**Figure 4-11**). The results of the environmental monitoring represent the baseline environmental condition in the region.

4.3.1 Ambient Air Quality

The existing quality of the ambient air environment serves as an index for assessing the pollution level and the assimilative capacity of any region and forms an important tool for planning project activities in that area. A detailed assessment of the existing ambient air environment was undertaken for the purpose mentioned above. The ambient air quality monitoring (particulate matters and gaseous pollutants) has been conducted at 2 representative locations from 04/01/2023 to 05/01/2023. The monitoring network was established based on the following key criteria:

- ❑ Important receptor locations (e.g., prominent villages, ecological sensitive areas etc.);
- ❑ Site reconnaissance survey and professional judgment

Under the provisions of the Air (Prevention & Control of Pollution) Act, 1981, the CPCB has notified fourth version of National Ambient Air Quality Standards (NAAQS) in 2009. This revised national standard aims to

provide uniform air quality for all, irrespective of land use pattern, across the country.

The ambient air quality monitoring has been carried-out as per the above guidelines for the following parameters:

- ☐ Particulate Matter (<PM₁₀)
- ☐ Particulate Matter (<PM_{2.5})
- ☐ Sulphur dioxide (SO₂)
- ☐ Nitrogen oxide (NO_x)
- ☐ Carbon monoxide (CO)

Interpretation of Air Quality Results

The value of PM₁₀ and PM_{2.5} are observed well below the permissible limit if compared with the National Ambient Air Quality (NAAQ) Standards. The obtained values of SO₂, NO₂ and CO are also well within the prescribed standards.

4.3.2 Ambient Noise Quality

Ambient noise level measurements in dB(A) have been recorded for every hour continuously for 24 hours for the monitoring stations and equivalent noise levels in the form of Leq day and Leq night. The results so obtained were compared with the standard specified in Noise Pollution (Regulation and Control) Rules, 2000.

The ambient noise monitoring has been conducted at two locations.

Interpretation of Noise Quality Results

The ambient noise levels at Project site (NL1) both during the day & night time are found to be within permissible limits of CPCB as compared to the industrial area standard. The ambient noise levels at village Jaimalsar (NL2) both during the day & night time are found borderline compared with the permissible limits of CPCB as compared to the residential area standard.

Surface Water

The district has no major river system, only few waterbodies and Indira Gandhi Canal shown in Land use map. During site visit (conducted in January 2023), only the Indira Gandhi canal has been found. A

Water Quality of Indira Gandhi Canal: The canal water sample has been analyzed based on CPCB classification. The pH value of the storage tank water has been found within normal range (8.07). The DO and BOD levels have been found as 6.3 mg/l and <2.0 mg/l respectively. TDS value have been found as 811 mg/l. The value of Oil and grease has been found a little on the higher side (0.5 mg/l), whereas, as per IS:2296 Class C specification, the maximum permissible limit is 0.1 mg/l. This may indicate presence of derivatives of food waste in the surface water. All the parameters are within the specified limit in the sample collected from Indira Gandhi Canal.

Ground water

Three ground water samples were collected from Jaimalsar village on 05/01/2023. The samples were analyzed for physicochemical and bacteriological parameters and results compared with IS: 10500 (2012) drinking water standards to identify and interpret any deviation in the statutory limits set for parameters under this standard.

Interpretation of Ground Water Quality Results:

pH- The pH value is observed 7.86, which is within the desirable limit of IS: 10500 drinking water standards thereby establishing its suitability for potable use.

Total Dissolved Solids- The TDS value for the ground water sample of Jaimalsar village was found 741 mg/l which is exceeding the 'Acceptable Limit'(500 mg/l) of 'Drinking Water Limits As per IS:10500:2012'.

Chlorides-Chloride concentration in ground water sample was 124 mg/l, which is within the acceptable limit.

Total Hardness- Total hardness value of the collected ground water sample was found 485 mg/l which is exceeding the 'Acceptable Limit'(200 mg/l) of 'Drinking Water Limits As per IS:10500:2012'.

Alkalinity-The alkalinity value of the ground water sample was found to be 259 mg/l which is slightly higher than the 'Acceptable Limit' (200 mg/l) of 'Drinking Water Limits As per IS:10500:2012'.

5 Ecological Environment

The environmental baseline of the proposed solar project and its surroundings including the transmission route has been established for the biological aspects under consideration. This has been achieved largely through consultations with relevant stakeholders, a desktop review of available literature, and the primary baseline survey carried out on 5th January 2023 and 6th January 2023.

The secondary data collection was carried out to identify the biodiversity value of the study area. The discussion with residents and forest officials was also conducted to gather more information on the ecological sensitivity/critical habitats located in the project area. This information further enabled to gauge potential ecological impacts that can be generated from the project activities.

5.1 Methodologies for Ecological Surveys

5.1.1 Desktop Review

A desktop review was conducted to determine the land use and land cover (Toposheet, Satellite imagery), forest type (Champion and Seth, 1962), bio-geographic Zones (Rodgers, Panwar and Mathur, 2000) and floral & faunal assemblage in the study area from published documents. To provide representative ecological status for the project, existing critical habitats, scrubs/vegetative cover and water bodies around the project area and other factors were documented for the ecological study. The survey was attempted to recognize the threatened birds and animal species, population and environmental networks under Indian Wildlife Protection Act (1972), and IUCN Red List utilizing information from eBird, Avi- base and Birdlife International database; and the territories and specific niche of target bird species present in proposed project area.

5.1.2 Flora Survey

Free check listing for trees, shrubs and for herbs and grasses were carried out to understand the floral diversity in project area.

5.1.3 Fauna Survey

Exclusive for birds, 4 vantage point (VP) surveys, 5-point counts (PC) surveys and 2 line transect surveys were conducted, covering the entire project profile including the transmission routes.

Data related to the other faunal species was also noted based on the direct sightings and from authentic secondary sources.

5.1.4 Avifauna Field Survey

Assessment of avifaunal diversity was carried out from 5th to 6th January 2023 by a team of experts. Proposed project area and a buffer area were surveyed using VP surveys, and PC surveys. The survey locations are based on the habitat types present in the study area. In the survey, we have covered a 5 km buffer area and habitats in order to develop better understanding of birds and their potential habitats.

5.1.5 Habitat Survey

A 'Habitat' according to IFC is defined as a terrestrial, freshwater or marine geographical unit or airway that supports assemblage of living organisms and their interactions with the non-living environment. The purpose of implementation of IFC Performance Standard-6 is to protect and conserve biodiversity, maintain ecosystem services and sustainably manage living natural resources. As per IFC, habitats are divided into - Natural, Modified or Critical. Critical habitats are subsets of Natural habitats. Mostly modified habitats were observed in the study area.

5.2 Analysis and Results

The data collected during the field survey and desktop assessment was utilized to understand the ecology of the proposed project area and potential impacts of the project activities on the biodiversity of the area.

5.2.1 Desktop Review

Biodiversity around the Project location

As per Avibase – The World Bird Database, 360 species of birds have been reported from the Bikaner district, out of which 23 bird species are globally threatened species. As per eBird, 324 bird species have been observed. These lists include numerous critical species like raptors, water birds, waders etc. There are several bird species that are either endangered or critically endangered or in some kind of threatened category by IUCN.

A list of target bird species has been made using the Birdlife International data, Avibase and ebird database of Bikaner district and 40 species have been identified as priority species. These species have been recorded in past from the Bikaner district but not necessarily from the proposed project area itself.

Important Bird Species

Some bird species in this region are critically endangered as per IUCN Red List. One of the most important species among these is Great Indian Bustard which was mostly sighted in parts of north-western part of Rajasthan.

Great Indian Bustard

The proposed site is approx. 137.54 km (NE) away from GIB priority area and approx. 660.69m (NE) away from GIB potential area of Rajasthan (Refer Fig 5-6). The predominant habitat of the study area is open scrubland along with agricultural land. Mines, stone quarries, industry expansion, extensive pesticide usage, grassland conversion, and power projects, as well as the expansion of highways, and other infrastructures, have all contributed to increased habitat degradation and disturbance and has led to a possible local extinction of the GIB from the proposed project area.

Protected Areas

The project site has 3 protected areas within 100km of the proposed project area. The project site is around 40 km from Diyatra Closed Area, 37 km from Jorbeer Conservation Reserve and 17 Km from Gajner Wildlife Sanctuary. These conservation reserves host a number of migratory as well as resident bird species.

5.2.2 AVISTEP Analysis

The Avian Sensitivity Tool for Energy Planning (AVISTEP) was developed by BirdLife International and the Asian Development Bank (ADB). AVISTEP is designed to identify areas where renewable energy resources could impact birds and biodiversity.

5.2.3 Flora Survey

Forest Type

Bikaner forest division is located in the north-western part of Rajasthan. Bikaner division has two sub-divisions, namely, Bikaner sub-division, and the Chattergarh sub-division. Forests of Bikaner division are primarily of dry thorny type.

According to Champion and Seth's (1968) classification, the forests of the division can be broadly classified under two sub-groups with their associated types: SUB-GROUP 5B: Tropical Dry Deciduous Forests & SUB-GROUP 6B: Tropical Thorn Forests

5.2.4 Faunal Diversity

A variety of reptiles, mammals and birds can be found in Rajasthan. Frogs, toads, gharials, crocodiles, lizards, skinks and snakes are the various reptiles in Rajasthan. Camels, tigers, gazelles, antelopes, nilgai, leopards are some of the mammal species in the region. Hundreds of species of migratory birds also visit Rajasthan which includes Siberian Cranes, flamingos, pelicans and many others. More than 300 birds live here and peacocks, warblers, sparrows, ducks, and bulbuls are some of them. Indian Wolf is listed as Near-Threatened while Indian Blackbuck is a Schedule-I species.

5.2.5 Field Survey Results

Vegetation Survey

The primary vegetation Survey was conducted in and around the project area. The line transects surveys and free check listing was done for the floral diversity. The tree/shrub/grass species were found during the survey including *Prosopis juliflora*, *Eucalyptus*, *Acacia leucophloea*, *Tecoma stans*, *Ziziphus sp.*, *Prosopis cineraria*, *Capparis decidua*, *Calotropis procera*, *Senna covesii*, *Lasiurus scindicus*, *Leptadenia pyrotechnica*, *Aerva javanica*.

Fauna Survey

Proposed project area/project footprint and buffer areas of 5km were surveyed using Vantage Point (VP) surveys, Line Transects (LT) and Point Count (PC) Surveys. The 5 km buffer was proposed to intensively survey the area. The faunal survey focused on mammals and avifauna of the project area.

Mammals

A number of mammalian species were identified during the primary field survey, by tracking and sightings of pellets, den, pugmark, and hoofmarks, outside the project footprint, within AOI (5 km radius) of the project site. Species recorded were *Hystrix indica*, *Vulpes bengalensis*, *Canis aureus*.

Avifauna

During primary survey 34 bird species belonging to 19 families were identified and recorded from the study area. Among this 34 bird species 18 species were recorded in vantage point survey, 13 species were recorded in point count survey, and 2 species were recorded during line transect surveys. Of these recorded 34 birds, 4 are listed as Vulnerable in the IUCN Red List of threatened species, which are Indian Spotted Eagle, Greater Spotted Eagle, Imperial Eagle and Tawny Eagle; and Egyptian Vulture and Steppe Eagle are listed as endangered of IUCN Red List. Six bird species are listed in the Schedule I of the WPA, 1972, which are the Long-legged Buzzard, Black-winged Kite, Shikra, Egyptian Vulture, Shaheen Falcon, and Eurasian Griffon.

5.2.6 Types of Habitats in the Study area

Major habitat types in the project area are water bodies, drainage channels and open scrub land. Among these land use types, following can be the potential habitats for birds.

Open Scrub Land: This type of vegetation is extensively found in non-cultivated lands, particularly revenue lands/patta land located within the study area. This type of land gets grown by *Prosopis juliflora* and other shrubs. Tall trees were generally found absent or sparsely distributed.

Agriculture fields: This is a modified habitat, where natural landscape has long been converted for cultivating agricultural crops. The fields are either under seasonal cultivation or fallow lands, with interspersed seasonal drainage channels. Singular or sparse trees are seen across wide distances. This type of habitat is preferred by certain avifauna like parakeets, weavers, munias and doves etc; butterflies and insects.

5.2.7 Critical Habitat Analysis Assessment

During the survey, presence of two endangered species- Steppe Eagle and Egyptian Vulture was confirmed (outside the project foot print, within AoI). Therefore IFC PS 6 will be applicable to the proposed solar project.

