“Consultancy services for ESIA for three Solar Parks, namely, Agar Solar Park (550 MW), Shajapur Solar Park (450 MW) and Neemuch Solar Park (500 MW), including internal evacuation infrastructure and associated transmission lines, of three parks of aggregate capacity of 1500 MW in the State of Madhya Pradesh, India”: Neemuch Solar Park

Rewa Ultra Mega Solar Limited

Final ESIA Report

15 October 2020

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“Consultancy services for ESIA for three Solar Parks, namely, Agar Solar Park (550 MW), Shajapur Solar Park (450 MW) and Neemuch Solar Park (500 MW), including internal evacuation infrastructure and associated transmission lines, of three parks of aggregate capacity of 1500 MW in the State of Madhya Pradesh, India”: Neemuch Solar Park

Final Report

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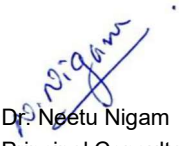

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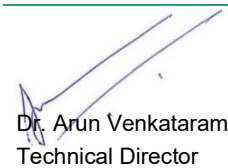

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Acronyms and Abbreviations

Name	Description
AAQ	Ambient Air Monitoring
AI	Availability Index
AMSL	Above Mean Sea Level
AoI	Area of Influence
BC	Block Categorisation
BMTPC	Building Materials and Technology Promotion Council
BWD	Baseline Water Depletion
BWS	Baseline Water Stress
C&D	Construction and Demolition
CGWA	Central Ground Water Authority
CGWB	Central Ground Water Board
CH	Critical Habitat
CHC	Community Health Centre
CHWTSDF	Common Hazardous Waste Treatment, Storage and Disposal Facility
CO	Carbon Monoxide
CPCB	Central Pollution Control Board
CPR	Common Property Resources
CR	Critical
CSR	Corporate Social Responsibility
D.G.	Diesel Generator
dB(A)	Decibels
DC	District Collector
DCP	Dry Chemical Powder
DD	Data Deficient
DEM	Digital Elevation Model
DPR	Detail Project Report
E&S	Environmental and Social
EBRD	European Bank for Reconstruction and Development
EHS	Environment, Health and Safety
EN	Endangered
EPC	Engineering, Procurement and Construction
ERM	Environmental Resource Management India Pvt. Ltd.
ESIA	Environmental and Social Impact Assessment
ESMF	Environment and Social Management Framework
ESMP	Environmental and Social Management Plan
ESS	Environment and Social Safeguards
FLA	Flood Likelihood Assessment
FPIC	Free Prior Informed Consent
GAP	Gender Action Plan
GoI	Government of India
GoMP	Government of Madhya Pradesh
GRC	Grievance Redressal Cell
GRM	Grievance Redressal Mechanism
GSS	Grid Sub Station
GW	Ground Water

Name	Description
Ha	Hectare
Ham	Hectare metre
HSE	Health, Safety and Environment
HW	Hazardous Waste
IA	Impact Assessment
IAV	Inter Annual Variability
IBAs	Important Bird and Biodiversity Areas
IFC	International Financial Corporation
IMD	India Meteorological Department
IP	Indigenous People
IPP	Indigenous People Plan
ISTS	Inter State Transmission System
IUCN	International Union for the Conservation of Nature
IWT	India Water Tool
JV	Joint Venture
KL	Kilo Litre
KLD	Kilo Litre per Day
Km	Kilo metre
Kmph	Kilometre per hour
KV	Kilo Volt
kVA	Kilo- Volt Ampere
LRP	Livelihood Restoration Plan
LUPA	Land Use Permission Agreement
MDR	Major District Road
MNRE	Ministry of New and Renewable Energy
MoEFCC	Ministry of Environment, Forest and Climate Change
MoP	Ministry of Power
MP	Madhya Pradesh
MPPCB	Madhya Pradesh Pollution Control Board
MPPTCL	Madhya Pradesh Power Transmission Company Limited
MPUVNL	Madhya Pradesh Urja Vikas Nigam Limited
MSK	Medvedev-Sponheuer-Karnik Scale
MW	Mega Watt
NAAQS	National Ambient Air Quality Standards
NFPA	National Fire Protection Association
NGO	Non-Government Organization
NH	National Highway
NO_x	Oxides of Nitrogen
NQ	Noise Quality
NRSC	National Remote Sensing Centre
NT	Near Threatened
O&M	Operation and Maintenance
PAF	Project Affected Family
PCA	Primary Census Abstract
PCU	Passenger Car Unit
PGCIL	Power Grid Corporation of India Limited
PHC	Public Health Centres
PM_{10}	particulate matter of particle size less than 10 micrometres
$PM_{2.5}$	particulate matter of particle size less than 2.5 micrometres
PMC	Project Management Consultant
PPEs	Personal Protective Equipments
PS	Performance Standard

Name	Description
PSS	Pooling Sub Station
PUC	Pollution Under Control
PV	Photo Voltaic
PVHI	Photo Voltaic Heat Island
R&R	Resettlement and Rehabilitation
RAP	Resettlement Action Plan
RFCTLARR Act 2013	The Right to Fair Compensation and transparency in land Acquisition, Rehabilitation and Resettlement Act, 2013
RoW	Right of Way
RPM	Respirable Particulate Matter
RPO	Renewable Purchase Obligation
RUMSL	Rewa Ultra Mega Solar Limited
SAR	Sodium Adsorption Ratio
SC	Scheduled Caste
SCADA	Supervisory Control And Data Acquisition
SECI	Solar Energy Corporation of India Limited
SH	State Highway
SO_2	Sulphur Dioxide
SPD	Solar Project Developer
SPO	Solar Purchase Obligation
SPPD	Solar Power Park Developer
SQ	Soil Quality
ST	Scheduled Tribe
SV	Seasonal Variability
SW	Surface Water
TAR	Total Annual Rainfall
TL	Transmission Line
VD	Village Directory
VU	Vulnerable
WB	World Bank
WHO	World Health Organization
WII	Wildlife Institute of India
WRI	World Resources Institute

EXECUTIVE SUMMARY

Introduction

ERM India Pvt. Ltd. (ERM) has been engaged by Rewa Ultra Mega Solar Limited (RUMSL) to undertake an Environmental and Social Impact Assessment (ESIA) of three Solar Parks, including internal evacuation infrastructure and associated transmission lines (TLs) of aggregate capacity of 1500 MW in the Neemuch, Agar and Shajapur Districts of Madhya Pradesh, India.

The ESIA for the aggregate 1500 MW Solar Parks has been divided into four distinct studies:

- ESIA for Neemuch Solar Park of 500 MW capacity;
- ESIA for Agar Solar Park of 550 MW capacity;
- ESIA for Shajapur Solar Park of 450 MW capacity; and
- ESIA for the external Transmission Line[1] infrastructure for all three Solar Parks.

This report is the Environmental and Social Impact Assessment study for the Neemuch Solar Park of 500 MW capacity (*hereinafter referred to as the 'Project'*), located at villages Badi, Kawai and Bardawada, District Neemuch in State of Madhya Pradesh..

The Resettlement Action Plan (RAP) and Indigenous People Plan (IPP) will be prepared as separate deliverables. RAP and IPP shall be referred for most updated information on the social baseline and impacts.

Project Description

A brief description of Project is given in table below:

Table 0.1 Brief Description of Project

S. No.	Particulars	Description
1.	Project Village location	Badi, Kawai and Bardawada
2.	Tehsil	Singoli
3.	District Name/State	Neemuch / Madhya Pradesh
4.	Location Coordinates	Latitude: 24°59'39.78"N and 25° 0'38.51"N Longitude: 75°13'26.82"E and 75°14'48.53"E
5.	Capacity	Unit 1: 160 MW Unit 2: 170 MW Unit 3: 170 MW
6.	Pooling Stations and Power Evacuation	Three Pooling substations of 33/220 kV (PSS), one in each Unit; Power evacuation through proposed 220/400 kV ISTS substation of PGCIL at Badi village located in north of Project site in between Unit 2 and 3.
7.	Climatic zone	Agro-climatic
8.	Average Elevation	Elevation ranges from 396 to 440 m amsl High gradient land area (>7°): Nil
9.	Site Conditions	Agricultural land, scrub land
10.	Road Accessibility	SH 9A (Bhilwara to Modak) is between 1 to 2.5 km south of the southern boundaries of Neemuch Project site. The individual units of the Project is connected through existing village roads
11.	Roads crossing Project site	Village roads
12.	Nearest Airport	Udaipur Airport (~140 km, WSW)
13.	Nearest Railway station	Mandalgarh, Rajasthan ~ 25 Km (N)
15.	River/ pond present in project footprint	Nil (refer Section 1.4)

[1] The external transmission line infrastructure refers to the power evacuation from the solar park site to the grid substation.

S. No.	Particulars	Description
16.	Number of Power line (66 KV and above) present in Project footprint	2 Transmission Line of 400 kVA and 220 kVA respectively.
17.	Protected areas (National Park/ Sanctuary)/ Forest land	The closest legally protected area (National Park or Wildlife Sanctuary) is Gandhi Sagar Wildlife Sanctuary located ~ 50 Km southeast of Unit 3; and The closest forest land is Arnea Reserve Forest block located 300m north of Unit 2
18.	Land Area Identified	**1065.7 hectares** (as per DPR, July 2020)
19.	Water Requirement	Construction Phase: 250-300 KLD for civil works and 80-100 KLD for domestic use of labour at site; and Operation Phase: ■ 308 KLD for solar panel cleaning; ■ 10 KLD domestic water; ■ 7 KLD for green belt maintenance; ■ 32 KL for firefighting and miscellaneous
20.	Source of Water	Construction: Tanker water Operation: Ground water
21.	DG sets	For backup power requirement during construction phase; No. and capacity yet to be determined.
22.	Soil Characteristics	Loamy sand – Project area
23.	Seismic Zone	Zone II (Low damage risk zone)
24.	Flood prone zone	High vulnerable zone
25.	Wind zone	High Damage Risk Zone

Land Requirement and Status

The following table provides a summary of the land requirement for the project.

