

Environment and Social Impact  
Assessment (ESIA) 600MW Solar Power  
Project of NHPC, Village Baiya,  
District Jaisalmer Rajasthan, India

Prepared for:

Adani Solar Energy Barmer One Pvt. Ltd

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# Executive Summary

India is one of the fastest-growing economies, the nation has set ambitious targets to ensure energy security, promote environmental health and meet its global climate commitments under the Paris Agreement. This includes a pledge to achieve 500 gigawatts (GW) of renewable capacity by 2030 and reach net-zero carbon emissions by 2070. As part of the total renewable energy capacity, solar energy accounted for 90.76 GW (45.1%), underscoring the nation's success in scaling up clean energy infrastructure.

Adani Solar Energy Barmer One Pvt. Ltd is a 100% subsidiary of Adani Green Energy Limited (AGEL). AGEL is incorporated in 2015 and is spearheading the renewable energy initiatives of Adani Group with an AGEL's operational total portfolio consists of 12,258 MW. Out of which solar 8,347.5 MW, wind 1,651 MW and 2,259.6 MW wind-solar hybrid capacity. The milestone is a testament to AGEL and its development partners firmly moving towards the goal of 50,000 MW renewable energy by 2030. AGEL's 10,934 MW operational portfolio will power more than 5.8 million homes and avoid about 21 million tonnes of CO2 emissions annually.

Adani Solar Energy Barmer One Pvt. Ltd. plans to develop 600 MW Solar Power Project spread across three (03) villages i.e., Gale ki Basti, Baiya and Bhu ki Dihani located in Fatehgarh Tehsil of Jaisalmer District, Rajasthan. The generated solar power will be evacuated through 220 kV Transmission Line at Fatehgarh-III PGCIL Substation which is at a distance of about 43 km from the Site.

AECOM India Private Limited (referred to hereafter as "AECOM") has been appointed by Adani Solar Energy Barmer One Pvt. Ltd (referred to hereafter as the "Client".) as an independent environmental consultant to conduct a comprehensive Environmental and Social Impact Assessment (ESIA) for the proposed Project. This assessment will evaluate potential impacts on the surrounding environment and communities, ensuring that project development meets regulatory standards and sustainable practices.

The 600 MW projected solar power facility would be evacuated via 43 km 220-kV transmission line connecting the site to the existing PGCIL Fatehgarh -III substation. No transfer/acquisition of land is involved in transmission line, and no physical displacement is foreseen in the project. A preliminary investigation/survey was conducted for transmission lines to pick one most practicable alignment route from at least three possible alignments, for which a comprehensive survey will be conducted during the execution of the major contract.

The Environmental and Social Impact Assessment (ESIA) is carried out as per the requirements of IFC Performance Standards, 2012; the World Bank Group Environmental, Health and Safety (EHS) Guidelines for Electric Power Transmission and Distribution, 2007; the Equator Principles 2020; and E&S regulatory requirements as applicable at the country, state and local bodies.

## Study Methodology

AECOM team conducted a site survey from the 14<sup>th</sup> to 17<sup>th</sup> April 2025 to undertake environmental monitoring and collection of baseline data for environmental, ecological and social aspects and consultation with key stakeholders. Secondary information through literature surveys were also collected for the study area. The impact identification and prediction are undertaken based on environmental and social baseline data collection. The major processes involved are:

- Identification – to define the impacts associated with different phases of the Project and the activities undertaken;
- Prediction – to forecast the nature, magnitude, type, duration, extent, scale, frequency likelihood and sensitivity of the major impacts; and
- Evaluation – to determine the significance of residual impacts i.e., considering how mitigation will reduce a predicted impact. Professional judgement, experience and knowledge of similar projects were used for impact analysis. The extent and potential consequences of the impacts have been compared against applicable reference framework. Mitigation measures have been suggested for each of the identified adverse impacts.

- Finally, an Environmental and Social Management Plan (ESMP) has been prepared delineates the roles, responsibility, and timeline for implementing mitigation measures to prevent the significant impacts arising from activities during different phases of the Project.