Criterion 1 (Tier 2) is applicable due to presence of Endangered species and containing nationally/regionally important equivalent national/regional listing (Schedule I species of WPA, 1972) during the survey in the proposed project area (1d). Critical habitat as per Criterion 1d "Habitat of significant importance to CR or EN species that are wide-ranging and/or whose population distribution is not well understood and where the loss of such a habitat could potentially impact the long-term survivability of the species."

Criterion 2 is not applicable due to the absence of endemic and restricted range species from the proposed project area.

Criterion 3 is not applicable due to the absence of migratory or congregatory birds with more than $\geq 1\%$ but $< 95\%$ of the global population. Migratory birds like Common Crane, Eurasian Griffon, Greater Spotted Eagle, and Eastern Imperial Eagle were observed during the survey. But their numbers were not high enough to qualify for more than 1% of their global population.

Criterion 4 is also not applicable due to the absence of Highly Threatened and/or Unique Ecosystems in the project area.

Criterion 5 is also not applicable since landscape features were not found to be supporting key evolutionary processes.

The proposed solar project is recognized as a **critical habitat Tier 2** (Criterion 1d) and IFC PS6 will be applicable due to the presence of conservation importance species during the field survey.

6 Socio Economic Environment

In order to assist the project impact assessment process, socioeconomic profiling of the project-influenced villages was carried out. Both primary and secondary data were gathered, examined, and analyzed in this exercise along with sharing critical insights in light of prospective effects on the socioeconomic environment of the community as a result of projected project activities in study villages. Secondary data from the 2011 Census, which is readily available for quick reference on the district's official website, has been used in this study as a secondary source of information.

6.1 Demographic Profile of Project Study Area

The latest Census data of India is not published yet and is only available of 2011. So, here in the demographic profile section, Geometrical Increase Method is used for calculation of projected Census data of 2022 by keeping reference and guidelines from last published Census Data of India, 2011.

6.1.1 Population

The distribution of men and women in the study villages. Depicts the sex ratio of 2022 projection in the study area village Jaimalsar and 5 km buffer area villages. The sex ratio of Jaimalsar village is 903 whereas in 5 km buffer village areas the sex ration varies from 797 to 900, with an average of 869. Rajasthan state has a sex ratio of 904.

6.1.2 Literacy Status of Study area villages

Figure 6-3 reflects the detailed literacy status of Jaimalsar village with comparison of both male and female literacy status. The literacy rate of Jaimalsar village is 60.02%. Out of total literacy status, male literacy status is more as compared to female literacy status. Male literacy rate in the village is 70.59% and in case of female literacy rate it is 48.34%. In 5 km buffer area villages it is also seen that male literacy status is higher than female literacy status.

6.1.3 Social Category of Study area villages

It has been revealed from the data that, majority of the village household are concentrated with SC population and few ST household. Overall, it can be generalized that the concentration of SC population is higher in Jaimalsar village and other 5 km buffer area villages.

6.1.4 Category of worker in study Area villages

Category of workers have been divided based on their modes of engagement in the study villages. The category of workers is defined as main workers and marginal workers out of total workers. Maximum concentration of main workers in Jaimalsar village which is 1203 respectively whereas, the number of marginal workers (1015) which is the 46% of the total workers in the village. It can be concluded that, in the villager under the project study area represents population engaged under main worker category over total workers.

6.2 Economic Activity of Project area villages

6.2.1 Irrigation in the Study Area

Bikaner District: The irrigated area under this category went upto 1.13 lakh ha (91.80%) in 1994-95 and 1.85 lakh ha (69.39%) in the year 2003-04. Although area of the canal irrigation increased between 1994-95 and 2005-06 yet its share decreased to (65.87%) due to expansion in the well and tube-well irrigated area. It is very important to note here that the extraction of groundwater through energized wells, tube-wells and pumping sets started during 90s in the area. Its share is 30.59% out of the total irrigated area in Bikaner district. Tank irrigation is almost negligible in Bikaner district.

6.2.2 Agriculture in the study area

Bikaner District: Agriculture in Bikaner district is dependent upon rainfall, irrigation tanks, wells, canals etc. The major agricultural crops grown are Pearl millet, Groundnut, Cluster bean, Moth, Gram, Mustard, Wheat, etc. The major horticulture crops grown are Aonla, Ber, Lime, Kinnow, and Jamun in fruits; Onion, Cauliflower, Musk melon, long melon, and carrot in vegetables; Isabgol and Sonamukhi in medicinal and aromatic crops.

6.2.3 Livestock in the Study Area

The majority of households in the study communities had animals, which was determined during the stakeholder engagement. Cows, buffaloes, sheep, goats, camels, and poultry make up the majority of the domesticated livestock owned by villages. During the field survey, interactions with the villagers indicated that milk from cattle is mostly utilized for residential purposes, although occasionally for commercial ones as well.

6.2.4 Livelihood Pattern of Study Areas

It was confirmed during the stakeholder consultations that working in Plaster of Paris Factories, agriculture and breeding of livestock like camels, horses and sheep are the principal occupation in project area village.

6.2.5 Status of Women in Study area villages

Through consultation with women in project area village it is known that they are engaged in household activities and taking care of children. They also help in agriculture during monsoon season with cleaning the land area, sowing seeds etc. They actively help in rearing livestock and other associated activities.

6.3 Amenities and Infrastructure in the Study Area Villages

The main amenities of the inhabitants in the project areas were evaluated during a site visit in order to assess the current standard of lives of the inhabitants.

6.3.1 Educational facilities

During stakeholder consultation with landowners and Sarpanch (Village Head), it has been confirmed that the Kawaloor village has easy access to pre-primary and primary education facilities in the village. The facility of higher education is not available in the village. For this, they have to go to Bikaner town which is approx. 20

km away from the Jaimalsar village. Additionally, it was further known from landowner consultation that dropping out of school students is very low and also a significant number of female students are attending schools along with male students as a result of the implementation of government initiatives to facilitate and promote women's education.

6.3.2 Health facilities

From the site assessment, stakeholder consultation with the villagers, landowners, Sarpanch, it is known that 1 PHC (Primary Health Centre) and 5 Anganwadi centers are there in Jaimalsar village. But for emergency services villagers have to go to Bikaner District Hospital which is approx. 30 km away and Bikaner Sub-District Hospital which is 27 km away from the solar project site village. Despite the distance, the hospital is easily accessible as confirmed by the stakeholders.

6.3.3 Drinking Water

Pipeline drinking water supply is available for all the households from a Water Treatment Plant in Nagaur village which is 3 km away from the project village as groundwater is bit alkaline in nature in project area village.

6.3.4 Source of Fuel for Cooking

It is revealed during community consultation exercise, that villagers are using both firewood as well as LPG connection as source of fuel for household cooking and associated activities.

6.3.5 Electricity

Households in the study area village are using electricity in the planned project area village, and the availability of power was confirmed by the locals to be nearly constant barring a very rare daily power outage.

6.3.6 Communication and Transportation

Transportation facilities are available at the district, tehsil and village level for the solar project area. The government bus services with facility of bus stand inside every village is available and considered to be an important mode of transportation in project village area. It is imperative to note that, the roads in rural areas are quite good and smooth for communication purpose.

6.3.7 Sanitation

Though open defecation is being practiced in the project study area, the majority of households utilize sanitary latrines provided by the government as part of the Swachh Bharat Abhiyan (SBA), according to information provided by the villagers during community consultation.

6.3.8 Archaeological/ Cultural Heritage Sites in study area

As observed during the site assessment, there is no designated archaeological or cultural heritage site present within 5 km radius of the proposed solar location.

6.4 Stakeholder Consultation

Consultation with community members was held separately at study villages. Various consultation exercises were carried out with representatives of Project Proponent, Landowners, Village Panchayat Members, and other Community Members from project area villages. The consultant has carried out stakeholder consultation exercise as a part of primary data collection process at the project site to understand different stakeholders' view and community's perspective about the proposed project and at the same time to identify any potential threat either direct or indirect on landowners and the community due to the proposed project.

6.4.1 Discussion of the Key points

This section provides a glimpse of relevant issues discussed along with key findings captured during community consultation with different stakeholders concerning proposed SPP in intervention area. [Key findings of the Consultation](#)

- ❑ Most of the proposed and procured land parcels in the project area are moderately plain with open scrubland and a few patches of agriculture.
- ❑ The land acquisition process is based on a lease rent agreement for 29 years 11 months and an additional 5% interest every 3 years. A lump sum of Rs. 15625/- per bigha is already given to the landowners.
- ❑ The livelihood of the local people is dependent upon agriculture, livestock, and nearby POP factories.
- ❑ No SC and ST land is acquired for the project. Also, no impact is envisaged on any vulnerable groups.
- ❑ As the groundwater is not used for drinking, a provision of adequate household piped drinking water from the nearby water treatment plant facility is available in the study area.
- ❑ Provision of pre-primary and primary education is available in the village but they have to travel to Bikaner town for further education. Stakeholder consultation could not be done with schools during the site assessment as winter vacation was going on.
- ❑ The study area village has simple access to PHC and Anganwadi centre amenities. For emergency purposes, the villagers are referred to district and sub-district hospitals which are well-connected.
- ❑ At the district, tehsil, and village level, Kawaloor village is well connected to available transport facilities by bus, auto, private car etc.

7 Environmental & Social Impact Assessment

There may be few potential environmental & social impacts due to the project activity during construction & operation phases. During the construction phase, the impacts may be regarded as temporary or short-term ranging from 6-9 months, while a few long-term impacts may also be visualized during the operation stage. Impacts have been assessed within the study area (5 km radius from project site). The project has overall positive impacts by providing a competitive, cost-effective, pollution free reliable mode of solar power. It will certainly meet the ever-increasing demand of power that will bridge the gap between demand and supply of power.

7.1 Approach & Methodology

Primary impacts of the project are assessed for a radius of 500 m around the project site and secondary impacts are assessed over the study area of 5 km radius of the project site. Also, 100 m RoW along the transmission line is also considered for the impact assessment. The methodology adopted to assess the significance of impact associated with project activities during construction and operation phase has adopted the following screening criteria given in **Table 7-1**.

Table 7-1: Screening Criteria for Environmental & Social Impact Assessment

| Impact | Distribution of impact | Duration of Impact | Intensity |
|------------------|--|--|---|
| Low/ Short | Influence of impact within the project site boundary and RoW of Transmission line (Site) | Limited for duration of less than 6 months (Short) | Limited local scale impact resulting in temporary disturbance/ loss of environment/ social components (low) |
| Moderate/ Medium | Spread of impact within 5 km from the project site boundary (Buffer) | Impact may extend up to 2 years (Medium) | Local scale impact resulting in short term change and/ or damage to the environment components. (Moderate) |
| High/ Long | Influence of impact beyond 5 km from the project site boundary (Widespread) | Impact extends beyond 2 years (Long) | Regional impact resulting in long term changes and/ or damage to the environment components. (High) |

7.1.1 Significance Evaluation Matrix

Significance evaluation matrix as shown in **Table 7-2** has been used to evaluate the significance of identified potential environmental impacts. This matrix includes criteria as discussed above to analyze the significance of impact. Color codes have been given to signify the impact intensity.