Table 0.2 Neemuch: Village Wise Land Allotment details

Land Category	Unit 1 (ha.)		Unit 2-(ha.)		Unit 3 (ha.)	Total land (Hectare)
	Bardawada	**Kawai**	**Kawai**	**Badi**	**Badi**	
Government Land (both NRED allotted & identified)	201.8	89.6	156. 1	163.2	351.7	962. 5
Private Land	5.1	4.2	0	1.7	10.4	21.4
Patta Land	50.7	0	22.4	3.6	5	81.7
Sum	**351.5**		**347**		**367**	**1065.7**

Source: Land Data provided by RUMSL, 3 June 2020

The private land comprises of 2 percent land of Solar Park, whereas Patta land comprises 7.6 percent of the total land identified for Neemuch Solar Park. As part of the latest update, the total land parcel being considered for the Neemuch Solar Park is 1065.7 ha after feasible avoidance of land being used for agriculture, habitation, structures and access spaces/ routes, etc. Some portion of the government land identified for the Neemuch Solar Park, though classified as government land is currently (informally) used/ encroached by the village community for agriculture or 'private' fodder lots; however this use/status is not indicated in the land records.

The land procurement process for the Solar Park commenced in 2016-17, where RUMSL identified potential land parcels potential project areas, with large chunks of unused government land. This was driven by the intent to use Government land for the project to minimize the use of Private or Patta lands the extent possible.
The land identification was followed by screening and scoping exercises, in order to identify the possible exclusions and avoidances on the identified land, comprising avoiding certain settlements/ clusters of structures, potential Bhil settlements, etc. Based on the recommendations from the scoping

exercise, another drone survey of the identified land parcels were undertaken, to further optimize the land requirement in a manner, that impacts to private and patta land owners and associated livelihoods are minimized.

Land Procurement

A Land Use Permission Agreement (LUPA) will be signed between New and Renewable Energy Department, Government of MP and RUMSL for the life of the project. Subsequently, M/S RUMSL will have a back-to-back Land Use Permission Agreement with the Solar Project developers, which would enable them to use the land for development of the solar project as per the agreed terms of the LUPA.

The private land for the project shall be purchased as per prevailing laws and policies in the State of Madhya Pradesh (through MP Mutual Consent Land Purchase Policy' dated 14th November, 2014.

Under the policy, the District Collector (DC), may purchase private and patta land based on the requirement, due to non-availability of government land and or shortfall in meeting the project land requirement through government land.

Applicable Reference Framework

- Applicable Indian (national, state and local) Environmental and Social Regulations;
- Applicable Permits (licences, approvals and consents) and permitting agencies;
- IFCs Performance Standards on Environmental and Social Sustainability (2012) (IFC, 2012);
- World Bank Environmental and Social Safeguard Policies;
- IFC/ WB General EHS Guidelines (2007) (IFC, 2007);
- IFC EHS Guidelines for Electric Power Transmission and Distribution, 2007; and
- MNRE Environmental and Social Management Framework for Solar PV Park, February, 2017.
- Applicable National Environmental Standards for Ambient Air, Noise, Water etc.

Current Baseline Status

The following table provides a summary of the baseline in the study area

Table 0.3 Summary of Current Baseline Status

S. No.	Category	Description of Baseline
1.	Location Characteristics	The Project site is located ~ 70 km from Neemuch town and is spread across three villages- Badi, Kawai and Bardawada of Singoli Tehsil. The Project area lies between Latitude: 24°59'39.78"N and 25° 0'38.51"N Longitude: 75°13'26.82"E and 75°14'48.53"E
2.	Study Area	The area of up to 5 km radius from the Project boundary (Solar Park area) has been demarcated as study area for the Project.
3.	Land Use and Land Cover	■ The current land use of the proposed project site is agricultural land, grazing land, and scrub land with some trees ■ Some are is under water features like natural drains, ponds
4.	Topography	■ The Project site area is fairly flat land; The high gradient area, i.e. area > 7° is nil.
5.	Drainage	■ Project site have water bodies and 3rd or 4th order dendritic drainage channels within the site area.
6.	Soil Characteristics	■ Soil in the area is black cotton soil; ■ No major anthropogenic activities are carried out in the area which may lead to soil contamination. There are stone quarrying activities occurring on the site, mainly in Unit 3 area.

S. No.	Category	Description of Baseline
7.	Ground Water	■ The Project site is located a 'Critical' block (Jawad Block) as per CGWB; ■ Water bodies present in the study are mostly rainfed and are used for domestic purposes as washing of clothes and for domestic animals
8.	Ambient Air Quality	As per baseline monitoring conducted for the Project, ambient air quality parameters (PM_{10}, $PM_{2.5}$, SO_2, NO_X) were within the prescribed CPCB limits.
9.	Ambient Noise Quality	■ As per baseline monitoring conducted for the Project, the noise levels during day and night time were observed within the CPCB prescribed limits. However, at two locations day time noise levels are at the edge of prescribed limit of 55 dB for daytime.
10.	Biological Environment	■ Habitats in the study area include agricultural land, open scrub, water bodies and open forest areas (no forest area within Project footprint); ■ The closest legally protected area is Gandhi Sagar Wildlife Sanctuary, [IUCN Management Category IV] which is located ~ 50 km southeast of Unit 3; ■ The closest internationally recognized biodiversity area is Gandhi Sagar Wildlife Sanctuary and reservoir which is located ~32 km southeast of Unit III3. This is also declared an Important Bird and Biodiversity Area (IBA) and supports significant concentrations of water birds (IBA Category A4iii); ■ Four species of herpetofauna, 58 species of avifauna and 12 species of mammals were recorded/reported from the study area during site visit.
11.	Demographic Profile	■ The project footprint falls in three Project villages, while the AoI comprises 32 villages. The Project villages comprise of 440 households with a population of 2,047 individuals (as per 2011 Census data while the current figure is expected to have increased significantly). ■ The average size of the households is 5 in the Study Area
12.	Social Stratification	The entire population in the Study Area falls in the rural category. The villages comprise majorly of Dhakad, Gujjar and Rajput communities and some households belonging to Bhil (ST), Balai and OBC groups.
13.	Gender Profile	■ The Project Villages exhibit lower adult sex ratio (915) and child sex ratio (750) as compared to the AoI, tehsil, district and the state figures of sex ratio. ■ Badi village has the lowest adult sex ratio of 884 amongst all project villages; ■ Women are responsible for domestic roles in a household along with working on agricultural farms, while men are engaged in activities of sale, purchase of goods and livestock grazing.
14.	Education and Literacy	The total literacy rate (54.2%), male literacy rate (69.2%) and female literacy rate (38.5%) in the Project villages is the lowest as compared to the AoI, Study Area, Tehsil and district figures. The female literacy rate in the AoI (51.1%) are relatively higher and are comparable to the district and state figures, while in the Project villages, the female literacy rates are quite low.
15.	Land Ownership	Census 2011 figures for land area indicate that 50.6 percent of the land area in the Project Villages is categorised barren and uncultivable land, 23.1 percent is net sown area, out of which 63 percent is unirrigated land and 37 percent is irrigated land. The Project villages have 7.8 percent of the total land area as forest land, 3.3 percent area under non-agricultural use and 4.2 percent as culturable waste land. Additionally, 4.6 percent is land comprising of miscellaneous tree crops, and 4.6% are permanent pastures and other grazing land.
16.	Livelihood Profile	The Study Area is categorized by 53.4 percent working population, where majority of the working population comes under Main Workers (56%)
17.	Water Supply and Sanitation	■ The Project villages fall in the region of extremely high baseline water stress and high risk of baseline water depletion. The quality of drinking water available at lower depth is reported to be good while higher salt concentration is found in water from deeper levels. There are issues of drying of borewells reported in the summer months. ■ Kawai has piped water connection while Tube-wells are also a significant source of water serving a majority of villages

S. No.	Category	Description of Baseline
18.	Health facilities and Health Seeking Behaviour	The health facilities in the Study Area follow a three-tier health infrastructure system, as also applies to the state of MP. As per Census 2011 data, in the Project Villages, however, there are no Community Health Centres (CHCs) or Primary Health Centres (PHCs). The villages of the Study Area have access to 2 Primary Health Centres, one each in Nayagaon and Jhantala villages. Four AoI villages of Dhangaon, Dhardi, Funsariya and Kadwasa, have a Primary Health Sub Centre in their village.

Stakeholder Consultations and Disclosure

During the ESIA process, a stakeholder identification and prioritization was conducted for identifying the key stakeholders of the project, while keeping in mind the nature of the project and its setting. Furthermore, consultations were conducted with these identified stakeholders through a participatory approach.

The table below gives the list of primary and secondary stakeholders, depending on the extent of impact (direct/ indirect) on the stakeholder by the project. Those person(s) or groups who will be directly impacted by the project are Primary Stakeholders and those who have an indirect influence or the Project impacts indirectly are the Secondary Stakeholders.