## Resource Requirement

### **Land Requirement**

The project site extends across three villages-Gale Ki Basti, Baiya and Bhu Ki Dihani located in Fatehgarh Tehsil of Jaisalmer District, Rajasthan. The proposed project will be set up on 1269.1141 Hectare of land. As per discussions with the representative from Adani Solar Energy Barmer One Pvt. Ltd., the government has allotted 1205.6199 Hectare of land (vide letter no. Rajaswa/2025/11) for the proposed power plant on a 29 year and 11 months lease period to Adani Solar Energy Barmer One Private Limited (a subsidiary company of AGEL). The remaining land pieces (63.4942 Hectare) were sourced through leases from private landowners. The power generated from the projects will be evacuated through 220 kV Transmission Line at Fatehgarh-III PGCIL Substation which is at a distance of about 43 km from the project The project would require land use rights for approx. 43 km transmission line.

### **Manpower Requirement**

During the construction phase, approx. 960 skilled, semi-skilled and unskilled labourers would be employed directly or indirectly. About 30 persons would be employed during the operational phase.

### **Water Requirement**

During construction phase, for preparing RCC foundations for module mounting structures, constructing control room and security rooms, water would be required. This water will be sourced from third-party vendor. Also, water would be required for domestic purpose including drinking and washing by the construction workers and staff. As reported by Adani Solar Energy Barmer One Pvt. Ltd. representative, water would be sourced by Contractor from safe authorized sources through vendor and supplied by tanker during construction phase.

During the operational phase, the project will require water primarily for domestic use, estimated at 1.35 KLD.

## Environmental Baseline

Environmental baseline information was collected through primary monitoring and reconnaissance surveys of the study area (5 km distance from the project boundary). The baseline study covered the following thematic areas:

- The primary environmental baseline data were collected with respect to air quality monitoring at two (02) locations, noise monitoring at two (02) locations, three (03) water quality (02 ground water and 01 surface water), one (01) soil samples and socio-economic profile. The ecology and biodiversity data were also collected as part of the primary data collection.
- The GIS mapping of the study area was done to present details on land use patterns, forest/ vegetation cover, settlements, water bodies, drainage pattern and contours.
- Information on geology, meteorological conditions, water and ecological resources, socio-economic status, etc., was collected from secondary sources.

## Biodiversity Baseline

An Ecology and Biodiversity study of the study area was conducted for assessing the biological diversity of the area with the objective of identifying species and habitats likely to be impacted by the proposed project infrastructure and activities. According to the Champion and Seth Classification of Indian Forests, the natural vegetation of the Study Area is classifiable into the following forest-types: Type 6B/C1 - (Desert Thorn Forests of Sub-group 6B - Northern Tropical Thorn Forests) and Type 6/1S1 [Sub-type 1S1 - Desert Dune Scrub of Group 6 - Tropical Thorn Forests].

The habitat profile of the Study Area on the collective basis of the primary and secondary data was obtained. The habitats present in the study area are classified into natural or modified habitats .The Project Site and the Study Area does not overlap any Designated Area.

Species profile of the study area can be classified into two different sections: flora and fauna:

- The floristic species profile of the Study Area consisted of eight (08) tree species belonging to four (04) families, six (06) shrubs species belonging to six (06) families and ten (10) herbs species belonging to six (06) families.
- The faunal species reported include forty-four (44) mammal species, one hundred and ninety-six (196) bird species and thirty-seven (37) reptile species.

### **Socio-Economic Baseline**

The socio-economic assessment of the proposed Project was undertaken based on site observations, Google Earth imagery, and secondary demographic data from the Census of India 2011.

#### **Demographic Profile**

The proposed 600 MW solar power plant will be established on four census villages, which form the core zone villages and there are another seven villages which are situated within 5 km radius of the project site, and it form the buffer zone villages. As per Census Data of 2011, there are total 2296 households in the study area and the total 11799 population residing in these 11 villages. out of which the male and female population constitutes 57.7% and 42.3% respectively. Whereas the overall SC and ST population of the core zone villages is around 19.5% and 9.2% only.