Table 7-2: Impact Significance Matrix

| Distribution | Duration | Intensity | Significance |
|--------------|----------|-----------|--------------|
| Within Site | Short | Low | |
| Within Site | Short | Moderate | |
| Within Site | Medium | Low | |

| Distribution | Duration | Intensity | Significance |
|--------------|----------|-----------|-----------------|
| Within Site | Medium | Moderate | LOW |
| Within site | Long | Low | |
| Buffer area | Short | Low | |
| Widespread | Long | Low | |
| Within Site | Short | High | MODERATE |
| Within Site | Medium | High | |
| Within Site | Long | Moderate | |
| Within Site | Long | Low | |
| Buffer area | Short | Moderate | |
| Buffer area | Medium | Low | |
| Buffer area | Medium | Moderate | |
| Buffer area | Long | Low | |
| Buffer area | Long | Moderate | |
| Widespread | Short | Low | |
| Widespread | Short | Moderate | |
| Widespread | Medium | Low | |
| Widespread | Medium | Moderate | |
| Widespread | Long | Moderate | |
| Within Site | Long | High | |
| Buffer area | Short | High | HIGH |
| Buffer area | Long | High | |
| Widespread | Short | High | |
| Widespread | Medium | High | |
| Widespread | Long | Moderate | |
| Widespread | Short | Low | |
| Widespread | Short | High | |
| | | | NO IMPACT |
| | | | POSITIVE IMPACT |

Table 7-3: Impact Aspect Matrix for Construction and Operation Phase

| Description of Activities | PHYSICAL ENVIRONMENT | | | | | | | | | BIOLOGICAL ENVIRONMENT | | | | | | | SOCIO-ECONOMIC ENVIRONMENT | | | | | | |
|---|-------------------------------|-------------|---------------|---------------------------------|----------|---------------------------------|-----------------------|------------------------|----------------------|------------------------|----------------------------|-------------------------------|--|-----------------|-------------------|-------------|----------------------------|------------------------------------|--------------------------------|------------------------------------|-----------------------------------|-----------------------------|--------------------------------|
| | Aesthetics and Visual impacts | Air Quality | Noise Quality | Top soil removal / Soil Quality | Land Use | Local Drainage and Physiography | Surface water quality | Ground Water Resources | Ground water quality | Terrestrial habitat | Ecological Sensitive Areas | Aquatic Habitat and resources | Conservation Importance & Resident Birds | Migratory Birds | Terrestrial Fauna | Agriculture | Domesticated Animals | Loss of land and livelihood source | Common Property Usage Conflict | Local Job and Economic Opportunity | Cultural and Behavioural Conflict | Community Health and Safety | Occupational Health and Safety |
| A. Construction Phase | | | | | | | | | | | | | | | | | | | | | | | |
| Site Clearance | L | M | L | L | M | L | | | | L | M | | M | L | M | L | L | M | | P | | L | L |
| Sourcing and transportation of construction material etc. | L | M | M | L | | | | | | L | L | | L | | | | | | L | P | L | L | M |
| Storage and handling of raw material and debris | L | L | L | L | L | | L | L | L | | L | | L | | | | | | | | | L | L |
| Establishment of labour camp and labour working conditions. | L | L | L | L | L | L | L | L | L | | L | | L | | | | | | L | P | M | | L |
| Operation of DG sets | | M | L | L | | | L | L | L | | L | | L | | | | | | | | | | L |
| Access Road Construction | | L | L | M | | | | | | | L | | L | | | | | | L | | | | |
| Foundation excavation | | M | L | L | L | | | | | | L | | L | | M | | | | | P | | L | L |
| Transportation of solar panels & components to site and storage | | M | L | | | | | | | | L | | L | | M | | | | | P | L | L | M |
| Transformer yard construction | | M | L | L | M | | | | | | L | | L | | M | | | | | P | | L | M |
| Substation construction | | L | L | L | M | | | | | | L | | L | | M | | | | | P | | L | L |
| Laying of transmission lines | L | L | L | L | L | | | | | | M | | M | | M | | | L | L | P | L | L | L |
| B. Operation Phase | | | | | | | | | | | | | | | | | | | | | | | |
| Vehicular movement carrying Officials on site during routine inspection, maintenance and operation of solar power plant | | L | L | | | | | | | | L | | L | | L | | | | | P | | | |
| Periodic maintenance of all solar modules (washing modules) | | | | | | | L | L | L | | L | | L | L | L | | | | L | P | | L | L |
| Maintenance of ancillary facilities such as store, yard, site office | | L | | | | | | | | | L | | L | | L | | | | | P | | | |
| Inspection of transmission lines | | | | | | | | | | | L | | L | | L | | L | | | P | | L | L |

| Description of Activities | PHYSICAL ENVIRONMENT | | | | | | | | | BIOLOGICAL ENVIRONMENT | | | | | | | SOCIO-ECONOMIC ENVIRONMENT | | | | | | |
|---|-------------------------------|-------------|---------------|---------------------------------|----------|---------------------------------|-----------------------|------------------------|----------------------|------------------------|----------------------------|-------------------------------|--|-----------------|-------------------|-------------|----------------------------|------------------------------------|--------------------------------|------------------------------------|-----------------------------------|-----------------------------|--------------------------------|
| | Aesthetics and Visual Impacts | Air Quality | Noise Quality | Top soil removal / Soil Quality | Land Use | Local Drainage and Physiography | Surface water quality | Ground Water Resources | Ground water quality | Terrestrial habitat | Ecological Sensitive Areas | Aquatic Habitat and resources | Conservation Importance & Resident Birds | Migratory Birds | Terrestrial Fauna | Agriculture | Domesticated Animals | Loss of land and livelihood source | Common Property Usage Conflict | Local Job and Economic Opportunity | Cultural and Behavioural Conflict | Community Health and Safety | Occupational Health and Safety |
| Security of solar power plant in operation | | | | | | | | | | | L | | L | | | | | | | P | L | | |
| Operation of solar power plant | L | | | | | | | | | | L | | L | L | L | | L?? | | | | | L | L |
| Electrocution & Collision Risk due to transmission line | | | | | | | | | | | M | | M | M | | | | | | | | M | M |

7.2 Impacts on Physical Environment

7.2.1 Air Quality

Pre-construction Phase

There will be **“No Impact”** on air quality in the pre-construction phase.

Construction Phase

During the construction phase, various project components such as site preparation, transmission cable laying, switchgear, approach roads, internal road network and porta cabin construction will require land clearing, leveling, excavation, grading activities, vehicle movement and DG set operation. This results in an increased level of dust and particulate matter emissions, which in turn will directly and temporarily impact ambient air quality. However, most of these project activities are expected to be restricted within the project boundary. Few POP factories are present in the surrounding areas of the project site, which may contribute to increased levels of particulate pollution in the locality. Since the impact is widespread, but for short duration and of low intensity, the impact can be termed of a **“Moderate”** significance. But the impact is reversible, and temporary in nature, if the mitigation measures are adopted.

Operational Phase:

During the operational phase, there would be minimal vehicular movement of about 10-15 nos. project vehicles for O&M purposes. Since a major source of emission into the ambient air will be absent during the operational phase therefore impact can be termed as **insignificant**.

Decommissioning Phase:

Air quality impacts in the decommissioning phase will be largely due to the following sources:

- ❑ Fugitive dust emissions from demolition, handling of demolition materials and transportation of materials;
- ❑ Vehicular emissions due to increased traffic movement on site and on the approach roads;
- ❑ Exhaust emissions from demolition machinery and other heavy equipment such as bulldozers, excavators and compactors; and
- ❑ Emissions from diesel generators required to be run for demolition purposes.

The biggest source of emissions in the decommissioning phase is the fugitive dust emissions from demolition activities. The demolition activities are likely to occur for a very small period of time (~3-4 months) and therefore the impact magnitude has been assessed as **“Low”**.

Mitigation Measure:

- ❑ All the project vehicles shall have a valid Pollution Under Control (PUC) certificate. Ensuring regular maintenance of project vehicles during construction and operational phase.
- ❑ Vehicles speed to be restricted to 20-30 km/hr on unpaved roads.
- ❑ Raw material should be covered with tarpaulin sheets during transportation and in storage areas.
- ❑ Water sprinkling on transportation road/ haul road to minimize the dust generation.
- ❑ Emission from the DG set should be monitored, and standard should be monitored as per the MoEF&CC/ CPCB guidelines.

- ❑ Fine materials should be transported in covered vehicles.
- ❑ Turn off the machineries when not in use.
- ❑ Restrict movement of vehicles on unpaved surface within the site.
- ❑ Water sprinkling in and around the project area to minimize the dust generation.

7.2.2 Noise Quality

The environmental impacts on ambient noise level are envisaged due to several project activities especially during the construction phase. Impacts on the ambient noise environment during the operational phase are minimal or negligible.

Pre-construction Phase

“**No Impact**” is anticipated during the pre-construction phase in noise quality.

Construction Phase

The major noise generating sources in the project are operation of vehicular traffic, and construction equipment like dozer, scrapers, concrete mixers, generators, pumps, compressors, rock drills, pneumatic tools, and vibrators. The project site is located amongst barren fields with no continuous noise generating sources in the vicinity of the project site. Assuming, the operation of these equipment is expected to generate noise in a range of 75 – 90 dB (A), which can be of **Moderate** significance.

Operational Phase:

Noise generating activity during operation of a solar power plant is very unlikely; therefore, impact in terms of increment in ambient noise level is not anticipated during the operational phase of the project.

Decommissioning Phase:

The sources of noise in the decommissioning phase include decommissioning activities, operation of DG sets and movement of vehicles. Similar impacts as during the construction Phase will be observed for ambient noise in the decommissioning phase and envisaged as “**Moderate Impact**”.

Mitigation measures

- ❑ Use DG set with acoustic enclosures.
- ❑ Restrict major noise generating activities during night time 10:00 pm to 6:00 am
- ❑ Provide personal protective equipment (e.g., Ear Muffs) to all workers wherever noise is generated due to machinery operation.
- ❑ Regular maintenance of project vehicles should be carried out.
- ❑ Regular maintenance of the construction equipment like dozer, scrapers, concrete mixers, generators, pumps, compressors, rock drills, pneumatic tools, and vibrators, that may generate noise if not maintained in a good condition.
- ❑ Plantation of green belt around the project boundary line that may contribute towards curbing noise generation.

7.2.3 Soil Environment

Pre-construction Phase:

“No Impact” on soil environment is envisaged during the pre-construction phase.

Construction Phase:

Soil compaction and erosion has been considered in the construction phase. The site clearance, excavation and access road construction will largely affect the top layers of the soil. Loss of top soil quality would have an impact on the agricultural productivity of the land but agricultural practice is not dominant in the project area. As there is no dense vegetation in the project area, site clearance for the site is anticipated to be minimal. Road quality in the region is good and therefore vehicles will be encouraged to utilize the established roads instead of going off-road. So, there is “Low” impact in soil environment in the construction phase.

Operation Phase

In the operation phase, soil compaction and erosion may occur due to heavy vehicle movement, which only happens during the occasional maintenance activities. Soil compaction for the operation phase has therefore been considered to be minimal.

Decommissioning Phase

In the decommissioning phase, soil compaction and erosion has been considered “Low”.

Mitigation Measures:

- ❑ Vehicles will utilize existing roads to access the site. Existing roads will be widened to have the width and turning radius to accommodate the necessary vehicles for the Project.
- ❑ Stripping of topsoil will be conducted only when required; and
- ❑ Stripping of topsoil, excavation and access road construction will not be carried out during the monsoon season or during heavy winds to minimize erosion and run-off.
- ❑ Topsoil that has been stripped should be stored for landscaping of the site.
- ❑ The stockpiles of soil should be kept moist to avoid wind erosion of the soil.
- ❑ The site should be restored at the end of the Project life cycle to pre-Project levels.

7.2.4 Alteration of Natural Drainage Pattern

Pre-construction Phase:

“No Impact” on natural drainage pattern is envisaged during the pre-construction phase.

Construction Phase:

During construction phase, site leveling activities, construction of underground reservoirs will be carried out which in turn may result in change of contour level and natural drainage system. There is no natural drainage in the project vicinity area though a man-made drainage, Indira Gandhi Canal is situated at a distance of 100 m towards north-west. Topographic changes will be limited to the Project footprint and there is “No Impact” on natural drainage channel.

Operation Phase

In the operational phase, there will be no such project activities which will cause any alteration of topography and natural drainage pattern, therefore **“No Impact”** is envisaged.

Decommissioning Phase

In the operational phase, there will be no such project activities which will cause any alteration of topography and natural drainage pattern, therefore **“No Impact”** is envisaged.

Mitigation Measures:

- ❑ Site levelling should be done with minimum alteration in contour level.
- ❑ Natural drainage pattern of the site should be followed as much as possible. It would be beneficial not to disturb the existing drainage pattern.
- ❑ The exit of runoff from the project site in the adjacent surrounding land area should be restricted.

7.2.5 Water Resources

In the construction phase, water requirement for the labours in rented houses is estimated to be about 27.3 KLD. The required water will be supplied through contractor. Additionally, water will also be required for construction activity. As discussed with the project proponent, it is known that they do not use groundwater for any activities in any stages of the project lifecycle.

Pre-construction Phase

“No Impact” is envisaged during the pre-construction phase in water resources.

Construction Phase

In the construction phase, water requirement for construction activities and labours in rented houses is estimated about 27.3 KLD. Further, construction activities will be limited only to 6 months' duration therefore a long-term water requirement is not expected. Considering the limited distribution of impact (within the site), short duration of activities and low intensity, significance of impact is assessed as **Low**.

Operation Phase

SRIPL-4 will purchase water for the solar plant through registered venders in the Project area. In operational phase, the water requirement for domestic requirements would be approximately 10.5 KLD for site personnel and security guards. Water will not be used for washing of solar panels, as robotic cleaning process will be adopted and reduce the pressure on groundwater table. Considering the distribution of the impact in within the site, long duration with low intensity, significance of impact is assessed as **Low**.

Decommissioning Phase

The impacts would be similar to the construction stage. It will be ensured that debris and other waste materials are not disposed in the surface water bodies. Considering the distribution of the impact in within the site, long duration with low intensity, significance of impact is assessed as **“Low”**.