Stakeholder Groups	Primary Stakeholders	Secondary Stakeholders
Community	■ Private Land Owners from Bardawada, Kawai, Badi villages ■ Patta Holders from Bardawada, Kawai, Badi villages ■ Squatters and Encroachers ■ Agricultural Labourers ■ Graziers ■ Vulnerable Social Groups in other villages in the vicinity ■ Contractors ■ Potential unskilled labourers to be engaged for the construction phase of the project ■ Owners of land required for temporary occupation or use ■ Local Community from Project villages.	■ Fence Line Communities from other villages in the vicinity ■ Non-recognised 'patta owners' who have procured the patta based on a verbal agreement with the original (and registered) patta holder;
Institutional Stakeholders	■ Gram Panchayats of Dhardi (for Bardawada village) and Badi (for Kawai and Badi villages); ■ Singoli Tehsil officials	■ Local Political Groups ■ Civil Society/ Local NGOs
Government Bodies/Regulatory Authorities	■ Regulatory Authorities comprising the following: - MP Pollution Control Board; - Central Pollution Control Board (CPCB) - Ministry of Environment Forest and Climate Change (MoEFCC) - Local Fire Authority; - Ministry of Road Transport and Highways - State Transport Authority; - District Collector and Revenue Department; - Central Electrical Authority through C.E(P&D) Jabalpur;	

Stakeholder Groups	Primary Stakeholders	Secondary Stakeholders
	- Department of Telegraph – Communication, Govt. of Madhya Pradesh; - Department of Panchayati Raj, Madhya Pradesh; - Labour Department; - Wildlife Warden, State Forest Department; - District and State Forest Department, MoEFCC. ■ District Administration	

Potential Environmental and Social Impacts

Assessment of potential impacts on the various environmental, ecological and social elements due to the Project activities were carried out for this ESIA study. The likely impacts on loss of land, land-based and non-land based livelihoods, vulnerable groups (women, youth etc.), labour, water environment, air environment, biological environment and socio-economic environment has been identified based on the actual and foreseeable events/Project activities. For the impact assessment, wherever necessary, professional judgement, experience and knowledge on similar projects have been used. The extent and potential consequences of the impacts have been compared against applicable standards and guidelines. Mitigation measures have been suggested for each of the identified potential impacts.

The following table provides a summary of potential environmental and social impacts due to the project. The mitigation measures are also recommended to mitigate the adverse impacts.

Category	Impacts	Mitigation Measures	Impact Significance (without mitigation measure)	Impact Significance (post-mitigation)
Planning Phase				
Impact due to Private Land Purchase	■ Approx. 21 ha. of private land is being considered for purchase by the project, which forms nearly 2% of the total area identified for the project; ■ The private land parcels that are identified are not being used for residential purposes, thus there is no physical displacement due to project; however, **economic displacement** will occur for the private land sellers whose land parcels will be purchased for project related activities affecting livelihoods and incomes; ■ **Landlessness** may potentially result due to purchase of private land parcels in some cases. The total land holding and proportion of land remaining with the sellers after the mutual consent based sale, is not known currently, but will be assessed during the RAP survey; ■ Agricultural labourers employed by the land owners of the private land parcels identified for purchase for the project will experience **loss of livelihood opportunities**;	■ The private land sellers should be provided with either alternate land parcels with similar nature of productivity and financial assistance to prepare the land for cultivation or adequate compensation at twice the value of land and assets, as per MP Mutual Consent Land Purchase Policy, 2014; ■ A Resettlement Action Plan- Livelihood Restoration Plan shall be formulated to cover economic displacement categories (subject to the qualifications stated under embedded controls) to address the following: - Livelihood impacts on the land owners if the holdings that remain are sub-optimal, or owners are rendered landless; - Additional livelihood assistance to vulnerable households, or women headed households, with skill trainings or entrepreneurship support, etc. under the LRP; - Impacts on land users or regular agricultural labourers affected - The general community being impacted due to access restrictions/easements; - Other impacts on private land owners.	Moderate	Minor

Category	Impacts	Mitigation Measures	Impact Significance (without mitigation measure)	Impact Significance (post-mitigation)
	■ Loss of access or easement for the local community due to diversions/ barricading of areas due to construction phase activities. ■	■ Preference to members of the families rendered landless or with sub-optimal holdings post selling land to the project for employment opportunities in the Construction/operation phase and/or small contracts; ■ Timely sharing of project related information with all relevant stakeholders; ■ Provision of Grievance Redressal Mechanism to all impacted stakeholders in order to raise and register their grievances.		
Impacts due to Patta land Purchase	■ Approx. 81.7 ha. of Patta land is being considered for purchase by the project, which forms approx. 8% of the total area identified for the project; ■ **Economic displacement** will occur for the Patta Land holders who have invested cost and efforts in the Patta land to make it cultivable and are currently undertaking agricultural activities; ■ The Tarmeem process demarcated the location of 43 Patta land parcels in Bardawada, 22 Patta land parcels from Kawai and 8 patta land parcels in Badi and while the recorded Patta land holders can be based on the available records, these will need to	■ Patta is being treated at par with ownership, for the land procurement process. Thus treatment of Patta Land holders will be similar to Private land owners and Patta holders shall be provided with either alternate land parcels with similar nature of productivity and financial assistance to prepare the land for cultivation or adequate compensation at twice the value of land and assets, as per MP Mutual Consent Land Purchase Policy, 2014; ■ A Resettlement Action Plan- Livelihood Restoration Plan shall be formulated to cover economic displacement categories (subject to the qualifications stated under embedded controls) to address: - Livelihood impacts on the land owners if the holdings that remain are sub-optimal, or owners are rendered landless;	Moderate	Minor

Category	Impacts	Mitigation Measures	Impact Significance (without mitigation measure)	Impact Significance (post-mitigation)
	be updated during the RAP survey to get the current number of affected households and persons (reasons outlined below).; ■ Typically Patta land owners are likely to be from vulnerable households like SC, ST and other previously landless households and the land purchase for the project may lead to cases of **landlessness, (which is more likely to be in this category than the category of private land holders, as landlessness is a baseline criteria for initial award of pattas)**; ■ It is understood that certain Patta Land parcels have been sold off based on a 'verbal agreement' by the household it was originally allotted to, without a change in records. Although this is not allowed as per the terms of the allotment, it is reported as a practise. In such cases, the households using the Patta lands through this arrangement are also understood to be impacted, in addition to original owners, who are still on record as 'patta holders';	- Additional livelihood assistance to vulnerable households, or women headed households, with skill trainings or entrepreneurship support, etc. under the LRP; - Impacts on land users or regular agricultural labourers affected - The general community being impacted due to access restrictions/easements; - Other impacts on patta land owners. ■ Preference to members (rendered landless or with sub-optimal holdings) of the families post selling land to the project for employment opportunities in the Construction/operation phase and/or small contracts; ■ Additional safeguards to be addressed through the RAP-LRP for Patta Land owners, including those who may have 'purchased' the patta informally from the original allottees based on a verbal agreement and without documentation ■ Timely sharing of project related information with all relevant stakeholders; ■ Provision of Grievance Redressal Mechanism to all impacted stakeholders in order to raise and register their grievances.		

Category	Impacts	Mitigation Measures	Impact Significance (without mitigation measure)	Impact Significance (post-mitigation)
	■ Agricultural labourers working at the Patta land parcels identified for purchase for the project will experience **loss of livelihood opportunities**; ■ **Loss of access or easement** for the local community due to diversions/ barricading of areas due to construction phase activities.			
Impacts due to LUPA of Government land	■ Government land being identified for the project from the three project villages amounts to 962.5 ha, which forms nearly 90% of the total land required for project. ■ This land has different uses by the local community: - Livestock grazing in the open as well as within encroached and bounded 'fodder lots' created by encroachers(see below); - Incidental collection of non-timber products like 'kattha'; - Easements, access to assets and other resources not within the project boundary, etc. and the change in use and ownership of Government land	■ Provision for alternate grazing land for livestock shall be made near the project villages or confirmation of adequacy of remaining grazing land, to be confirmed during the RAP survey (including the assessment of access and quality of the remaining area); ■ Development of a program to include grazing area improvement and fodder intensification (cultivation) in designated areas, as agreed with the Tehsil office and the local dependent community of graziers. This may include the development of community fodder lots under the Livelihood restoration activity in the area as part of Resettlement Action Plan. This, if feasible, shall serve the purpose of improving the quality of the grazing land, ensuring access and as an income generating activity for people losing land based livelihoods. ■ The project developer is also encouraged to explore identifying unused areas within the solar park boundary	Major	Moderate

Category	Impacts	Mitigation Measures	Impact Significance (without mitigation measure)	Impact Significance (post-mitigation)
	will affect the users in the community to varying degrees. ■ The Impacts on users of this land type comprise the following: – Loss of Grazing land for the livestock in the area and loss of livelihood and nutritional security due to possible reduction in livestock herd size due to reduced access to grazing land (potential vulnerability) – Loss or severance of access for the community, livestock, etc.; ■ Loss of cultural resources in terms of religious trees, structures, etc.	and a part of the area with solar panels (10% area), for fodder cultivation, or controlled and managed open grazing of goats, or agriculture (selected crops), to explore the potential of 'mixed land use' areas in solar parks that benefit the local community too. This may be done with the agreement of RUMSL and in partnership with domain specialist agencies and local organisations working in the region. Additional positive effects may include countering the 'heat island effect' described in Section 6.2.4. ■ Provision of easements shall be maintained in order to not sever the access to CPRs for the community; ■ Preference of members of Project affected households (PAH), as identified in the RAP, in employment opportunities during construction phase; ■ In case of Squatters and encroachers, RUMSL shall serve a three months advance notice to the project affected persons (PAPs) to manage the potential losses to standing crops; ■ In case of crop losses ensuing from project activities, RUMSL shall pay compensation for crops, as defined in the RAP (entitlement matrix); ■ Timely sharing of project related information with all relevant stakeholders in order to serve advance notice and reduce the extent of impacts and losses;		