#### **Vulnerable Groups**

The Schedule Caste population residing in Study area is around 19.8% and it is almost similar in the core villages (19.5%). The maximum schedule caste population in the core villages reside in Gajsingh Ka Gaon village (around 33.7%). The percentage of ST population residing in study area is around 4.1 % and within core zone villages the share is even higher, 9.2%. Further, while community consultation was conducted it was understood from discussion that non-officially designated tribes were present to be residing within the study area, hence potential impacts due to establishment of proposed solar power park on them could be ascertained.

#### **Literacy Level**

Analysing Census Data of 2011, average literacy rate in study area is 55.5%, which is lower than state average literacy rate of 66.11%, and district average literacy rate of 57.22 % and slightly higher than the literacy rate at tehsil level that is 54.71%. The literacy rate in the core zone villages that is around 48.3% is considerably lower than state, district's literacy rate. The male and female literacy rate in core zone villages is 64.2% and 27.8% respectively.

#### **Workforce Participation**

As per Census Data of 2011, it has been found that the share of working population in the study area is 40.4% which is even lower than the working population share of Rajasthan state (43.6%) and for Jaisalmer district (43.1%). Of the total population, majority with 59.6% are non-worker in the study area. Of these non-workers male and female share are almost equal. Based on review of Census Data of 2011, it is analysed that out of total workers in study area the main workers represent around 59.9% and the marginal workers represent around 40.1% (out of the total worker the male marginal workers and female marginal workers are around 24.1% and 16.0% respectively). Thus, it can be inferred that participation of women in the economic activity is very limited in the study area. Men are the main livelihood earning member of the family.

### **Stakeholder Engagement**

During the site visit for ESIA, Primary and secondary of stakeholders were consulted with the objective of collecting baseline data/information and to understand concerned issues. Engagement methods adopted was based on cultural and social acceptability and suitable and appropriate methods for each of the different stakeholder groups.

## Environmental and Social Impacts

The Project being renewable energy, which uses solar energy for power generation would aim to generate electricity and reduce equivalent fossil fuel consumption as compared to conventional power generation. The renewable energy projects are cleaner compared to fossil fuel-based energy projects.

- **Air Quality:** During construction, short-term and localized impacts on air quality are anticipated due to fugitive dust emissions from earthworks, access road development and increased vehicular movement. With the implementation of standard dust suppression measures and good construction practices, the overall impact is expected to be low and temporary. No significant air emissions are anticipated during the operational phase
- **Noise and Vibration:** Noise and vibration due to construction activities, maintenance activities, vehicular movement, etc. overall noise impacts are anticipated to be minor and manageable
- **Biodiversity:** Land clearance, disturbance to ecology and biodiversity within the Project footprint
- **Occupational Health and Safety:** higher noise levels, mechanical vibrations, exposure to hazardous materials, safety of workers, etc.
- **Community Health and Safety:** impact on community infrastructures, health and safety of community, aesthetic changes etc. The civil works and influx of workers may cause adverse impacts, including social conflict, the spread of communicable diseases, inefficient disposal of solid waste and improper sanitary conditions at labour camps, which may lead to pollution and inconvenience for local communities

An Environmental and Social Management and Monitoring Plan has been proposed to ensure that social and environmental impacts, risks, and liabilities identified during the ESIA process are effectively managed during the operation and closure of the project. The ESMP delineates the monitoring and management measures to avoid and/or minimize the identified impacts by allocating management responsibility and suggesting skill requirement for implementation of these measures.