Mitigation Measures:

- ❑ Robotic cleaning or Jet water spray method/ dry cloth wiping method would be adopted for minimizing the consumption of water.

- ❑ Ensure optimal usage of water viz., storage and reuse of wash water after module washing and plantation of low water requirement species.
- ❑ Water use and harvesting/recharging in the project will be a key performance indicator that will be monitored through the project O&M phase.

7.2.6 Solid/Hazardous Waste Disposal

Pre-construction Phase

“No Impact” is envisaged during the pre-construction phase in waste disposal.

Construction Phase:

Solid waste during the construction phase consists primarily of scraped building materials, excess concrete, and cement, excavated material, rejected components and materials, packing materials (pallets, crates, plastics etc.) and human waste. The broken solar panels will be properly packed and will be sent back to manufacturer/approved vendors. However, taking in consideration the impact within site, short duration and moderate intensity, the impact is considered as **low**.

Operation phase:

There will not be any substantial generation of solid waste, other than insignificant quantity of domestic waste, and broken solar panels. The broken solar panels will be stored separately in a designated area and subsequently sent back to the manufacturer. Considering the limited distribution of impact (within the site), long duration of activities and low intensity, significance of impact is assessed as **low**.

Decommissioning phase:

Different varieties of solar panels have different metals present in the semiconductor and solder. Solar panel wastes include heavy metals such as silver, lead, arsenic, cadmium, selenium that at certain levels may be classified as hazardous wastes. Some of these metals like lead and cadmium are harmful to human health and the environment at high levels.

Mitigation Measures:

- ❑ Use of proper segregation system so that food waste and recyclables viz. paper, plastic, glass, scrap metal waste etc. are segregated and stored in designated waste bins/ containers. The recyclables should be periodically sold to local recyclers.
- ❑ The excavated material generated will be reused for site filling and levelling to the maximum extent possible.
- ❑ Broken solar panels should be handled properly. It would be beneficial if broken solar panels are segregated and stored in a designated area for further processing for further disposal through authorized vendor.
- ❑ Spent oil from transformer will be collected and stored in paved and enclosed area and subsequently sold to SPCB authorized recyclers.
- ❑ Any hazardous waste generated will be disposed as per The Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016, and e-waste generated will be managed as per E-Waste (Management) Rules, 2022.

7.2.7 Changes in Land Use

Pre-construction Phase

As the impacts on land use are restricted in the construction phase, there was **“No Impact”** in the changes in land use in the pre-construction phase.

Construction Phase

During construction phase, impact on land is anticipated due to various activities such as site levelling and development of solar power plant. Land use classification will change into industrial land use after the development of solar power plant. Impact on natural drainage system may be anticipated. Further, impact will be of long term and permanent in nature, but impact will not be of adverse nature. As the proposed land is predominantly open scrubland, the impact on land is assessed as **“Moderate”**.

Operation Phase

“No Impact” on land use is envisaged during the operation phase.

Decommissioning Phase

“No Impact” on land use is envisaged during the decommissioning phase.

Mitigation measures

- ☐ changes in contour level should be avoided to the extent possible
- ☐ Maintain natural drainage system

7.3 Impact on Biological Environment

During the field survey, we encountered 6 of the target species, which are Egyptian Vulture, Greater Spotted Eagle, Indian Spotted Eagle, Steppe Eagle, Eastern Imperial Eagle and Tawny Eagle. Besides these, Long-legged Buzzard, Black-winged Kite, Common Kestrel, Shikra, Shaheen Falcon, and Eurasian Griffon were observed during the survey which are protected under Schedule-I of WPA, 1972.

The proposed site is approx. 137.54 km (NE) away from GIB priority area and approx. 660.69 m (NE) away from GIB potential area of Rajasthan. The predominant habitat of the study area is open scrubland along with agricultural land.

The project area may provide habitat to more than the above-mentioned birds and mammals during the project life cycle.

“No Impact” is envisaged on biological environment of the project area during the pre-construction and decommissioning phase.

The potential impacts envisaged on ecology during the construction and operation phase are enlisted below:

7.3.1 During Construction Phase

Impacts due to the Project-

Construction work, along with any related activities like vehicle movement, will only be transitory in nature. Some

endangered and vulnerable bird species, including migratory and resident species, were among the bird species observed during the survey.

- ❑ A minor loss of vegetation and habitat owing to site clearance, road construction, building, new power line construction etc. may take place because open scrubland and agriculture predominates throughout the landscape. There are few trees present in the proposed area.
- ❑ Site clearance, construction of access roads will have an impact on ground dwelling mammals, ground-nesting birds such as Lapwings, quails, francolins etc. and reptiles such as monitor lizards, snakes, and other species. Project activities are most likely to impact the behaviour and activity pattern of species (breeding etc.) in a specific season.
- ❑ The activities carried out during the construction often lead to water, noise, and light pollution. Noise and light pollution generated during the construction phase can cause shift in territories of mammals and noise can have negative impacts on burrowing animals such as rodents and some mammalian species.
- ❑ There can be cases of roadkill of mammals and reptiles on access roads due to movement of vehicles on these access roads.
- ❑ During construction phase, the workers may be involved in illegal hunting and trapping of birds such as Grey Francolins, Sandgrouse for food.

Significance of Impacts

The impact of site clearance will be low on vegetation and ground breeding birds and reptiles. With robust mitigation measures these impacts can be further reduced to insignificant.

Mitigation Measures

- ❑ The strict prohibition shall be implemented on trapping, hunting or injuring wildlife by subcontractors and shall bring a penalty clause under contractual agreements.
- ❑ As far as possible, abatement controls and measures to reduce emissions and pollutants (noise, erosion, waste) should be installed. Noise emitting equipment should be avoided during night. During the daytime, ambient noise quality standards should be maintained.
- ❑ Fencing for project area should be regularly monitored and repaired to avoid any mammal intrusions which may risk human-wildlife conflicts.
- ❑ Proper disposal and management of the kitchen and solid waste generated on the site should be undertaken.
- ❑ The footprints of the construction activities shall be kept to minimum to reduce disturbance to flora and fauna.
- ❑ In case of any active nest, in the project area, the nest should not be disturbed by any means and it should be immediately reported to headquarters who will take prompt action.
- ❑ To avoid roadkill of birds and animals, there should be a speed limit on vehicles and there should be no movement of vehicles on access roads at nighttime.
- ❑ Native tree species such as *Prosopis cineraria*, *Acacia leucophloea*, *Tecomella undulata*, *Ziziphus sp.*, *Calotropis procera* should be avoided to remove from the project sites as the species are native and have ecological, economic & cultural importance in the landscape unless there are no alternatives. Priority should be given to *Prosopis cineraria*/Khejdi tree.
- ❑ Construction workers and operation & maintenance staff should be informed and sensitized about the

important wildlife present in the area and actions needed to be taken in case of entry of wildlife in the project area.

- ❑ General awareness regarding wildlife shall be enhanced through trainings, posters, etc. among the staff and labourers.

7.3.2 During Operation Phase

Impacts due to the Project

- ❑ Birds are prone to collision with solar panels and/ or transmission lines. The canal and water treatment plant present near the proposed solar site can provide habitat to birds and mammals in future which can lead to a risk of collision and electrocution of birds.
- ❑ Long-legged Buzzard, Black-winged Kite, Shikra, Egyptian Vulture, Common Kestrel, Shaheen Falcon, and Eurasian Griffon were the conservation important species as per Schedule-I of WPA, 1972 were observed. Egyptian Vulture and Steppe Eagle are listed as “Endangered”; and Greater spotted Eagle, Tawny Eagle and Eastern Imperial Eagle are listed as “Vulnerable” in the IUCN Red List of threatened species. They are also at risk of collision with transmission lines.
- ❑ Project infrastructure can be used by birds such as raptors for nesting as well as hunting using transmission towers as vantage points. During these hunting events, they are at risk of colliding with the transmission lines which can lead to their death.
- ❑ PV solar energy facilities appear to be an “evolutionary trap” for birds who perceive them to be bodies of water on which they attempt to land. Insects, the prey of insectivorous birds, are also apparently attracted by this so-called “Lake Effect.” It might cause fatality or injury as birds contact the hard-solar panels or surrounding ground as they attempt to land mistaking it for water (Upton, 2014). Bird species preferring wetlands and migratory bird’s species such as Storks, Cranes, and other wader species are prone to collision with the solar panels.

Significance of Impacts

Overall impact during operation phase is anticipated to be “**high**”.

Mitigation Measures

- ❑ Forest department must be informed in case of any wildlife sighting or any incident involving wildlife.
- ❑ Covered conductors, daytime visual markers, visibility enhancement objects such as marker balls, bird deterrents, or diverters shall be installed on any wires and transmission lines to enhance visibility of towers/transmission lines for bird to avoid avian collision particularly crossing near the forest areas and near to water bodies.
- ❑ Regular monitoring of project areas and transmission towers for any birds nesting activity and terrestrial mammal breeding activities. Raptors also use transmission line structures as a vantage point to locate their prey. Staff should be trained and promoted to discourage the nesting/denning via regular monitoring and clearing the potential nesting areas. Markers for the aboveground wiring should be provided to prevent birds from perching there and from being electrocuted.
- ❑ Any dead animals/carcass shall be removed in time from the site so that it does not attract movement of raptors. In addition, the carcasses produced in nearby villages should be properly disposed (underground) to avoid vultures and others scavengers to be attracted towards the project site.

- ❑ In case of any active nest, in the project area, the nest should not be disturbed by any means and it should be immediately reported to headquarters who will take prompt action.
- ❑ Moreover, to minimize effect of “Lake effect”, visual frightening techniques like “Scare crow” may be considered to frighten any bird trying to land on panels, and prevent birds from landing.
- ❑ Training of local staff and security guards for spotting of bird carcass and reporting the same. This will help to ensure the strategic actions when the species are spotted in the region.
- ❑ A comprehensive monitoring of bird assemblages and terrestrial mammals should be conducted which should take in account seasonal variation, fly paths and their behavior.
- ❑ In order to avoid roadkill by vehicular collision certain precautions should be taken such as:
 - ◆ Maximum speed limit should be decided to curb the roadkill of animals in the project area, especially during night and early morning as mammals and reptiles are active during the night and tend to cross the road at night.
 - ◆ Speed breakers can be constructed to limit the speed of the vehicle to reduce road kills.
 - ◆ The edges of roadside bushes should be removed to increase visibility so that drivers can avoid accidents as well as increase the shyness for animals to cross the roads.
 - ◆ General awareness regarding wildlife shall be enhanced through trainings, posters, etc. among the staff and labourers.

7.4 Impact on Socioeconomic Environment

Socio-economic impact assessment is designed to assist communities in making decisions that promote long- term sustainability, including economic prosperity, a healthy community, and social wellbeing. To assess and understand the social impacts associated with the project, social indicators have been identified and analyzed.

7.4.1 Impacts during Pre-constructional Phase

Development of proposed project involves acquisition of land for solar panel installation, site office, PSS, Transmission Line and administration and other facilities. And these activities will impacts on socio economic condition of area.

Mitigation Measures:

- ❑ Avoid sourcing **Schedule V** area and **ST** land for the project
- ❑ Avoid procuring highly fertile land.
- ❑ Avoid procuring land near the cultural or archaeological heritage area.
- ❑ Follow all applicable state, national and international laws and regulations of land acquisition process for the proposed project.
- ❑ Monitor the entire land acquisition process so that neither physical nor economic displacement would occur in the project area.
- ❑ To ensure a transparent process for acquiring land, in consultation with all the stakeholders and local governing bodies.
- ❑ To provide fair compensation to the families who are affected or whose land has been acquired or livelihood has been affected, because of the land acquisition.

7.4.2 Loss of Land/Livelihood

Construction Phase

SRIPL-4 is implementing of 300 MW Solar Power Project at Jaimalsar village, Bikaner district of Rajasthan. The project site is predominantly plain land with moderately plain, predominantly open scrubland and few agriculture patches. Land in the project influenced area is predominantly unused sandy soil. Otherwise, there is hardly any agricultural activity reported due to the nature of desert climate and scanty rainfall throughout the year as confirmed by the landowners as well as sarpanch. It has also been observed that, only a few isolated patches of agriculture as reported.

Hence, considering all the above points neither physical nor economical displacement is confirmed during site visit. Hence, taking the distribution of impact within site for short duration and medium intensity, the impact significance can be termed as '**Low**'.