Category	Impacts	Mitigation Measures	Impact Significance (without mitigation measure)	Impact Significance (post-mitigation)
		■ Employment to members of such encroacher and squatter households, based on qualification; ■ Skill development of members of such encroacher and squatter households, based on any existing skill set (if any), and self-declared interests; ■ Provision of Grievance Redressal Mechanism to all impacted stakeholders in order to raise and register their grievances.		
Impact on Vulnerable Groups	■ Out of the three phases, the Indigenous Communities and vulnerable groups are understood to be impacted the most during Planning phase of the project, on account of loss of livelihoods linked to land being procured for project. Since these agricultural workers are not rightful owners or users of land as per records, the project related compensation measures would not be directly reaching out to this group.	■ To identify and assess the extent of impacts on this group, a review of the scope of FPIC and IPP, in terms of remaining impacts on IP groups, their traditional livelihoods and customary land use; including dependence on natural resources, will be undertaken; ■ Based on this review, the target groups for the FPIC process will be identified in terms of villages and number of households in each village. ■ It should be noted that the exact number of households may be identified only post the site walk through and social mapping. ■ Review the consultation process carried out as part of allotment process of unoccupied government land through discussions with personnel from the Land Division of District Magistrate office to access the Gram Sabha resolutions as part of the land allotment process.	Moderate	Minor

Category	Impacts	Mitigation Measures	Impact Significance (without mitigation measure)	Impact Significance (post-mitigation)
		■ Relevant details in relation to the Gram Sabha Resolution will be collected to understand implications for any legacy issues. ■ As part of the stakeholder engagement, ensure adequate representation of the Indigenous groups and vulnerable groups, and specific engagement activities are undertaken with these groups; ■ Ensure that the grievance management mechanism established is accessible to these groups.		
Construction Phase	■			
Land use and Land cover	■ The establishment of the Solar Park will convert scrub land and agricultural land to industrial use for the long term (at least 25 years). The total land area of more than 1,000 ha will undergo land use change, out of which almost 90% is government land. ■ In the construction phase, temporary land use changes will occur at contractor facilities and labour camps, material storage areas; ■ During construction phase, there will be permanent change of the land use within the land parcels where the Solar Park and pooling substation will be established.	■ Construction activities should be restricted to designated area; ■ On completion of construction activities, land used for temporary facilities such as Contractor office, batching plant (if any), stockyard, labour camp should be restored to the extent possible; ■ The land use around permanent Project facilities should not be disturbed; and ■ The land should be restored back to the original state to the extent possible after completion of life cycle of the Project and in case there are plans not to continue further at the site	Moderate	Moderate

Category	Impacts	Mitigation Measures	Impact Significance (without mitigation measure)	Impact Significance (post-mitigation)
Soil erosion and compaction	■ The site clearance activities, excavation and levelling of ground will cause disturbance of the soil strata and impact on soil quality. ■ The project will undertake the soil compaction activity to ensure soil stability during the establishment of storage areas, labour camp, access road, installation of batching plant, establishment of substation, SCADA building etc. ■ During construction activities, there would be compaction of soil in the Project area during movement of vehicles/ construction machinery and work force movement. ■ In addition, laying of electrical wires in the agricultural field during erection of internal electrical lines will also lead to the compaction of agricultural soil to certain extent.	■ The topsoil present in the construction shall be removed and stock pilled in separate area; ■ The stock pile should be protected from natural elements to prevent from erosion and also degradation; ■ Topsoil to be reused on site for landscaping purpose; ■ Defined routes for transportation and construction vehicles, workers etc. to minimize soil compaction; ■ Good drainage as per the natural slope condition should be provided to reduce surface runoff and associated erosion; ■ Back filling and revegetation of the area disturbed will be undertaken phase wise immediately after the completion; and ■ Site clearance, piling, excavation and access road construction will not be carried out during the monsoon season to minimize erosion and run-off.	Minor	Negligible
Waste generation and soil contamination	■ General construction waste generated onsite will comprise of concrete, steel cuttings/filings, packaging materials or plastic. ■ Municipal solid wastes consisting of food waste, plastic, glass and waste	■ Construction and Demolition Waste should be stored separately and disposed through approved facility/landfill; ■ All waste should be stored in a shed that is protected from the elements (wind, rain, storms, etc.) and away from natural drainage channels;	Minor	Minor

Category	Impacts	Mitigation Measures	Impact Significance (without mitigation measure)	Impact Significance (post-mitigation)
	paper will also be generated by the construction workforce at canteen facility/ labour camp. ■ A small proportion of the waste generated during construction phase will be hazardous and will include waste fuel, grease, broken modules, paints, chemicals and waste oil containing rags.	■ A log book should be maintained for quantity and type of hazardous waste generated; ■ Designated areas should be provided for Solid Municipal Waste and daily collection and period disposal should be ensured; ■ EPC Contractor should ensure that no unauthorized dumping of used oil and other hazardous waste is undertaken at the site; ■ Hazardous waste to be disposed through MPPCB authorised vendors; ■ In case of accidental/unintended spillage, the contaminated soil should be immediately collected and stored as hazardous waste; ■ The guidelines and procedures shall be prepared and followed for immediate clean-up actions following any spillages; ■ Damaged/ discarded solar panels to be disposed with the help of authorised recycling vendors/ module installation contractors/ supplier; and ■ Other wastes such as e-waste, used discarded batteries shall be disposed off in accordance to E-waste rules and batteries management and handling rules		

Category	Impacts	Mitigation Measures	Impact Significance (without mitigation measure)	Impact Significance (post-mitigation)
Topography and Drainage	■ Impact on topography of the Project site due to site levelling activities. ■ Any changes to topography in the area will advertently impact the drainage channels and might result in water logging in adjoining areas of the Project site.	■ Project shall ensure to avoid any unnecessary changes in the topography especially during the preconstruction and construction phase; ■ Micro drainage channel should be particularly avoided when constructing access roads or planning the Transmission Line pathway in order to ensure no change to the topography of the area. ■ Storm water drains must be designed in line with the natural topography and eventually drain into the natural seasonal streams in the Site area	Minor	Minor
Water resources	■ Stress on local water resources due to water requirement for the foundation activities, establishment of substation, labour camp during construction phase ■	■ No ground water abstraction during construction phase ■ As part of project designing, SPD shall consider the rainwater harvesting ponds in the open area depending on the topography, slope, natural drainage etc. Accordingly infrastructure such as drains/ piping system/ size of pond etc. shall be designed. ■ Similarly, in case water is sourced from surface water bodies, infrastructure requirements shall be identified and planned in project design ■ Construction labour deputed onsite to be sensitised about water conservation and encouraged for optimal use of water; ■ Regular inspection for identification of water leakages and preventing wastage of is necessary for efficient utilisation of water	Major	Major to Moderate

Category	Impacts	Mitigation Measures	Impact Significance (without mitigation measure)	Impact Significance (post-mitigation)
Water Quality	■ The quality of water in the water bodies could be affected due to surface runoff from contaminated soil (soil contamination due to oil/ fuel spillage and leakages) especially during monsoon season. ■ The surface runoff carrying the loose top soil will lead to increased sedimentation in the receiving water bodies. ■	■ Ensure proper cover and stacking of loose construction material at site to prevent surface runoff and contamination of receiving water body; ■ Open defecation and random disposal of sewage will be strictly restricted; ■ Planning of toilets, soak pits and septic tanks, waste collection areas away from natural drainage channels; ■ Provision of number of toilets across with easily accessible location as the project site is spread across large area of 2 Units separated geographically; ■ Use of licensed contractors for management and disposal of waste and sludge; ■ Labourers will be given training towards proactive use of designated areas/bins for waste disposal and encouraged for use of toilets; ■ Provision for impervious storage area, especially for fuel & lubricant, hazardous waste, etc. will be made onsite; and ■ Spill/ leakage clearance plan to be adopted for immediate cleaning of spills and leakages.	Minor	Minor to Negligible
Ambient air quality	■ Fugitive dust emissions from site clearance, piling work, handling of construction materials, emission due	■ The construction site shall be barricaded; ■ Keeping areas of open excavation to a minimum;	Minor	Minor to Negligible

Category	Impacts	Mitigation Measures	Impact Significance (without mitigation measure)	Impact Significance (post-mitigation)
	to movement of vehicles on unpaved roads, plying of vehicles, etc. ■ Vehicular emissions due to increased traffic movement on site and on the approach roads; ■ Exhaust emissions from construction machinery and other equipment such as batching plant, if any; and ■ Emissions from diesel generators required to be run for construction power purposes	■ Minimising stockpiling by coordinating excavations, spreading, re-grading, compaction activities; ■ Cease or phase down work if excess fugitive dust is observed, investigate source and take suppression measures; ■ Speed of vehicles on site to be limited to 10-15 km/hr; ■ The emissions from diesel generator shall be by optimised operations, orientation at the site and providing adequate stack height for wider dispersion of gaseous emissions ■ Switch off machinery and equipment when not in use; ■ Prevent idling of vehicles and equipment; and ■ Vehicle engines will be properly maintained and will have a valid Pollution under Control (PUC) to ensure minimization in vehicular emissions		
Ambient noise quality	■ Noise generation due to construction activities, operation of equipment's, machineries, D.G. sets, movement of vehicles and heavy earth moving machineries. ; ■ Local communities may get disturb due to higher than anticipated noise.	■ Ensure safe distance of project related activities from schools, hospitals, etc.; ■ Only well-maintained equipment to be operated on-site; ■ If it is noticed that any particular equipment is generating too much noise then lubricating moving parts, tightening loose parts and replacing worn out components to be carried out to bring down the noise. It is to be ensured that such machinery are kept far away from the households;	Moderate	Minor