**Table 1-1 Key Environment Management Plan Aspects**

Sl. No.	Aspect	Impact	Action
1	Ambient Air Quality	<ul style="list-style-type: none"> <li>• Fugitive dust emissions during construction (earthworks, vehicle movement)</li> <li>• Exhaust emissions from construction machinery and DG sets</li> </ul>	<ul style="list-style-type: none"> <li>• Implement dust suppression measures such as regular water sprinkling on access roads, foundations and material storage areas, particularly during dry periods.</li> <li>• Cover trucks carrying soil, sand and construction materials to prevent spillage and dust dispersion.</li> <li>• All stockpile materials which are likely to generate airborne fugitive dust will be covered with canvas or plastic sheets during windy season</li> <li>• Ensure construction machinery and vehicles are well maintained and comply with applicable emission norms.</li> <li>• Restrict vehicle speeds on village roads and internal project roads.</li> <li>• DG sets shall be provided with acoustic enclosures and operated in compliance with the prescribed emission standards. Adequate stack height shall also be maintained for the DG sets in accordance with CPCB norms.</li> <li>• Prefabricated materials would be used wherever feasible, to minimize localized air pollution</li> <li>• Conduct periodic ambient air quality monitoring during construction at representative locations.</li> </ul>
2	Ambient Noise Levels	<ul style="list-style-type: none"> <li>• Noise generation due to construction activities</li> </ul>	<ul style="list-style-type: none"> <li>• Conduct periodic noise monitoring during construction and operation phases.</li> <li>• Regular Maintenance of construction equipment</li> </ul>

Sl. No.	Aspect	Impact	Action
			<ul style="list-style-type: none"> <li>No construction activities or movement of vehicles shall be permitted during night-time hours (10:00 PM to 6:00 AM) on roads near the village area.</li> <li>Periodic monitoring of noise levels shall be carried out to ensure compliance of noise levels remain as per the Noise Pollution (Regulation and Control) Rules, 2000, as amended in 2010.</li> <li>Implement a Grievance Redress Mechanism (GRM) to address noise-related complaints promptly.</li> </ul>
3	Natural Hazards	<ul style="list-style-type: none"> <li>Potential risks include damage to infrastructure, safety hazards for workers and communities and disruption to operations.</li> </ul>	<ul style="list-style-type: none"> <li>Conduct site-specific hazard risk assessments and integrate findings into project design.</li> <li>Ensure all structures comply with applicable safety codes for wind and seismic resilience.</li> <li>Develop and implement an Emergency Preparedness and Response Plan (EPRP) covering extreme weather events and natural disasters.</li> <li>Train workers in emergency response procedures and conduct regular drills.</li> <li>Maintain coordination with local authorities for early warning systems and disaster response.</li> </ul>
4	Soil and Land	<ul style="list-style-type: none"> <li>Soil erosion due to excavation and grading</li> <li>Soil compaction and contamination from oil spills</li> </ul>	<ul style="list-style-type: none"> <li>Implement erosion control measures such as bunds, silt traps and proper drainage at excavation sites.</li> <li>The topsoil shall be properly stored in a designated isolated area and adequately covered to prevent loss due to strong winds and surface runoff.</li> <li>Restrict vehicle movement to designated routes to minimise soil compaction.</li> <li>Provide spill kits at fuel storage and maintenance areas and ensure immediate clean-up of any oil or chemical spills.</li> <li>Construction debris would be reused in paving on site approach road</li> <li>Re-vegetation would be undertaken in the area after the completion of construction.</li> <li>Restore temporarily disturbed areas post-construction to near-original conditions.</li> <li>Oil and chemical container would be stored with secondary containment like dyke or embankment.</li> </ul>
5	Waste Management (Solid & Hazardous)	<ul style="list-style-type: none"> <li>Generation of construction debris and domestic waste</li> <li>Generation of hazardous waste such as used oil, grease, oily rags and batteries</li> </ul>	<ul style="list-style-type: none"> <li>Segregate waste at source into biodegradable, recyclable and hazardous waste categories.</li> <li>Dispose of construction debris through authorised vendors or reuse where feasible.</li> <li>All packaging material would be kept at a designated interim storage area</li> <li>Collect domestic waste from labour camps and dispose through local-authority-approved or authorised agencies or bio-compositing at the sight.</li> <li>Store hazardous waste (used oil, lubricants, oily waste) in designated, banded areas with proper labelling.</li> <li>Dispose hazardous waste only through State Pollution Control Board authorised recyclers/ vendors and maintain waste manifests and records.</li> </ul>