Mitigation Measures:

- ❑ Stakeholder engagement plan and community development plan should be implemented for project involved villages and if possible, it may extend up to the adjacent areas.
- ❑ It should be ensured that maximum employment is given to the locals w.r.t their capacity and skills.
- ❑ Grievance Redressal Mechanism should be followed onsite. Complaints from the locals should be timely registered, investigated and resolved in a transparent manner.

Operation Phase:

- ❑ There would be no impact on land during operation phase. There would be a requirement of security guards for plant site, hence local employment opportunity would be generated and this would be a positive impact of the project as it would enhance the economic opportunities to the locals.

Mitigation Measures:

- ❑ Based on need assessment, CSR initiatives should be implemented in the project affected villages.
- ❑ Community development plan should be implemented.
- ❑ It should be ensured that employment is given to the locals w.r.t their capacity and skills, wherever possible.
- ❑ Grievance Redressal Mechanism (GRM) should be followed onsite. Complaints from the locals should be timely registered, investigated and resolved.

7.4.3 Community Engagement

Construction Phase:

There are chances that the local community's interest may impact with any sort of undue activities. Considering the future possibilities of such impacts, the impact significance can be termed as **Moderate**.

Mitigation Measure:

During the projects construction phase efforts will be made to engage with the community through the

Panchayati Raj Institution representatives and key identified leaders of the community at project site in Jaimalsar Village of Bikaner district.

7.4.4 Occupational Health & Safety Impact

Construction Phase:

Occupational Health & Safety Hazards for workers:

Occupational Health and safety hazard associated with project activities (during construction) in Solar Power Plants are identified as follows:

- ❑ **Electrocution and firing due to short-circuit:** It should be ensured that proper training be given to workers before they initiate any project activity as well as the workers must wear their appropriate Personal Protective Equipment (PPE) viz. helmets, safety jackets, safety shoes, goggles, gloves etc. as per their nature of work involved.
- ❑ Possible injuries associated with working with transmission line laying
- ❑ Accidents during cutting, chipping and piling
- ❑ **Physical injuries:** These can occur when workers involved in loading/unloading activities don't adhere to proper ergonomics discipline. Injuries like muscle strain, ligament tear, slip disc can occur which may prove to be fatal.
- ❑ **Diseases due to unhygienic condition:** It should be ensured that proper and adequate number of toilets should be constructed for the labourers so that hygienic conditions prevail in the site area.

Taking the distribution of impact as within site, duration as short and intensity as moderate, the impact significance can be taken as **Moderate**.

Mitigation Measures:

- ❑ All material will be arranged in a systematic manner with proper labelling and without protrusion or extension onto the access corridor.
- ❑ Loading and unloading operation of equipment should be done under the supervision of a trained professional.
- ❑ Proper PPEs should be provided to workers handling welding, electricity and related components. Workers handling electricity and related components shall be provided with shock resistant gloves, shoes and other protective gears.
- ❑ There should be periodic training to educate the workers for proper use of PPE's.
- ❑ Fire extinguishing equipment should be provided in adequate number on site to handle any possible fire outbreaks
- ❑ An accident reporting and monitoring record should be maintained.
- ❑ Display of phone numbers of the city/local fire services, etc. at site should be done.
- ❑ There should be arrangements for hygienic and scientific sanitation facilities for all the labourers working in the site.
- ❑ There need to have enclosed and exclusive provision for women to protect the privacy and dignity of the women involved in the work force.
- ❑ Provision of the Contract Labour Rules, 1971 require the operator of a construction site to provide adequate sanitation facilities to worker within the site premises.

- ❑ SRIPL-4 should inform the labour about the Grievance Redressal Mechanism (GRM) by which they can inform about any grievances.
- ❑ SRIPL-4 should ensure that labour receive training on health and safety issues involved in the project.
- ❑ SRIPL-4 should inform the labour about Emergency Preparedness Plan (EMP) and communication system to be followed during emergency.

Operation Phase: Occupational Health & Safety Hazards for workers

Occupational Health and safety hazard associated with project activities (during operation) in Solar Power Plants are identified as follows:

- ❑ Electrocution/ Electrical Shocks: These may occur when the skin comes in contact with live power lines etc. The severity of the burn depends on voltage, current, time of contact etc.
- ❑ Firing due to short-circuit
- ❑ Diseases due to unhygienic condition

The impact significance can be taken as **Moderate**.

Mitigation

- ❑ Provide and ensure wearing of personal protective equipment's viz., gloves, helmets, earplug, safety belt etc.
- ❑ Ensure effective work permit system for critical activities such as electrical work and working at height
- ❑ Prepare emergency communication system and emergency preparedness plan.
- ❑ Ensure proper sanitation facilities.

7.4.5 Corporate Social Responsibility

Construction Phase

To empower the local community through different development and support programmes the project proponent should take some initiatives for Community Development Plan under their CSR Policy in the project villages to address any existing gaps towards their basic development.

The project proponent will develop their own CSR Policy in alignment with its CSR vision, principles and values, for delineating its responsibility as a socially and environmentally responsible corporate citizen. The Policy will lay down the areas of intervention, principles and mechanisms for undertaking various programs in accordance with Section 135 of the Companies Act 2013.

Operation Phase

The CSR activity must continue during Operation Phase to comply with the need and requirement of the areas development and to avoid any conflict during that phase.

7.4.6 Impact on Cultural/ Archaeological Site

So far it was informed that there is no designated or non- designated heritage site within the buffer zone of the site. During field visit and stakeholder consultation process, it was also confirmed the absence of any archaeological site within the vicinity of the project area, so, there is no question of impact arising from the

project, on the heritage sites. In case of any accidental discovery of artifacts during construction activities, chance find procedure is required to be planned and implemented accordingly.

No impact is envisaged both during construction and operation phase.

7.5 Climate Risk Assessment

This section forms the Climate Change Risk Assessment (CCRA) for the project to ascertain on-going and expected changes in climate patterns and an evaluation of the climate related physical risks and transitional risk (as appropriate).

The CCRA provides a high-level review of the following:

- ❑ The current and anticipated climate change risks (transition and/ or physical as defined by the Task Force on Climate – related Financial Disclosures (TCFD)) of the Projects operations.
- ❑ The plans, processes, policies and systems required for the Project to manage these risks (i.e., to mitigate, transfer, accept or control).

The assessment will also include a review of the project's compatibility with India's national climate commitments. IFC's mission is to promote sustainable private sector investment in developing countries, helping to reduce poverty and improve people's lives. Moreover, the project proponent is following the project in line with IFC's PS-3 principle.

7.5.1 Applicable Regulation

The Equator Principles (EPs) are a financial industry benchmark for determining, assessing and managing environmental and social risks of projects. There are 10 EPs which require consideration when developing a project with international funding. The latest revision (EP 4)⁶ came into effect in October 2020. The updates included a requirement to undertake a CCRA for all Category A and, as appropriate, Category B project. Due to the nature, location and scale of the project, it is considered to fall under **"Category B"**.

Physical risks include increased extreme weather events, changes in precipitation patterns, rising mean temperatures, sea level rise etc. Transitional risks are defined as policy, technology and market, legal and reputational risks. The CCRA is required to assess potential physical risks and transition risks (the latter only for projects emitting more than 100,000 T CO₂ per year).

7.5.2 Risk Assessment

The revised EPs (EP 4) introduced the requirement to carry out a CCRA aligned with the Climate Physical Risk and Climate Transition Risk categories set out in the recommendations of the Task Force on Climate Related Financial Disclosures (TCFD).

The risk assessment reviews the climatic patterns over the project location and surrounding area over recent years including changes in temperature, precipitation, wind and hazardous climate events. Projected trends are set-out for the coming years up to 2099 with a risk evaluation undertaken detailing physical risks in line with TCFD recommendations.

7.5.3 Impact due to climate change and variability

ADB screening tool has been designed to consider climate induced risks and natural hazards of geophysical origin. This screening tool helps to expand the ADB's risk assessment capacity when its policy framework and

project life cycle operations. ADB has developed this risk screening tool to rapidly assess impacts and associated risk at the project preparation stage. The checklist presents a set of questions which helps to analyze the risk value of the project.

Table 7-1: Checklist for Preliminary Climate Risk Screening

| Risk Assessment Category | Risk Value | Total | Remarks |
|--|---|-------|--------------------------------------|
| Predetermined impacts and risk factors- | | | |
| Which physical environment best describes the project area? | Using ADB draft screening tool data, add the score for the physical environment that best describes the project location. | 2 | Arid/Semi-arid & Desert environment. |
| Categorize sectoral risk of project. | Add risk value from 0-3. | 2 | Solar power project (Energy sector) |
| List individual hazards that may impact project. | Add risk value of 1 for each natural hazard (up to a maximum of 4). If hazards unknown, use 3 as a risk value. | 3 | Earthquake, sand storms, drought |
| Estimate the number of people in the project area "exposed" to risk after project is completed. | For less than 100 score =0, 100-1000 = 1, 1000-10000 score =2, greater than 10000 score = 3. | 0 | |
| Stakeholder engagement and risk knowledge | | | |
| Do the projects proponents have the institutional capacity to successfully incorporate, manage, and deliver risk management measures to the project? | Good capacity, risk value = 0; poor capacity, risk value =1; very poor capacity, risk value = 2. | 0 | |
| Will potentially hazard impacts on communities, gender, indigenous peoples, or the social dimensions of risk be considered in the concept paper? | Yes / No (if No or unsure, add risk value = 1) | 0 | |
| Are there any demographic or socio-economic variables (i.e., population increase, settlement patterns, biophysical and environmental conditions) that may increase exposure to hazard impacts? | Yes / No (if yes or unsure, add 1 risk value) | 0 | |
| Is it likely that executing agency stakeholders have some practical knowledge of risk reduction measures for the project? | Yes / No (if No or unsure, add risk value = 1) | 0 | |
| Will the project reduce, leave unaltered, or increase the risk to project beneficiaries? | Reduce risk, score = 0; leave risk unaltered, score = 1; increase risk, score = 2. | 0 | |
| Will the project reduce, leave unaltered, or increase the risk to the localized environment/ project dependent ecosystem? | Reduce risk, score = 0; leave risk unaltered, score = 1; increase risk, score = 2. | 0 | |
| Do country/institutional policies or environmental laws significantly promote | Yes / No (if No or unsure, add risk value = 1) | 0 | |

| Risk Assessment Category | Risk Value | Total | Remarks |
|---|---|-------|----------|
| risk management measures? | | | |
| Does the project require a risk expert to introduce risk reduction measures in project design, implementation, or operations and maintenance? | No= 0 Yes =1 or 2 based on assessment of the level of risk | 0 | |
| Total Risk Value (range 0 to 25) | High Risk: 17-25 Moderate Risk: 8-16 Low Risk: 0-7 | 7 | Low Risk |

Low Risk (0-7): this range indicates the project proposal has considered risk management measures to minimize hazard impacts and associated risks, and that the project may therefore have a potentially higher threshold against current and anticipated risks.

Moderate Risk (8-16): project exposure to risk is likely. It is recommended that risk reduction measures be incorporated into project design and activities.

High Risk (17-25): project exposure and vulnerability to potential risks is very likely. It is highly recommended that risk reduction measures be incorporated into project design and activities, and that a further review of the project proposal be undertaken.

7.5.4 Mitigations

Mitigation for Solar Modules:

The main climate impacts on photovoltaic systems are likely to be due to temperature increase, increased cloud cover, and extreme events. Mitigation measures include the following:

- ☐ Assured structures are strong enough to withstand higher winds (although roof-mounted structures can't be more robust than the building on which they are located).
- ☐ Use designs that improve passive airflow beneath photovoltaic mounting structures, reducing panel temperature and increasing power output.
- ☐ For locations where temperature increases or significant heat waves are expected, choose modules with more heat – resistant photovoltaic cells and module materials designed to withstand short peaks of very high temperature.
- ☐ Where solar energy is likely to become more diffuse with changes in cloud cover, rough surfaced photovoltaic modules are more efficient, and output can be improved under overcast conditions by selecting an appropriate tilt angle.
- ☐ Where clouds are likely to pass over modules more quickly, consider micro-inverters for each panel to improve stability and increase power output.

Mitigation for Transmission and Distribution:

Improving the resiliency of electricity infrastructure involves preparing T&D (Transmission & Distribution) systems to continue operating despite damage. Adaptation efforts should also increase the system's ability to return to normal operations rapidly if outages do occur. Specific measures include the following:

- ☐ Higher design standards for distribution poles and towers
- ☐ Change routes of overhead lines along roads away from trees, and use covered and/or insulated conductors and more underground cables, especially in wooded areas
- ☐ Where lightning strikes may increase, include lightning protection (earth wires, spark gaps) in the distribution network
- ☐ Design improved flood protection measures for equipment mounted at ground level in substations
- ☐ Antennae, switch boxes, aerials, overhead wires, and cables from precipitation; wind; unstable ground conditions; and changes in humidity.