Category	Impacts	Mitigation Measures	Impact Significance (without mitigation measure)	Impact Significance (post-mitigation)
		■ Machinery and construction equipment that may be in intermittent use to be shut down or throttled down during non-work periods; ■ Low noise equipment shall be used as far as practicable; ■ The number of equipment operating simultaneously shall be reduced as far as practicable; ■ Install enclosures around construction area, in order to reduce the extent of noise emanating due to project related activities; ■ DG set with acoustic enclosures shall be used; ■ Vehicular movement through village roads should be planned to avoid traffic jam and inconvenience to local residents; ■ Equipment noise should be 85 dB (A) at 1 m from the source in line with WB/IFC EHS guidelines; ■ Minimal use of vehicle horns needs to be encouraged; ■ Limit construction related activities to day time in order to restrict the noise related nuisance in the evenings, where permissible noise threshold is lesser; ■ Provision of Grievance Redressal Mechanism to all the key stakeholders in order to raise and register their grievances pertinent to noise and dust related issues		

Category	Impacts	Mitigation Measures	Impact Significance (without mitigation measure)	Impact Significance (post-mitigation)
Occupational health and safety	■ Construction of support structure for PV module would require operation of pile drivers. ■ The installation of solar module will involve operation of cranes and other mechanical lifting equipment. ■ Laying of interconnecting cable with require digging. ■ The commissioning of the inverter rooms and Transmission Line will also involve live power lines. ■ Working on live wires carrying power has dangers of electric shock and electrocution. ■ Construction and commissioning of PSS and associated structures will involve multiple hazards i.e., working at height, use of cranes and mechanical lifting equipment, working with high voltage power; ■ Besides this, there could be slip and trip hazards especially during monsoon season; and ■ The area experiences extreme winter and summer condition. Working	■ Health & safety training to be provided during both construction and operation phase; ■ Prior to start of work, workers should be informed about the related safety risks and precautions to be taken through tool box meetings; ■ Manual lifting by adult men to be less than 55 kg and for women it should be less than 30 kg; ■ Adequate PPEs to be provided for all activities at site including for welding, cutting or similar operations which may cause hazard to eyes; ■ All persons performing construction work to wear safety shoes and helmets confirming to national standard; ■ Every worker engaged in handling sharp objects which may cause injury to hand shall be provided suitable hand gloves; ■ While working in hot conditions, measures such as work break at regular intervals, keeping hydrated by drinking water and liquids, covering face with damp cloth etc. shall be used; ■ Obtain and check Contractor's safety method statements; ■ Monitor health and safety performance and have an operating audit system;	Minor	Minor

Category	Impacts	Mitigation Measures	Impact Significance (without mitigation measure)	Impact Significance (post-mitigation)
	during very high and low temperature could cause health hazards. ■ The Project site also needs to implement proper measures for fire safety, structural safety and any for emergency situations.	■ Permitting system should be implemented to ensure that cranes and lifting equipment is operated by trained and authorized persons only; ■ Appropriate safety harnesses and lowering/raising tools should be used for working at heights; ■ All equipment should be turned off and checked when not in use; ■ Emergency contact numbers and route to the nearest hospital to be displayed at the construction site; ■ The local/ host community to be kept at safe distance from construction site; ■ Site specific safety or emergency response plan should be in place to account for natural disasters, accidents and any emergency situations; ■ Site specific/ activity specific Hazards Identification and Risk Assessment (HIRA) should be developed prior to start of the activities at site; and ■ Provide H&S achievement information to employees		
Habitat Modification and Loss	■ The habitat with the highest sensitivity in the Project site is the scrub land adjacent to [Water Body adjacent Unit 3]. The water body supports migratory and resident bird species including small colonies of the Vulnerable Woolly-necked Stork. As vegetation	■ Larger mature trees with significant height and girth should be avoided to the extent possible when constructing the Solar Park. Larger trees can be set aside within the Solar Park and avoided as part of the micro-siting of the solar modules	Minor	Minor

Category	Impacts	Mitigation Measures	Impact Significance (without mitigation measure)	Impact Significance (post-mitigation)
	surrounding the water body is commonly utilized by resident bird species, the loss of these habitats could result in displacement of fauna from the area. Storks are also commonly found perched at heights on Transmission Lines or trees near water bodies and therefore the loss of vegetation would affect the Vulnerable Woolly-necked Stork.	■ The Kawai Pond and Bardawada Pond is located within 500 m and 100 m from Unit 2 and 1 respectively. The vegetation surrounding these ponds should be avoided to the extent possible when siting temporary facilities (i.e. labour camps, contractor facilities, batching plant, etc.). ■ A natural canal delineates the border between Kawai and Badi Villages. The canal was dry during the site visit despite the assessment being immediately after the monsoon season. The canal may pass through Unit II and/or Unit III after the compound is constructed. The natural drainage through the canal should not be blocked due to construction and operation/maintenance activities. ■ If changes in the boundaries of the proposed units or any further expansions are anticipated than the areas surrounding the Arnea Reserve Forest block should be avoided to prevent increased risk of edge effects. ■ The area around the [Water Body Unit 3] should be avoided for the siting of any ancillary facilities including access roads, contractor facilities or labour accommodation and even siting of equipment (e.g. DG set, waste storage area, material storage area, etc.) should not be undertaken adjacent to the water body.		
Impacts due to Construction activities	■ Construction activities at Project site will create a disturbance to local fauna and force them to remain in an alert mode for extended periods of time that prevents proper foraging,	■ No hunting, trapping or injuring of local fauna should be communicated to labourers through a workshop or formal training exercise. The training should also communicate presence of species protected under Wildlife Protection	Minor	Minor

Category	Impacts	Mitigation Measures	Impact Significance (without mitigation measure)	Impact Significance (post-mitigation)
	roosting, nesting, breeding, mating and socializing activities ■ The resultant impact could affect the viability of local flora, ground-roosting bird species and ground-dwelling fauna ■ human-wildlife conflict	Act, 1972 Schedule I and the penalties associated with contravention on the identified law; ■ Noise control measures such as acoustic enclosures for DG sets, noise attenuation barriers in areas near sensitive habitat and proper maintenance of the vehicles used for the Project site should be implemented to reduce the effect of construction noise on local ecology; ■ Set routes, consolidation of trips and no off-roading policies should be introduced by the EPC contractor to reduce the impact from noise and human-wildlife conflict; ■ Adequate toilets, gas/firewood and space should be provided in any anticipated labour accommodation and the labourers should be informed not to enter or utilize any resources from surrounding forest land over the course of the construction period; ■ Local semi-skilled and unskilled labourers should be used to the extent possible to reduce demographic influx into the Project site and therefore reduce the risk of disturbance to local fauna; ■ Waste that is generated from the Solar Park during construction and operation should be stored in covered containers within the site premises. Uncovered waste may attract fauna to the Solar Park;		

Category	Impacts	Mitigation Measures	Impact Significance (without mitigation measure)	Impact Significance (post-mitigation)
		■ Excavated areas should be adequately fenced and security should be deployed to prevent wildlife intrusion into these areas; ■ Construction work and anthropogenic movement should be restricted near any major water bodies to reduce the impact on aquatic bird species (resident or migratory); ■ Construction activities and transportation should be avoided during peak ecological activity i.e. dawn (5:30 am to 7:30 am) and dusk (5:00 pm to 7:00 pm). Night-time activities should be kept to a minimum; ■ Areas with pre-existing nests, ground-roosting sites and burrows should be avoided for construction related work to reduce the impact on local fauna; and ■ Hazardous materials and waste should not be stored near any drainage channels or cliff-sides to prevent contamination of the surrounding environment and impact on local flora/fauna.		
Ecosystem Services	■ Project will include the long-term loss of food resources, water, shelter, nesting sites, etc. ■ The existence of the walled compound may also hinder daily pathways taken by reptiles, mammals and birds for foraging, roosting and socializing	■ Nesting trees should be avoided to the extent possible when it falls within the Solar Park site. ■ Larger mature trees[1] with significant height and girth should be avoided to the extent possible when constructing the Solar Park. Larger trees can be set aside within the Solar Park and avoided as part of the micro-siting of the solar modules.	Minor	Minor

[1] Mature trees can provide several ecosystem services including firewood, non-timber forest produce, shelter, climate regulation, habitat provision and foraging resources.