Sl. No.	Aspect	Impact	Action
6	Occupational Health and Safety	<ul style="list-style-type: none"> <li>• Electrocutation</li> <li>• Firing due to short-circuit</li> <li>• Possible injuries associated with working at height</li> <li>• Diseases due to unhygienic condition</li> </ul>	<ul style="list-style-type: none"> <li>• Prohibit open burning or indiscriminate dumping of waste within the Project area.</li> <li>• Regular electrical safety training to workers with safety procedures and other safety requirements that pertain to their respective job assignments.</li> <li>• Implement Lock out/ Tag Out (LOTO) system.</li> <li>• Use work equipment or other methods to prevent a fall from occurring. Collective protection systems, such as edge protection or guardrails, should be implemented when working at height.</li> <li>• PPEs e.g., shock resistant rubber gloves, shoes, other protective gear etc. should be provided to workers handling electricity and related components.</li> <li>• The transformer yard should be provided with fire extinguishers and sand buckets at all strategic locations to deal with any incident of fire; and</li> <li>• An accident reporting, and monitoring record shall be maintained.</li> </ul>
7	Biodiversity	<ul style="list-style-type: none"> <li>• Disturbance to wildlife</li> <li>• Wildlife mortality due to collision and electrocution</li> </ul>	<ul style="list-style-type: none"> <li>• Regularly monitor and remove any carcasses from the site, thereby avoiding attracting scavenging raptors, such as vultures, into the project area</li> <li>• Install line markers on transmission line to avoid bird and bat fatality. The specifications for bird flight diverters should be decided in consultation with appropriate experts as well as Central Electricity Authority.</li> <li>• Avoid use of artificial lighting in and around the project site as far as possible.</li> <li>• Proper barricading shall be installed around all excavation areas using plastic mesh to avoid any accidental entry of wildlife.</li> <li>• Ground cover shall be conserved across the project site to the maximum extent possible and restored through the plantation of indigenous and non-invasive species of trees, shrubs and herbs. Temporary-use and laydown areas shall be revegetated promptly upon completion of construction activities.</li> <li>• Monitoring should be conducted in collaboration with the Forest Department during the project phases, especially in the construction phase, to find out the accidental introduction of IAS in the project site. Invasive Alien Species (IAS) identified eradication process should be initiated as earliest, if any.</li> <li>• Conduct Awareness programme regarding IAS, its potential risk and mitigation measures.</li> <li>• Solar panels shall be selected with anti-reflective coating (ARC), preferably in combination with white, non-polarizing gridding, to minimize reflectivity and light polarization.</li> <li>• The use of herbicides within the facility shall be prohibited. Manual weeding methods shall be adopted to control and regulate plant growth in the project area.</li> </ul>

### **Key Findings**

Applying the criteria stipulated by the IFC Policy on Environmental and Social Sustainability for environmental and social categorization of projects, the proposed 600 MW solar project may be assigned as 'Category B' with respect to environmental and social impacts. Based on the primary and secondary data available to date, the environmental

and social risks and impacts associated with the proposed project activities are anticipated to be limited in number, generally site-specific, largely reversible, and effectively manageable through appropriate mitigation measures, thereby supporting a 'Category B' classification.

Additional rationale for the above categorization is as below:

- Solar power project is a clean technology project using solar energy for generation of electricity.
- No harmful emissions are expected from the project operations.
- The Project Site does not coincide or overlap with any Designated Area; and
- Available data suggests that the construction, operation and decommissioning of the proposed solar project are likely to have limited environmental and social impacts which can be readily addressed with mitigation measures.

Moreover, mitigation measures for potential impacts on Air, Water, land, soil, noise, ecology and socioeconomics have been specified through proper mitigation measures as suggested in the report.

The ESMP provides a delivery mechanism to address potential adverse impacts, to instruct contractors and to introduce standards of good practice to be adopted for project activities taken up during construction and operation phases of the project. Inspection and monitoring of the environmental and social components would increase the effectiveness of suggested mitigations. A site-specific Grievance Redressal Mechanism (GRM) should be implemented by the Client to overcome public inconvenience (if any) during the O&M phase. The Project to ensure that all applicable environmental and social regulatory approvals and permits are obtained in accordance with statutory requirements.

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