Other Mitigations:

To reduce GHG emissions during the construction phase, the following steps can be considered:

- ☐ Securing a grid connection rather than use of generators.
- ☐ For construction, wherever possible use recycled materials.

It is envisaged that insurance could cover these extreme events with engineering solutions also possible (such as modification to the cooling system) thereby reducing moderate to high impacts to low.

7.6 Human Right Risk Assessment (HRRA)

As per UN guiding principle of Human Rights Risk assessment, it is an ongoing risk management process that a reasonable and prudent company needs to follow in order to identify, prevent, mitigate and account for how it addresses its adverse human rights impacts. It includes four key steps:

- ☐ Assessing actual and potential human rights impacts;
- ☐ Integrating and acting on the findings;
- ☐ Tracking responses;
- ☐ Communicating about how impacts are addressed

7.6.1 Management and Mitigation Strategy

For clients to get ahead of expectations and fulfil their obligations under the UNGPs, they need to understand the four key roles business has in providing remedy:

| SI. NO. | BUSINESS ROLE | EXPECTATION |
|---------|---|---|
| 1. | <i>Respect Human Rights</i> | Businesses have a responsibility to respect internationally recognized human rights. This includes not causing, contributing to, or being directly linked to an adverse impact on human rights. |
| 2. | <i>Provide or Cooperate in Remediation</i> | When businesses cause or contribute to harms, they should provide or cooperate in remediation through legitimate processes. |

| SI. NO. | BUSINESS ROLE | EXPECTATION |
|---------|--|--|
| 3. | <i>Prevent or Mitigate Harm</i> | Businesses should take proactive measures to prevent or mitigate human rights harms before they occur rather than relying on paying compensation if/when harm has been done. |
| 4. | <i>Establish or Participate in Effective Grievance Mechanisms</i> | Companies should provide effective grievance mechanisms for potentially impacted stakeholders. Grievance mechanisms must satisfy all effectiveness criteria under UNGP 31 and never be used to preclude access to remedy. |

7.6.2 Monitoring and Evaluation

Addressing Human Rights Risks in (Renewable Energy) Supply Chains

- ❑ **Strengthening Human Rights Due Diligence (HRDD) Practices:** Carrying out HRDD along their value chain, collaborating with business partners and local stakeholders to align expectations and to develop, implement, and verify proactive measures to prevent and mitigate human rights impacts.
- ❑ **Engaging suppliers:** Working closely with suppliers to strengthen due diligence efforts and raising supplier awareness of social and environmental expectations, integrating sustainability metrics into supplier contracts, and asking mining companies to undertake sustainability audits to verify their practices.
- ❑ **Disclosing progress:** Disclosing information around who our suppliers are, material sourcing locations, and actions taken to mitigate risks.
- ❑ **Understanding local contexts:** No longer reliant on publicly available reporting, we are taking more proactive approaches to understand impact on the local level across their supply chains. Efforts include partnering with peers, civil society, and NGOs to implement independent studies to assess issues and impacts at key sourcing locations.
- ❑ **Increasing traceability of mineral sourcing:** Increasing the traceability of mineral sourcing across the value chain by using blockchain technology.

7.6.3 Environment And Social Management Plan

An Environment and Social Management Plan has been developed following the delineation of impacts and mitigation measures. These measures will be adopted by the project proponent and imposed as conditions of contract of the sub-contractor employed for respective phases of the solar power project. The mitigation measures suggested during operation will be made part of the regular maintenance and monitoring schedule.

The ESMP includes the following:

- ❑ Mitigations suggested for adverse environmental and social impacts and associated risks;
- ❑ Institutional arrangement - management tools and techniques for the implementation of environmental impacts and risk mitigations;

- ❑ Monitoring and reporting of requirements and mechanisms for the effective implementation of the suggested mitigations;
- ❑ Monitoring arrangements for effective implementation of suggested mitigations for the project; and
- ❑ Reporting requirement to the regulatory agencies and funding institutes.

Table 8-8: Overall impact assessment

| Phase of the Project | Risk Assessed |
|----------------------|---------------|
| Construction | No Impact |
| Operation | No Impact |

Table 8-9: Overall Project Risk Assessment

| Environment and Social Parameters | Impact During Construction Phase | Impact during Operation Phase |
|--|----------------------------------|-------------------------------|
| Establishment of Labor Camp | Moderate | No Impact |
| Engagement of labour | Moderate | Positive Impact |
| Occupational Health and Safety | Moderate | Moderate |
| Community engagement | Moderate | No impact |
| Common Property Resources | No impact | No impact |
| Employment generation | Positive Impact | Positive Impact |
| CSR | Positive Impact | Positive Impact |
| Loss of Land/ Livelihood | Moderate | Positive Impact |
| Cultural/ archaeological site | No impact | No impact |
| Laying of Transmission Lines | Minor | Minor |
| Rainfall | No Impact | No Impact |
| Alteration of natural drainage pattern | Low | No impact |
| Water resource (Surface/ Ground) | Low | Low |
| Surface Water Quality | No impact | No impact |
| Ambient Air Quality | Moderate | No Impact |
| Ambient Noise Level | Moderate | No Impact |
| Solid and Hazardous waste | Low | Low |
| Visual Effect | Low | Low |

8. Environmental & Social Management Plan

SRIPL-4 is committed to implement an effective Environmental and Social Management Plan (hereinafter referred as ESMP) to continuously manage and communicate the potential social and environmental impacts and risks imposed on the project employees (direct and indirect) and the local communities residing in the immediate vicinity of the project area.

The ESMP is comprised of some site-specific management plans viz. Emergency Management Plan, Waste Management Plan, Storm Water Management Plan, Environmental Monitoring Plan, Traffic Management Plan and Social Development Plan for the SRIPL-4, 300 MW Solar Power Plant at Bikaner tehsil in Bikaner District of Rajasthan. The management plans will be executed through Environmental Social Management System.

Table 8-1: Environment and Social Impact and Mitigation Plan

| SN | Aspect | Impact | Impact Intensity without mitigation | Action | Impact Intensity with mitigation | Monitoring/ training Requirement | Responsibility |
|---------------------------|---|--|-------------------------------------|--|----------------------------------|--|--|
| CONSTRUCTION PHASE | | | | | | | |
| A | Physical Environmental Management Plan | | | | | | |
| 1 | LANDSCAPE AND VISUAL | Impacts on Visual and landscape envisaged due to presence of machinery during the construction phase. | LOW | <ul style="list-style-type: none"> Ensure that all the machineries in the construction site will be kept in an orderly manner at the end of each working day. Construction machinery, equipment, and vehicles not in use will be removed in a timely manner to the extent possible. Collection and disposal of waste materials will be done on regular basis at the end of each working day. | NO IMPACT | Instructions to be given to the contractor or these can be a part of contract document. | Contractor under the supervision of SRIPL-4 Personnel |
| 2 | GROUND WATER ABSTRACTION | Construction activities will be limited only to 6-9 months' duration therefore a long-term water requirement is not expected. The water will be supplied to the project site by authorized vendor during the construction period. Considering the limited distribution of impact (within the site), short duration of activities and low intensity, significance of impact is assessed as Low. | LOW | <ul style="list-style-type: none"> During construction phase, water is being supplied by authorized vendor for which no permission needed from CGWB by the SRIPL-4. Construction of rainwater harvesting pit to recharge the ground water is recommended. | LOW | Maximum efforts should be made to reuse and recycle of waste/ used water to reduce water demand of the proposed project. | Project Developer/ Contractor under the supervision of SRIPL-4 Personnel |
| 3 | GROUND WATER QUALITY | <ul style="list-style-type: none"> Wastewater from toilets constructed for site office & labour camp can contaminate groundwater. Any material spill like diesel or lubricants can contaminate ground water. | LOW | <ul style="list-style-type: none"> Storage of oil shall be undertaken on paved impervious surface and secondary containment shall be provided for fuel storage tanks. Hazardous waste shall be stored with secondary containment and spill proof impervious surface. Adequate drainage facility for easy escape of surface run-off from the project site shall be provided Leak-proof holding tanks for sanitary wastewater shall be constructed to protect the seepage of wastewater. Wastewater holding tanks / septic tank shall be located at more than 500 m away from bore wells or any other underground water holding tanks. It shall be ensured that the wastewater does not find its way into surface waters or water wells. | LOW | <ul style="list-style-type: none"> Machinery and vehicles shall be thoroughly checked for the presence of leaks if any; Storage of oil on site to be checked Storage of sanitary wastewater shall be removed / cleaned periodically to avoid any leakage. | |
| 4 | AIR QUALITY | Generation of fugitive Dust due to movement of vehicles inside the project area during construction period and Emission from Diesel Generators | MODERATE | <ul style="list-style-type: none"> Vehicles speed to be restricted to 20-30 km/hr on unpaved road. This will reduce dust emission. Raw material shall be covered with tarpaulin sheet during transportation and in storage area. Water shall be sprinkled on the unpaved road/ haul road to minimize the dust generation wherever required. All the project vehicles shall have valid PUC certificate. | LOW | Training of drivers to be conducted once in two months. | Project Developer/ Contractor under the supervision of SRIPL-4 Personnel |

| SN | Aspect | Impact | Impact Intensity without mitigation | Action | Impact Intensity with mitigation | Monitoring/ training Requirement | Responsibility |
|----|--------------|--|-------------------------------------|--|----------------------------------|---|--|
| | | | | <ul style="list-style-type: none"> □ Ensure regular maintenance of project vehicles during construction and operational phase. □ Emission standard of the DG sets operated in the project area shall be maintained as per MoEFCC/ RSPCB guidelines. □ DG sets preferably placed away from settlement area. □ Exhaust emissions of construction equipment shall be adhered to emission norms as set out by MoEFCC/ CPCB/ SPCB. | | | |
| 5 | SOIL QUALITY | Topsoil Loss | LOW | <ul style="list-style-type: none"> □ Since topsoil conservation is essential, appropriate storage of topsoil in an already designated area and shall be maintained to prevent its loss in high wind and runoff. Only covered transportation of topsoil within project site shall be allowed. □ Use topsoil at the time of plantation on the approach road. □ Construction debris shall be reused in paving on site approach road to prevent dust generation due to vehicular movement | NO IMPACT | <ul style="list-style-type: none"> □ The workforce shall be sensitized to handling and storage of hazardous substances viz. fuel oil, machine oil/ fluid etc. □ The workers engaged in handling hazardous substances shall be briefed about the possible hazards and the need to prevent contamination. | Project Developer/ Contractor under the supervision of SRIPL-4 Personnel |
| | | Soil Contamination | | <ul style="list-style-type: none"> □ In case of any accidental oil spill, the soil of that area shall be taken out and stored separately for disposal as hazardous waste. □ Store hazardous material (like used oil) in isolated room with impervious surface. □ Filling and transfer of oil to and from the container shall be on impervious surface. | | | |
| 6 | NOISE LEVEL | <ul style="list-style-type: none"> □ Impacts on noise level at the project site and its surrounding area envisaged due to vehicular movement to deliver construction materials and solar plant parts. □ Noise from DG sets. □ Construction noise generated from using of machinery, and concrete mixing. Considering all the sources at a time, noise level may reach moderate level. | MODERATE | <ul style="list-style-type: none"> □ Regular maintenance of construction machinery and equipment shall be carried out to ensure noise emissions are maintained at design levels. □ Integral noise shielding to be used where practicable and fixed noise sources to be acoustically treated, for example with silencers, acoustic louvers and enclosures. □ Keep stationary source of noise such as DG sets (during construction phase) at farthest point from the settlements. □ Restrict major noise generating activities during night timer 10:00 pm to 6:00 am □ Provide personal protective equipment to workers working near DG sets and other high noise source. □ Local communities need to be informed about the vehicular movement before start of heavy vehicle carrying materials and machines to site. Sensitive locations shall be identified and avoided as far as possible from the route | NO IMPACT | Noise emissions of construction equipment shall be adhered to emission norms as set out by MoEF&CC/ CPCB | Project Developer/ Contractor under the supervision of SRIPL-4 Personnel |