Category	Impacts	Mitigation Measures	Impact Significance (without mitigation measure)	Impact Significance (post-mitigation)
	■ Loss of viability of the [Water Body Unit 3] due to any impacts (e.g. sedimentation, water contamination, etc.) from the adjacent construction work for Unit 3 of the Project.	■ Natural drain passing between Kawai and Badi should be unaffected by the Project construction. Similar seasonal drainage pathways should not be blocked during the Project construction. ■ Seeding of native plant species outside of the Solar Park especially in areas where the soil layers have been impacted and around water bodies to offset the loss of floral resources and dependent ecosystem services. ■ Pollution and spill control mechanisms should be implemented and strictly enforced around [Water Body Unit 3] to ensure that there is no impact to the water quality or any drainage channels into the water body.		
Impacts due to temporary occupation of land for construction activities	■ The land required for temporary activities like setting up of a number of labour camps for the required duration, land for safety setbacks, storage areas, parking areas and other construction related temporary land requirements, if these are located outside the boundary of the Project Area. If all these activities can be accommodated with the Project footprint, the impacts from temporary land lease-rent, will be avoided; ■ Other impacts, from noise, nuisance, resource use, etc., are discussed below.	■ Provision of adequate lease on rental amounts to the land owners shall be ensured by RUMSL; ■ The land leased/ rented shall be restored to its original state (or made better) at the time of handing it back to the owners; ■ Provision of compensation for the loss of livelihoods to the users of the land required for temporary use as this will temporarily economically displace them; ■ Application of all precautions to implement and follow the COVID-19 related safeguards, as relevant and as prescribed by the government, at that time	Minor	Negligible

Category	Impacts	Mitigation Measures	Impact Significance (without mitigation measure)	Impact Significance (post-mitigation)
	■ COVID 19 related infection risks may persist and may be enhanced for workers, living and working in close proximity of each other	■ Timely dissemination of project related information with all relevant stakeholders, in order to serve advance notice and reduce the extent of losses/ impacts; ■ Provision of Grievance Redressal Mechanism to all the key stakeholders in order to raise and register their grievance.		
Impact on Community Health and Safety	■ The movement of material and machinery would pose health and safety risks to the community and livestock as the vehicular movement will increase in the area and may result in collision and accident risks, and create additional vehicular and dust pollution, affecting people, animals and potentially affecting crops in the vicinity of the corridor of movement; ■ Labour influx in the area due to construction phase may lead to community health and safety related impacts which may include - Potential spread of communicable diseases (infectious and vector-borne), if external labour will be sourced from outside the region,	*Responsibilities of RUMSL* ■ Ensuring stakeholder engagement through the project cycle and provision of an effective Grievance Redressal Mechanism to avoid, mitigate and mange conflicts and disagreements; ■ As part of the stakeholder engagement and information disclosure process, the community will be provided with an understanding of the activities to be undertaken and the precautions to be taken for safety; ■ RUMSL shall maintain safe distance of project components from schools, hospitals, etc. in order to avoid interactions with community hotspots and hence risks of accidents; ■ The Contractors to be engaged by RUMSL shall be informed of the EHSS practices that are expected from its workers during the construction phase engagement. Obligations like preparation of Traffic Management Plan, Local Procurement Plan, EHSS Plan (including for	Moderate	Minor

Category	Impacts	Mitigation Measures	Impact Significance (without mitigation measure)	Impact Significance (post-mitigation)
	- The issue of COVID-19 related infections may remain a relevant concern and may need to be especially managed both, within labour camps and in the interactions of workers and the local community ■ Conflicts with local community resulting from disagreements over other issues and local impacts	managing COVID 19 related risks), etc. shall be communicated to them at the time of selection and appropriate clauses should be included at the time of contract finalization; ■ The contractor shall be required to adhere to IFC's accommodation guidelines, for the labour camps in terms of provisions, sanitation facilities, etc. thus limiting the probability of diseases and infections in the local community on account of improper management of waste; ■ RUMSL shall put in place a grievance redressal mechanism to allow community members to report any concern or grievance related to project activities. The contractors engaged shall also be contractually required to put in place a similar mechanism to deal with concerns raised by the community (or external stakeholders) and the workers engaged during construction phases. ■ *Contractors* ■ The contractor shall induct migrant workers on health and safety awareness and practices to be followed at site during construction phase; ■ The contractors shall cordon off areas that are under construction and put relevant safety signs to restrict movement of local community members or workers engaged at site, which may become safety threats;		

Category	Impacts	Mitigation Measures	Impact Significance (without mitigation measure)	Impact Significance (post-mitigation)
		■ The Contractors shall prepare a Traffic Management Plan and traffic movement due to the project in the area will be regulated to ensure road and pedestrian (including livestock) safety; ■ Additionally, training on vehicular safety shall be organised for the transport workers. ■ The movement of workers from the project site and labour camps shall be regulated and similarly the project boundary and labour accommodation to check for unauthorized visitors/ outsiders entering the site in order to avoid any possible interactions leading to conflicts or tensions between the migrant workforce and host community; ■ Contractors shall ensure that regular health check-ups are conducted for the construction phase workers (especially migrant workers staying in temporary labour accommodation) and any major illnesses are reported in the Block level medical authorities at the earliest; The labour accommodation should be clean and hygienic and disposal of kitchen waste and food waste shall be done on a daily basis in an appropriate manner; ■ Proper sanitation facilities shall be provided, taking into account the number of labourers that will be using the facilities, both at construction site, as well as labour accommodation;		

Category	Impacts	Mitigation Measures	Impact Significance (without mitigation measure)	Impact Significance (post-mitigation)
Stress on community resources	■ Depletion of ground water resources in the area may take place due to use for project related activities like construction, use for drinking water, cooking and sanitary purposes, etc. potentially affecting water availability for the local population, that depends on the same resources; ■ Potential loss of forest resources due to exploitation triggered by influx of labour in the area, thereby affecting the stock available for the local community; ■ Wear and tear of roads may take place due to movement of heavy machinery on the roads, creating movement problems and risks for local road users.	RUMSL responsibilities ■ There will be a worker Code of Conduct defined by RUMSL that prevents workers and contractors from using the local resources like water, forest, which will be shared with private SPDs for onward sharing with sub-contractors and its workers; ■ An induction session will be organised for the migrant workers where they will be sensitized on the Do's and Don'ts during their stay near project location, which would include aspects on conservation of community's resources; ■ The contractor shall be asked to use Tanker water supply during the summer months, which are dry months in which water scarcity issues are reported by the community; ■ Periodic maintenance activities for roads used for transportation of goods for the project shall be the undertaken by RUMSL, through its contractors; ■ Provision of Grievance Redressal Mechanism to all the key stakeholders in order to raise and register their grievance on misuse of locally available resources.	Minor	Minor to Negligible
Impact on Employment and Entrepreneurship opportunities	■ The construction phase will provide a boost to the local employment as a higher number is expected to be	■ Enhancement Measures ■ The sourcing of local labour wherever possible should be made obligatory by RUMSL (through contractual	Moderate (Positive)	Moderate (Positive)

Category	Impacts	Mitigation Measures	Impact Significance (without mitigation measure)	Impact Significance (post-mitigation)
	engaged as construction labour during construction phase; ■ Development of smaller vendors in the area through petty shops, petty contractors, etc. providing essential goods and services during the construction phase; ■ There will be an impact on local food basket due to increased demand for agricultural products and food items.	provisions) for the Solar Project Developers and sub-contractors and in all major procurement activities; ■ Preference should be given to the land losers and vulnerable population in the Project Villages, to the extent practicable; ■ Employment of members of SC-STs and Women Headed households should be ensured by the Solar Project Developers through documented agreement with contractors/ sub-contractors; ■ Engagement of local vendors, to the extent possible, for the goods and services required for the project during construction phase; ■ The project proponent will establish a mechanism to audit subcontractors and suppliers with respect to compliance of utilizing local labour and resources; ■ Provision of Grievance Redressal Mechanism to all the key stakeholders in order to raise and register their grievance with respect to information sharing related to jobs and opportunities for vendor-ship.		
Impact on women	■ Potential impacts on women within households affected by private and patta land procurement, where women are not land owners: - Women may be potentially affected more severely in such	■ A Gender Action Plan is being prepared for the Project where women focussed engagement is detailed in Appendix F; ■ Provide alternative arrangements for land, and create access for ease of use to collect fuelwood, and fodder.	Moderate	Minor

Category	Impacts	Mitigation Measures	Impact Significance (without mitigation measure)	Impact Significance (post-mitigation)
	households, if they are being rendered land-less - Risk of gender based violence from delayed payments or other land ownership based conflicts ■ Women Headed households (both Joint as well as independent) may potentially become more vulnerable in cases of sale of land for the project, if land is not in their name, or they do not receive the benefits. ■ Women land owners may face additional risks of not being included in negotiations, or other key meetings due to prevailing cultural norms and may not therefore receive the benefits and advantages compared to those who do participate ■ Access to jobs during the construction phases generally skews in favour of males, thus preventing women from availing project benefits. ■ Women and girls are disproportionately at risk in terms of safety (gender based violence, harassment, curtailed movement, reduced access to resources) during the construction phase, with the arrival of migrant labourers in the construction phase and their accommodation being planned near the project villages.	■ Ensure that the employment of women from vulnerable households is done for the project and efforts are made for development of women owned enterprises in the area, from where procurement for project related needs is undertaken; ■ Undertake a profiling of the various social groups in the Study Area, to understand the individual needs and concerns of the various women belonging to different social groups and design community development and CSR programmes in light of the same; ■ As part of the stakeholder engagement, RUMSL shall ensure and communicate to the private Solar Project developers, that Women focussed discussions are conducted in order to ensure adequate representation of the Women and their needs and concerns in order to design specific engagement activities; ■ Include provisions of coverage of women under skill training and Financial literacy training programs, as part of livelihood restoration activities by the project or through developmental programs of SPDs; ■ Provision of Grievance Redressal Mechanism to all the stakeholders in order to raise and register their grievances.		