| SN | Aspect | Impact | Impact Intensity without mitigation | Action | Impact Intensity with mitigation | Monitoring/ training Requirement | Responsibility |
|----|---|---|-------------------------------------|---|----------------------------------|--|--|
| | | | | and if unavoidable, drivers shall be informed to restrict speed at those locations. <input type="checkbox"/> Diesel generator sets, if used; will adhere to noise standards of MoEF&CC. | | | |
| 7 | SOLID WASTE | Contamination of land | LOW | <input type="checkbox"/> Designated land within the project area shall be allotted for the disposal of solid waste. <input type="checkbox"/> Distribute appropriate number of properly contained litter bins and containers properly marked as "Municipal Waste". <input type="checkbox"/> Solid waste shall be collected and disposed of from the project site regularly to avoid any decomposition of solid waste. This will help to restrict the generation of foul smell from the designated site. <input type="checkbox"/> Domestic and construction waste like recyclables viz. paper, plastic, glass, scrap metal waste etc. shall be properly segregated and stored in designated waste bins/containers and periodically sold to local recyclers. <input type="checkbox"/> Awareness among the project workers/ contractors shall be increased regarding management of solid waste. | NO IMPACT | Periodic EHS audits shall be conducted to monitor. | Project Developer/ Contractor under the supervision of SRIPL-4 Personnel |
| 8 | CHANGE IN LOCAL TOPOGRAPHY | <input type="checkbox"/> Alteration in natural drainage pattern. <input type="checkbox"/> This is a dry region with no surface water drainage. | LOW | <input type="checkbox"/> Considerable alteration of contour level shall not be allowed. <input type="checkbox"/> Alternatives will be provided to collect surface runoff from the project site during the monsoon period. <input type="checkbox"/> Exit of runoff from the project site in the adjacent areas shall not be allowed. <input type="checkbox"/> Storm water drain shall be designed considering the natural contour level. <input type="checkbox"/> Site preparation activities shall be designed to avoid any significant elevation of the land or blocking or altering natural drainage channels in the project site. <input type="checkbox"/> Site preparation and development shall be planned only after a detailed drainage plan has been prepared for site. <input type="checkbox"/> If channels/drains get blocked due to accumulation of soil / waste materials, it will be ensured that they are cleaned especially during monsoon season. | NO IMPACT | The drainage patterns of the area will be maintained. | Project Developer/ Contractor under the supervision of SRIPL-4 Personnel |
| B | Ecological Environmental Management Plan | | | | | | |
| 9 | ECOLOGY AND BIODIVERSITY | <input type="checkbox"/> The project site and transmission route are devoid of any kind of higher order vegetation, no forest patch or other environmentally sensitive features along the proposed transmission route. Vegetation is very sparsely distributed consisted of mainly thorny species | LOW | <input type="checkbox"/> All project activities shall be undertaken with appropriate noise mitigation measures to avoid disturbance to faunal population in the region. <input type="checkbox"/> Movement of construction and transport vehicles shall be restricted to dedicated paths to minimize any harm to small animals within the site. <input type="checkbox"/> Transportation of construction material shall be restricted | LOW | <input type="checkbox"/> Weekly carcass monitoring to be carried out in an around the project area. <input type="checkbox"/> Awareness training to be conducted for the workers regarding presence of conservation importance | Project Developer/ Contractor under the supervision of SRIPL-4 Personnel |

| SN | Aspect | Impact | Impact Intensity without mitigation | Action | Impact Intensity with mitigation | Monitoring/ training Requirement | Responsibility |
|----|--|--|-------------------------------------|--|----------------------------------|---|--|
| | | <p>throughout the transmission route.</p> <ul style="list-style-type: none"> ❑ The construction activities will lead to loss of scrub vegetation. ❑ Increase in vehicular movement in the proposed study area can also lead to death of reptiles and mammals due to road kill. | | <p>to daytime hours in order to minimize the man – animal conflict.</p> <ul style="list-style-type: none"> ❑ Speed of the vehicle should be controlled in and around the project area to minimize the accidental death of faunal population. ❑ General awareness regarding wildlife among the construction workers shall be enhanced through putting signage, posters, among the staff and labourers. ❑ Temporary barriers shall be installed on excavated areas. | | <p>species including eagles, vultures & other mammals in the project area.</p> <ul style="list-style-type: none"> ❑ Vehicle speed and use of dedicated pathways shall be checked weekly. ❑ Signages depicting GIB & other key animals as listed in the study should be placed for generating awareness. | |
| C | Social Management Plan | | | | | | |
| 1 | ENGAGEMENT OF LOCAL AND MIGRANT LABOUR | Conflicts between labour and contractor | MODERATE | <ul style="list-style-type: none"> ❑ Employment will be provided to local people wherever possible, especially as unskilled construction workers and security guards ❑ SRIPL-4 shall include clause or provisions related with non-engagement of forced and child labour, gender equity, non-discrimination on employment and opportunity and freedom to express their view in contractor's agreement and HR policy ❑ SRIPL-4 through its contractors shall ensure that labour is being adequately paid by contractors. Also ensure that wages are being paid as per the requirement of minimum wages act ❑ SRIPL-4 shall include clause to ensure access of necessary basic amenities and facilities such as drinking water, kitchen, toilet and crèches (for female workers children) ❑ SRIPL-4 shall conduct internal audits as when required to monitor the performance of contractor. ❑ SRIPL-4 through the contractor inform the labour about emergency preparedness plan and communication system to be followed during emergency situation. ❑ SRIPL-4 through contractor shall ensure that labour receive training on health and safety issues involved in the project. | LOW | <ul style="list-style-type: none"> ❑ Periodic audits should be conducted to monitor the contractor engaging the labourers are following proper code of conduct ❑ SRIPL-4 to ensure that minimum wages are paid to the workers ❑ Grievance redressal mechanism shall be in place and workers shall be made aware to register their grievances ❑ All health & safety protective measures shall be provided to workers | Project Developer/ Contractor under the supervision of SRIPL-4 Personnel |

| SN | Aspect | Impact | Impact Intensity without mitigation | Action | Impact Intensity with mitigation | Monitoring/ training Requirement | Responsibility |
|----|---|--|-------------------------------------|---|----------------------------------|--|---|
| 2 | LABOUR ACCOMMODATION (Onsite and offsite Labour camp) | Conflicts between labour and local community | MODERATE | <ul style="list-style-type: none"> ❑ SRIPL-4 to setup onsite labour camp for labours employed through contractors to restrict the interaction of migrated labour with local community as to avoid any conflict. ❑ Labour camp accommodation should be in compliance to IFC worker accommodation guidelines. | LOW | <ul style="list-style-type: none"> ❑ All requisite provisions should be provided to workers in labour camp as per IFC worker accommodation guidelines. ❑ Drinking water should be tested before supplying to labourers. ❑ Grievance Redressal mechanism should be followed and monitored. | Project Developer/ Contractor under the supervision of SRIPL-4 Personnel |
| 3 | LAND PROCUREMENT | <ul style="list-style-type: none"> ❑ Loss of Land, Livelihood ❑ Obstruction to places of relevance ❑ Manhandling Natural Resources of Utility | MODERATE | <ul style="list-style-type: none"> ❑ All the land required will be allocated to SRIPL-4 the prime project stakeholder, and within a specifically demarcated area dedicated to the 300 MW Solar Project. This will be done only after finalisation of all procurement. ❑ Land procurement has almost been completed and assessment has been carried at the field level with landowners and relevant stakeholders keeping in mind Covid-19 restrictions. ❑ It shall be ensured that maximum employment will be given to the locals based on their capacity and skills. ❑ Recommended complaint resolution procedure (Grievance Redress Mechanism) shall be to assure that any complaints regarding project related components are promptly and adequately investigated and resolved. ❑ Alternate way/ road shall be provided if case of any obstruction in the villager's access. ❑ Procurement of agricultural land shall be avoided, and minimum land shall be considered for layout of access roads and transmission lines. ❑ Any waste generated during the construction phase shall not be accumulated near the religious structure as this might affect the sentiment of the locals. | LOW | <ul style="list-style-type: none"> ❑ SRIPL-4 Land and Project Team to understand mitigation measures. ❑ Construction contractors shall adhere to social obligations, labour laws and international commitments. ❑ SRIPL-4 through contract agreement, shall ensure that contractor shall provide the migrant workers adequate information on expected social behaviour and hygiene practices to be followed at site. ❑ Water usage should be monitored and controlled to minimize the wastewater generation. ❑ SRIPL-4 to ensure that all site personnel and migrant labourers avoid using any community infrastructure facilities like water bodies, electricity etc., without prior permission from the Panchayats. | Project Developer/ Contractor under the supervision of SRIPL-4 Personnel Social Management team for grievance Handling |
| 4 | IMPACT ON INDIGENOUS PEOPLE AND ARCHEOLOGICALLY IMPORTANT SITES | Unrest among the community due to dislocation of any structure or thing of cultural belief Impact on indigenous people due to land intake from ST people and use of village resources. | NO IMPACT | There are no indigenous people present in the area. No archaeological site is there. Therefore, there shall be no impact. | NO IMPACT | - | - |
| 5 | COMMUNITY ENGAGEMENT | Community Empowerment | MODERATE | <ul style="list-style-type: none"> ❑ Given the short duration of the Project construction phase efforts will be made to engage with the community through the Panchayati Raj Institution representatives and key identified leaders of the community. | LOW | <ul style="list-style-type: none"> ❑ Need assessment study shall be carried out to understand community needs continuously throughout the project lifecycle. | Contractor under the supervision of SRIPL-4 Personnel / PRI representatives |

| SN | Aspect | Impact | Impact Intensity without mitigation | Action | Impact Intensity with mitigation | Monitoring/ training Requirement | Responsibility |
|-----------------|--------------------------------------|--|-------------------------------------|---|----------------------------------|---|---|
| | | | | | | <input type="checkbox"/> Grievance Redressal Mechanism shall be followed and grievance register shall be maintained onsite. <input type="checkbox"/> Stakeholder engagement plan shall be prepared and implemented every month. | |
| 6 | OCCUPATIONAL HEALTH AND SAFETY | <input type="checkbox"/> Material handling and storage <input type="checkbox"/> Possible injuries associated with working with transmission line laying <input type="checkbox"/> Other occupational hazards. | MODERATE | <input type="checkbox"/> All material shall be arranged in a systematic manner with proper labelling and without protrusion or extension onto the access corridor. <input type="checkbox"/> Loading and unloading operation of equipment shall be done under the supervision of a trained professional. <input type="checkbox"/> All work at height shall be undertaken during daytime with sufficient sunlight. <input type="checkbox"/> Proper PPEs shall be provided to workers handling welding, electricity and related components. <input type="checkbox"/> Fire extinguishing equipment shall be provided in adequate number on site to handle any possible fire outbreaks. <input type="checkbox"/> An accident reporting and monitoring record shall be maintained. <input type="checkbox"/> Phone numbers of the city/ local fire services, etc. shall be displayed at site. <input type="checkbox"/> The labour engaged for working at height shall be trained for temporary fall protection devices. | LOW | <input type="checkbox"/> The labour engaged for working at height shall be trained. <input type="checkbox"/> All the workers shall be made aware of the possible occupational risks/ hazards by the way of an OHS training/ awareness programme. <input type="checkbox"/> An accident reporting and monitoring record shall be maintained. <input type="checkbox"/> Periodic audits shall be conducted. | Contractor under the supervision of SRIPL-4 Personnel |
| OPERATION PHASE | | | | | | | |
| A. | Physical Environment Management Plan | | | | | | |
| 1 | HAZARDOUS WASTE MANAGEMENT | Contamination of land and soil | LOW | <input type="checkbox"/> Hazardous waste shall be stored with secondary containment and spill proof impervious surface. <input type="checkbox"/> Broken solar panels shall be collected in closed containers and disposed as per the standards. | NO IMPACT | <input type="checkbox"/> Hazardous storage and management shall be carried out as per legal regulation. <input type="checkbox"/> Authorized vendor shall be appointed for collection, transport & disposal of hazardous waste. <input type="checkbox"/> Record of generation & disposal of hazardous waste shall be maintained. <input type="checkbox"/> Periodic EHS audits shall be conducted to monitor the same. | Project Developer/ SRIPL-4 Personnel |
| 2 | SOLID WASTE MANAGEMENT | Contamination of land | LOW | <input type="checkbox"/> Formulation of Proper Soils waste Management Policy. <input type="checkbox"/> Periodic collection and disposal of Solid waste from the project site. | NO IMPACT | Periodic EHS audits should be conducted to monitor the same. | Project Developer / SRIPL-4 Personnel |