Category	Impacts	Mitigation Measures	Impact Significance (without mitigation measure)	Impact Significance (post-mitigation)
Operations Phase				
Soil Environment	■ Operation phase will generate small amount of municipal waste from site office and waste such as broken solar panels. The hazardous waste generated at substation include used/spent oil, oil soaked cotton and filter waste, waste containers/tins of paints, used lead acid batteries, nonferrous scrap, insulated aluminium and copper wires/cables, waste dry chemical residues etc. which needs proper storage and disposal. ■ Improper management of broken panels will cause damage to the environment.	■ SPD shall prepared SOP for storage and disposal of broken solar panels and tie up with an authorized dismantling agency for disposal of panels. MNRE had prepared a concept note for storage and disposal of used solar panels. The recommendations such as recycling of glass, storage of discarded panels in cover shed etc. shall be adopted in the Project; (1) ■ The broken solar panels shall not be mixed with normal glass. ■ RUMSL shall prepare a waste audit checklist as part of their routine site monitoring and auditing plan during operation phase for monitoring of waste management at site. ■ A waste management plan is provided in Appendix F of report	Minor	Minor
Water resources and quality	The Jawad Block falls under Critical category ■ The utilization of ground water for operation phase of the project may compromise with competitive users (drinking water requirement of villages and irrigation purposes) in the	**Conserving Water Resources** ■ Dry robotic cleaning of modules to be explored as recommended by MNRE (2); ■ Alternate sources of water shall be explored	Major	Major to Moderate

(1) http://164.100.94.214/sites/default/files/webform/notices/DraftBluePrintAntimony.pdf

(2) MNRE had issued a letter dated 3 June 2019 to Principal Secretaries of States and Solar Association of all States regarding optimal utilization of water and preferably use Robotic technology for cleaning of modules.

Category	Impacts	Mitigation Measures	Impact Significance (without mitigation measure)	Impact Significance (post-mitigation)
	district based on ground water availability; ■ Any discharge of waste water from site to waterbodies will impact the water quality of water bodies	■ Ground water abstraction shall be done in accordance to CGWB guidelines. ■ Implement rainwater harvesting and/or groundwater recharge and replenishment opportunities within Site premises especially near the low-lying and gently sloping area. ■ Optimising water usage in the SCADA building by application of water conservation measures such as sensor based taps, low flush urinals etc.; ■ Maintain logbook for water consumption; ■ Implement groundwater and wastewater monitoring vis-à-vis quality/quantity; ■ Adopt less water consuming module cleaning methods; ■ The surface runoff from during solar panel cleaning shall be diverted to a settlement tank for settlement of suspended solids. The overflow shall be treated in water treatment unit and recycled in the Project. ■ Use of water from multiple sources to avoid dependency on one particular source (groundwater or surface water). This also includes tapping of rainwater received during the monsoons for the long-term and uninterrupted operations. ■ The Project should implement principles of water stewardship to ensure water security not just for the site,		

Category	Impacts	Mitigation Measures	Impact Significance (without mitigation measure)	Impact Significance (post-mitigation)
		but also for other stakeholders within the watershed. Some of the water stewardship frameworks/ standards that can be adopted are UN Global Compact's CEO Water Mandate or AWS Standards. ■ Identify stakeholders directly impacted by the groundwater use at the Project site and develop long-term stakeholder engagement plan particularly focused on stakeholders near site to develop positive perception towards Project and its operations. **Rain Water Harvesting** Rainwater harvesting pond shall be provided at site. In addition, groundwater recharge shall be undertaken within the Site to replenish the shallow aquifer zones. Piezometers to be installed to monitor the groundwater level changes in the aquifer trapped by the abstraction wells at Project site. **Water Quality** ■ Ensure proper cover and stacking of loose construction material at site to prevent surface runoff and contamination of receiving water body; ■ Open defecation and random disposal of sewage will be strictly restricted; ■ Planning of toilets, soak pits and septic tanks, waste collection areas away from natural drainage channels;		

Category	Impacts	Mitigation Measures	Impact Significance (without mitigation measure)	Impact Significance (post-mitigation)
		■ Provision of number of toilets across with easily accessible location as the project site is spread across large area of Units; ■ Use of licensed contractors for management and disposal of waste and sludge; ■ Labourers will be given training towards proactive use of designated areas/bins for waste disposal and encouraged for use of toilets; ■ Provision for impervious storage area, especially for fuel & lubricant, hazardous waste, etc. will be made onsite; and ■ Spill/ leakage clearance plan to be adopted for immediate cleaning of spills and leakages. **Other Management Aspects** Preparing an inventory of water consumption during construction and O&M activities. A water management plan is provided in Appendix F of report		
Occupational Health and safety	■ Electrical and mechanical risks during O&M activities; ■ Fire hazards; ■ Contact with the transmission line can result in electrocution; ■ At substation location, risks associated with transformer blast, electrical hazards are predicted.	■ Periodic Health & safety training to be provided to team; ■ Activity specific Hazards Identification and Risk Assessment (HIRA) should be conducted and accordingly SOPs shall be prepared for all O&M activities. ■ The lock in-lock out system will be followed during maintenance/ repair activities at substation and Transmission Line; ■ Records of incident/ accidents shall be maintained;	Minor	Minor to Negligible

Category	Impacts	Mitigation Measures	Impact Significance (without mitigation measure)	Impact Significance (post-mitigation)
		■ Root cause analysis shall be carried out for any incident/ accident ■ All persons performing maintenance/repairing work to wear safety shoes and helmets confirming to national standard; ■ Appropriate safety harnesses and lowering/raising tools should be used for working at heights; ■ All equipment should be turned off and checked when not in use; ■ Emergency contact numbers and route to the nearest hospital to be displayed at the construction site; ■ The local/ host community to be kept at safe distance from construction site; ■ Site specific safety or emergency response plan should be in place to account for natural disasters, accidents and any emergency situations; ■ Provide H&S achievement information to employees		
Photovoltaic Heat Island Effect	■ PVHI effect are detectable in the day, the real significant warming occurs in the evening hours, partially because these large photovoltaic installations took longer to cool down in the night time hours; The increase in localized temperature may cause discomfort to the habitation and wildlife in the vicinity of Solar Park	■ The existing ground vegetation in the Solar Park area shall be disturbed to minimum extent; ■ Ground vegetation shall be planted in the buffer areas/open areas available in the Solar Park; ■ The feasibility of mixed land use development in the Solar Park shall be explored		

Category	Impacts	Mitigation Measures	Impact Significance (without mitigation measure)	Impact Significance (post-mitigation)
Flood Likelihood Assessment	■ Likelihood of flooding event and its impact in and around the Site is evaluated as medium.	■ Undertake an assessment to estimate the High Flood Level (HFL) at the Site. This will help in estimation of the risks of flooding and inundation to the Site. Installation of solar panels and other critical infrastructure above the HFL will greatly reduce disruptions and losses to the Park; ■ Enhance structural stability of banks of all seasonal streams which are in close vicinity of the Site units and provide robust erosion protection to withstand flood water; ■ Storm water drains must be designed in line with the natural topography and eventually drain into the natural seasonal streams in the Site area; ■ Ensure that the Site's SWD outfalls are at an elevation higher than the maximum water levels of the natural seasonal streams; ■ Provide sluice/ flap gates at the SWD outfall to prevent backflow during a backflow event; ■ Make provisions for pumping infrastructure within the Site to ensure rapid evacuation of water in case of high flow/backflow associated with ponds and seasonal streams ; ■ Implement an effective flood monitoring and disaster management system in place for effective mitigation of floods at a Site level; ■ Coordinate with the district and local disaster management cells to update on flood early warning notifications.		
Collision and electrocution risk	■ Electrocution risk occurs when bird and bat species roost or nest Transmission Lines and are exposed to the uninsulated electrical components. There is also a chance of collision with the live electrical line components due to the line being not clearly visible during daytime hours (lack of reflective capacity) and night-time hours (poor light). ■ The presence of the Solar Park in close proximity to [Water Body Unit 3] can increase the risk of collision and electrocution because the walled compound and internal Transmission Line infrastructure (if overhead lines	■ Restrictions should be imposed so that dead carcasses are not disposed near the Solar Park. The O&M team should be trained on removing any carcasses found around these Project components in a timely manner to ensure that no vulture or birds of prey are attracted to the Project site. ■ RUMSL should maintain a carcass register as part of the Operation and Maintenance (O&M) phase to record any bird carcasses or suspected bird carcasses. The register should include a date, type of specie (to the extent identifiable), geographic location and nearest Transmission Line infrastructure for each carcass entry. If possible, the register should be backed-up with photo-	Moderate	Negligible

Category	Impacts	Mitigation Measures	Impact Significance (without mitigation measure)	Impact Significance (post-mitigation)
	are close to the boundary wall near the water body) would be used by avifauna for roosting	documentation of any identified carcasses or remains. If the number of carcasses are significant, then RUMSL should commissioning an ecologist to suggest more stringent mitigation measures at the sensitive Project components. ■ The O&M team should be instructed to regularly inspect transmission towers as part of their periodic maintenance and rounds of the operational Solar Park. The purpose is to identify any roosting or nesting of bird species. ■ The internal Transmission Line, if any, should be marked with diffractors/diverters at a spacing of 10m apart including bird guards/diverters in low voltage lines/cables.		
Community health and safety	The Operations phase would have very limited activity outside the project site as the construction phase would have been over and the scale of activity and workforce at the project footprint area would have reduced significantly. This would lead to far fewer impacts: ■ Less or negligible noise, ■ Fewer workers at site on near project villages, ■ Reduced traffic load (compared to construction phase) from the movement of people and goods.	■ Where community residential clusters are closer to the project boundary, keep a safety setback (as relevant) to mitigate the heat island effect. ■ Community sensitization sessions should be re-organised at the beginning of Operations phase, in order to mention about the new developments in the area and provided an understanding of the precautions to be taken for safety; ■ Project's Grievance Redressal Mechanism for the community shall still be in implementation to deal with any concerns of community health and safety, being raised by the local community.	Minor	Negligible
Impact on employment	■ The Operations phase would require much smaller workforce as compared to construction phase and the skillset	■ The private SPDs shall advertise the roles of Technical staff required during operations phases, in the local	Minor	Minor