| SN | Aspect | Impact | Impact Intensity without mitigation | Action | Impact Intensity with mitigation | Monitoring/ training Requirement | Responsibility |
|----|---------------------------------|--|-------------------------------------|--|----------------------------------|--|---|
| | | | | <input type="checkbox"/> Litter bins properly marked as "Municipal Waste" shall be distributed in appropriate number. The waste generated shall be disposed as per The Municipal Solid Wastes (Management and Handling) Rules, 2000 & amended in 2016. <input type="checkbox"/> Domestic waste shall be composted. Recyclable wastes viz. paper, plastic, glass, scrap metal waste etc. shall be properly segregated and stored in designated waste bins/containers and periodically sold to local recyclers. <input type="checkbox"/> Awareness shall be created among the project personnel. | | | |
| 3 | WASTEWATER MANAGEMENT PLAN | Degradation of ground and surface water quality | LOW | <input type="checkbox"/> It shall be ensured that constructed septic tanks during operation are well contained and impermeable to prevent leakage of wastewater into soil. <input type="checkbox"/> Septic tanks shall be emptied and collected by contractor at appropriate intervals to avoid overflowing. | NO IMPACT | Periodic EHS audits should be conducted to monitor the same | Project Developer / SRIPL-4 Personnel |
| 4 | ECOLOGY & BIODIVERSITY | <input type="checkbox"/> The project site and transmission route (PSS to GSS) is devoid of any kind of higher order vegetation. <input type="checkbox"/> However, there is high risk of collision and electrocution resulting in mortality of birds due to transmission line and project infrastructure. <input type="checkbox"/> There bird species may include conservation important bird species such as raptors, vultures, waders. <input type="checkbox"/> Risk of collision of birds with solar panels due to "Lake-view Effect" is possible which can lead to damage to project infrastructure as well as various bird species. | HIGH | <input type="checkbox"/> All project activities shall be undertaken with appropriate noise mitigation measures to avoid disturbance faunal /avifauna population in the region. <input type="checkbox"/> Movement of project vehicles shall be restricted to dedicated paths to minimize any harm to small animals within the site. <input type="checkbox"/> Speed of the vehicle shall be controlled in and around the project area to minimize the accidental death of faunal population. <input type="checkbox"/> General awareness regarding wildlife among the workers shall be enhanced through putting signage, posters, among the staff and labourers. <input type="checkbox"/> Plantation of native, fast-growing trees on access roads and/ or in nearby barren areas/ schools/ Panchayat office which may also give an alternate habitat to the faunal species especially the bird species and maintain the ecological balance <input type="checkbox"/> Bird diverters to be installed in all overhead lines. <input type="checkbox"/> The project shall be constructed and operated as per the latest legal regulation. | MODERATE | <input type="checkbox"/> Weekly carcass monitoring to be carried out in and around the project area. Since the project area is critical habitat, and 9 conservation importance species have been observed during the field survey, a detailed winter season bird monitoring is recommended. <input type="checkbox"/> Awareness training shall be conducted for the workers regarding presence of conservation importance species & other mammals in the project area. <input type="checkbox"/> Check on vehicle speed and use of dedicated pathways shall be carried out weekly. <input type="checkbox"/> Signages depicting key birds and animals as listed in the study shall be placed for generating awareness. | Project Developer/ Contractor under the supervision of SRIPL-4 Personnel. |
| B | Social Management Plan | | | | | | |
| 1 | CORPORATE SOCIAL RESPONSIBILITY | Community Empowerment | POSITIVE | <input type="checkbox"/> Employment shall be provided to local people wherever possible, especially as unskilled construction workers and security guards <input type="checkbox"/> Developmental needs and expectations (such as employment in the project or up-gradation of educational, health care facilities, training, cultural property and | POSITIVE | CSR Activities shall be documented Conducted continuously throughout the project cycle. | SRIPL-4 Personnel SRIPL-4 Personnel |

| SN | Aspect | Impact | Impact Intensity without mitigation | Action | Impact Intensity with mitigation | Monitoring/ training Requirement | Responsibility |
|-----------------------|---|---|-------------------------------------|--|----------------------------------|--|----------------------------|
| | | | | infrastructure) of local communities shall be identified through the Gram Panchayat, villagers and local administration. | | | |
| | | | | <input type="checkbox"/> Opportunities for contributing to the economic and developmental needs of villagers through skill training shall be explored. | | Conducted continuously throughout the project cycle. | SRIPL-4 Personnel |
| | | | | <input type="checkbox"/> Issue of water scarcity to promote agriculture and allied activities can be taken up under CSR activity as agriculture is the main source of income as shared by the community. | | | |
| 2 | OCCUPATIONAL HEALTH AND SAFETY OF WORKERS | <input type="checkbox"/> Electrocution <input type="checkbox"/> Firing due to short-circuit <input type="checkbox"/> Possible injuries associated with working at height <input type="checkbox"/> Diseases due to unhygienic condition | MODERATE | <input type="checkbox"/> Provide and ensure wearing of personal protective equipment's viz., gloves, helmets, ear plug, safety belt etc. <input type="checkbox"/> Ensure effective work permit system following the laws of the state and central level for critical activities such as electrical work and working at height <input type="checkbox"/> Prepare emergency communication system and emergency preparedness plan <input type="checkbox"/> Ensure proper sanitation facilities. | LOW | Periodic EHS audits | Project SRIPL-4 Developer/ |
| DECOMMISSIONING PHASE | | | | | | | |
| 1 | Ambient Air quality | <input type="checkbox"/> Dust | LOW | <input type="checkbox"/> Proper handling <input type="checkbox"/> Using of PPEs | LOW | -- | Project SRIPL-4 Developer/ |
| 2 | Noise quality | <input type="checkbox"/> Noise level | MODERATE | <input type="checkbox"/> Using of PPEs <input type="checkbox"/> Plantation of green belt around the project boundary line that may contribute towards curbing noise generation. | LOW | -- | Project SRIPL-4 Developer/ |
| 3 | Land | <input type="checkbox"/> Soil quality <input type="checkbox"/> Land use | LOW | <input type="checkbox"/> Changes in contour level should be avoided to the extent possible. <input type="checkbox"/> Maintain natural drainage system | LOW | -- | Project SRIPL-4 Developer/ |
| 4 | Social | <input type="checkbox"/> Aesthetics | LOW | <input type="checkbox"/> Site to be restored in its original shape | LOW | -- | Project SRIPL-4 Developer/ |

Successful implementation of environmental and social management plan will require training of personnel, documentation and record keeping and monitoring of implementation process which are described in the following paragraphs.

8.7 Environmental Monitoring Programme

The following environmental parameters will be monitored as when required during project construction and operational phase respectively for compliance.

Table 8-1: Environment Monitoring Plan

| EQI No | Environmental Quality Indicator (EQI) | Monitoring Parameter | Location | Period & Frequency |
|--------|---|--|---|---|
| 1 | Ambient Air Quality | Measurement of PM ₁₀ , PM _{2.5} , SO _x , NO _x , CO | One location at the project site and one location within 500 m periphery of the project area. | Once during construction phase |
| 2 | Ambient Noise quality | Measurement of Ambient Noise Level in dB(A) | | Once during construction phase |
| 3 | Ground Water quality | IS 10500 parameters | One location at Project site | Once during construction phase & half-yearly during operation |
| 4 | Surface Water quality | IS 2296 parameters | Nearby surface water body /canal /reservoir | Once during construction phase |
| 5 | Soil Quality | Soil parameters viz. pH, SAR, Water holding capacity, Conductivity, Organic Carbon, NPK | Abutting village land & project site | Once during construction phase & half-yearly during operation |
| 6 | Livelihood Impact Assessment | After completion of total land procurement required for the proposed project | Project site | Once after completion of land procurement |
| 7 | Need based CSR & Social Activity Monitoring | During Operation | Nearby villages | Once in a year |

9. Categorization of Projects as per IFC guidelines

As part of its review of a project's expected ecological, social and environmental impacts, IFC uses a system of social and environmental categorization. This categorization is used to reflect the size of impacts understood because of the client's social and environmental assessment and to specify IFC's institutional requirements. The categories used by the IFC are:

- ❑ **Category A Projects:** Projects with potential significant adverse social or environmental risks or/and impacts that are diverse, irreversible, or unprecedented.
- ❑ **Category B Projects:** Projects with potential limited adverse social or environmental risks or/and impacts that are few, generally site-specific, largely reversible and readily addressed through mitigation measures.
- ❑ **Category C Projects:** Projects with minimal or no adverse social or environmental risks or/and impacts, including certain financial intermediary (FI) projects with minimal or no adverse risks.

Category FI Projects: Business activities involving investments in financial institutions (FIs) or through delivery mechanisms involving financial intermediation.

The project can be categorized as **Category B** as per IFC on the condition that robust mitigation measures for ecological impacts are implemented throughout the life cycle of the project.

10. Conclusion

The project is categorized as **Category B** as per IFC on the condition that the mitigation measures for key species is implemented throughout the life cycle of the project. The project shall be constructed and operated as per the latest legal regulation.

An environment and social analysis have been carried out considering physical environment (climate and rainfall, topography, geology, air, noise, water resources & quality, soil, etc.), biological environment (flora & fauna, natural/ critical habitat) and socio-economic environment (demography, community and employee health, land and labour etc.).

Brief Assessment of the proposed Project:

- ❑ **Location of project site w.r.t ecologically sensitive area:** The project area is located at Jaimalsar village in Kolayat taluka of Bikaner district. No designated forest land i.e. Reserve Forest, Protected Forest or unclassified forest is observed in the project or within 5 km radius area. Project site do not have any permanent structure and it is devoid of any large vegetation except for the availability of scattered scrub vegetation as observed during the site visit. The level of impact generated from removal of this seasonal ground cover can be termed as negligible as the species are very common and have least conservation value.
- ❑ **Presence of Important Faunal Species:** During primary survey 34 bird species belonging to 19 families were identified and recorded from the study area. Among this 34 bird species 18 species were recorded in vantage point survey, 13 species were recorded in point count survey, and 3 species were recorded during line transect surveys. Of these recorded 34 birds, 3 are listed as Vulnerable in the IUCN Red List of threatened species, which are Indian Spotted Eagle, Eastern Imperial Eagle and Tawny Eagle; and Egyptian Vulture and Steppe Eagle are listed as endangered of IUCN Red List. Seven bird species are listed in the Schedule I of the WPA, 1972, which are the Long-legged Buzzard, Greater Spotted Eagle, Black-winged Kite, Shikra, Egyptian Vulture, Shaheen Falcon, and Eurasian Griffon.
- ❑ **Land Acquisition:** Approximately 1100 acres of land requirement has been estimated, out of which 500 acres has been taken on lease for solar power development, rest is still under process for the proposed project.
- ❑ **Advantage of the proposed plant:** The 300 MW proposed plant is located within the area which receives maximum solar radiation intensity of about 5.353 KWh/sqm/day with mean yearly insolation of 1954 KW/m² which is a good potential for harnessing solar energy.
- ❑ **Source of Pollution:** The solar power project is based on clean technology and does not likely to cause any significant pollution. Further, the project will help to reduce GHG emissions.
- ❑ **Resettlement:** No resettlement and rehabilitation involved in the proposed project.
- ❑ **Community Willingness:** Community is aware about the project and does not show any unwillingness for the proposed project. It is a clean technology. On a review of the detail community consultation undertaken, no uncertainty or doubt on the project activities was observed among the locals. The community hence seem to be receptive about the upcoming proposed solar power project.

- ❑ **Project Benefit:** The produced electricity will be evacuated to 220 kV at 33/220 kV Grid Substation (132 KV GSS RRVPNL Sub- station) is at a distance of approx. 3.5 km from the PSS (proposed within the project boundary in village Jaimalsar). The proposed solar power project will be connected to Bikaner-2 substation of CTU and will help to cater the energy requirement of the area.
- ❑ **CSR plan:** The CSR plan focused on community development will be implemented by the SRIPL-4.

There is no adverse impact on the nature of habitat, any natural existing land resources and effect in the regular life of the people. Most impacts are expected to occur during the construction phase which are considered to be of a temporary in nature. The main project impacts are associated with clearing of shrub vegetation, waste management and excavation and movement of soils. From this perspective, the project is expected to have a small "environmental footprint". Adequate provisions have been made for the environmental mitigation and monitoring of predicted impacts.

During the construction phase, there will be both direct (drivers, vehicle vendors, contractors, watchmen) as well indirect employment generation (commercial establishments e.g., small shops near the site). Operation phase will also enhance income generating avenues of the locals (small shops, local authorized water supplier, driver etc.)

In view of above, it can be concluded that the upcoming solar power plant site will not degrade the quality of surrounding environment. At the same time, the socio-economic conditions of the surrounding area and power scenario will get better.

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Alok Chandra Adhikari
Partner

E-mail: alokchandra@epmcind.com
Phone: +91-9163446337, 9433231697

**Environmental Planning Management
Consultancy (EPMCind)**

DL-10/2, First Floor, Sector-II, Salt Lake City,
Kolkata-91, India



**Environmental
Planning
Management
Consultancy**

<http://epmcind.com/>