Category	Impacts	Mitigation Measures	Impact Significance (without mitigation measure)	Impact Significance (post-mitigation)
	of the required workforce shall be different. ■ The Operations phase would require Engineers, Technicians to manage the Plant operations and amongst the requirement of semi-skilled workers in limited numbers for housekeeping and Security related jobs, on the payroll of RUMSL. ■ Additionally, there may be some vacancies with the private Solar Project Developers (SPDs) that may have some local employment, if feasible	newspapers to enable hiring of competent people from nearby areas, to the extent feasible; ■ Preference shall be given (to the extent feasible) to hire competent members from PAHs for semi-skilled jobs like housekeeping or Security Guards.		
Impact on women	■ The nature of impacts are envisaged on women in the Operations phase will be as following: ■ The extent of outsiders and migrant population in the area would have reduced along with risk to their safety; ■ There would be limited requirement of labourers jobs or vendor-ship opportunities in Operations phase, which might render them in search of livelihood options again.	The SPDs shall ensure appropriate measures for hiring of women, as per required skill set, are put in place, during the Operations phases	Minor	Negligible

Analysis of Alternatives

An analysis of probable alternatives for the chosen technology and location of Project site along with other similar factors that contribute to the Project as a whole has been carried out. The following scenarios have been taken into consideration:

- Project vs No Project scenario;
- Alternate Source for Power Generation;
- Location for Project Site

The selected Project has following advantages:

- The Project is environment friendly with minimal greenhouse gas emissions;
- It is the most feasible choice of power generation in the State of Madhya Pradesh; and
- It will contribute towards the state of Madhya Pradesh attaining self-sufficiency in power supply
- Site with high solar irradiation;
- ~ 90% of Land area is government land;
- Most of the land parcels selected are scrubland with barren rocky surfaces with sparse vegetation;
- No physical displacement for Project;
- No ecological sensitive receptor such as National Parks, Wildlife Sanctuary, within 5 km radius;
- There are no places of Archaeologically Important Places (ASI recognized);
- There exists no major obstacles around the site in the form of trees, buildings etc. that could lead to near shading; and
- Site is approachable through State Highway 9A and National Highway (NH) – 76 connecting Kota and Chittorgarh.

Environmental and Social Management Plan

The ESMP identifies potential impacts from the planned activities and outlines mitigation measures required to reduce the likely negative effects on the physical, biological and social environment. This is in accordance to Environmental and Social Management Framework, February, 2017. A separate RAP-LRP document will contain the management plan for resettlement related impacts.
The ESMP describes the mitigation measures for all the identified potential impacts associated with the proposed project during its planning, construction and operation phases. The ESMP delineates the monitoring and management measures to avoid and/or minimize such impacts by allocating management responsibility and suggesting skill requirement for implementation of these measures. The ESMP shall ensure a continuous communication process between RUMSL, EPC contractor, workers (including sub-contractors), local community and other stakeholders. RUMSL have an obligation to ensure compliance to all the commitments towards Environment, Social, Health and Safety Standards while executing all the project related activities for the proposed project.

A designated EHS Manager and a Supervisor for overseeing social and community aspects shall be appointed for the project and shall be responsible for implementation of ESMP at site, its monitoring, liaison with local community and reporting. An indicative budget for ESMP implementation and monitoring indicators are also given.

As part of ESMP, Project specific management plans have been identified and developed. Following management plans have been developed for the Project:

- Waste Management Plan;

- Water Management Plan;
- Occupational Health and Safety Plan;
- Disaster Management and Emergency Response Plan;
- Contractor and Labour Management Plan;
- Gender Action Plan; and
- Stakeholder Action Plan

Grievance Redressal Mechanism

The primary objective of the GRM shall be to provide an accessible mechanism to the stakeholders of the project and resolve any social and environmental related grievances. For this purpose, a Grievance Redressal Cell (GRC) shall be established, to resolve non-judicial disputes arising out of various matters related to the implementation of the ESMP, as well as other aspects of the project, as deemed fit to be raised before the GRC. The GRC will comprise of members from the EPC contractor team, RUMSL, community representatives, members of Gram Panchayat, women representatives.

The GRC will be driven internally by the Project team and shall have representation from the following teams to ensure fair and timely solution to the grievances:

- Site Manager/Project Manager;
- EHS Officer;
- Community Relations Officer;
- Senior representation on behalf of the Project Company; and
- Any other concerned person with decision making authority in relevance to the grievance or aggrieved party.

Formats for recording of grievances and maintaining the grievance records have been provided as part of the report.

Conclusion

The ESIA has assessed the overall acceptability of environmental and social impacts likely to arise as a result of construction and operation of Neemuch Solar Park.

- Project's potential environmental impacts will be mostly confined to construction phase and site-specific. These impacts include change in land use, stress on ground water resources, increase noise & vibration and air quality, etc. during the site preparation of Solar Park, pooling substations and community health and safety during material transportation.
- The proposed project will require water for cleaning of solar modules during operation phase. The project area falls under semi-critical category in terms of ground water availability. Water requirement for the project will be met mainly through ground water. Considering the stress on water resources in the area, it is recommended to evaluate alternate sources or plan for dry robotic cleaning.
- The land footprint of the project is 1065.7 hectares for Solar Park. The social impacts of the project will be higher in the planning and construction phases of the project, where land linked livelihoods will be impacted, there would be an impact on community resources and community health and safety risks, during construction phases and some short term employment will be generated.
- The Environmental and Social Management Plan (ESMP) describes mitigation measures for impacts specific to Project activities and also discuss implementation mechanism. Project specific management plans are also provided for certain Project activities such as waste management, occupational health & safety, contractor and labour management plan, gender action plan,

stakeholder management plan, grievance redressal, etc. This ESIA study together with mitigation measures and follow up of recommendations on management actions will help RUMSL in complying with the environmental standards.

1. INTRODUCTION

ERM India Pvt. Ltd. (ERM) has been engaged by Rewa Ultra Mega Solar Limited (RUMSL) to undertake an Environmental and Social Impact Assessment (ESIA) of three Solar Parks, including internal evacuation infrastructure and associated transmission lines of aggregate capacity of 1500 MW in the Neemuch, Agar and Shajapur Districts of Madhya Pradesh, India.

The ESIA for the aggregate 1500 MW Solar Parks has been divided into four distinct studies:

- ESIA for Neemuch Solar Park of 500 MW capacity;
- ESIA for Agar Solar Park of 550 MW capacity;
- ESIA for Shajapur Solar Park of 450 MW capacity; and
- ESIA for the external Transmission Line[1] infrastructure for all three Solar Parks.

This report is the Environmental and Social Impact Assessment study for the Neemuch Solar Park of 500 MW capacity (*hereinafter referred to as the 'Project'*), located at villages Badi, Kawai and Bardawada, District Neemuch in State of Madhya Pradesh. The subsequent Resettlement Action Plan (RAP) report and Indigenous Peoples Plan (IPP) will contain baseline information on the households from the villages falling in the project boundary, as well as the associated impacts.

1.1 Project Background

The Government of India has identified the solar power sector as one of the critical components for infrastructure development and overall economic growth. The Government of Madhya Pradesh (GoMP), through the Ministry of New and Renewable Energy (MNRE), is developing ground mounted grid connected solar power projects in Madhya Pradesh.

Rewa Ultra Mega Solar Limited (RUMSL) is a Public Undertaking Company incorporated on 10th July 2015 as a 50:50 joint venture (JV) company between Solar Energy Corporation of India Limited (SECI) and Madhya Pradesh Urja Vikas Nigam Limited (MPUVNL). Its primary objective is to develop and facilitate development of large scale solar power projects in the state of Madhya Pradesh.

RUMSL is planning to develop following three Solar Parks and their associated internal evacuation infrastructure and transmission lines:

- Agar Solar Park of 550 MW capacity
- Shajapur Solar Park of 450 MW capacity and
- Neemuch Solar Park of 500 MW capacity

RUMSL is in the discussions with World Bank (WB) to provide financial support for the Project. The International Finance Corporation (IFC) is providing investment advisory services to the GoMP to develop the Project on a Public Private Partnership mode and to support the GoMP in meeting its energy requirements and in the process, to meet the GoMP's Renewable Purchase Obligation (RPO)[2] and Solar Purchase Obligation (SPO)[3].

[1] The external transmission line infrastructure refers to the power evacuation from the solar park site to the grid substation.

[2] Renewable Purchase Obligations (RPOs) refers to the obligation imposed by law on some entities to either buy electricity generated by specific 'green' sources or buy, in lieu of that, renewable energy certificates from the market. The obligated entities are mostly electricity distribution companies and large consumers of powers.

[3] Solar Purchase Obligations (SPOs) are state-specific obligations for solar RPOs that have been created as per the National Tariff Policy.

Scoping Study

An Environmental and Social Scoping Study for the entire 1500 MW Project had been previously undertaken during September 2018- March 2019. The key outcomes of the scoping study relevant to the Neemuch Project site are described below:

- Local community indicated that village '*abadi'* land (*(habitation area)* used by squatters for residence and livelihood should be excluded from the Project footprint.
- Local community had raised concerns about the settlement of Bhil families within the Project footprint area i.e. Badi Village, as these communities had been residing on these land parcels for over 30 years;
- The Project may impact *patta* land (1), which was reportedly uncultivable at the time of allotment by the GoMP. The community was afraid that the compensation provided for these land parcels may not consider the time, money and effort put into these land parcels to make them cultivable;
- The groundwater resources in the Neemuch District (Jawad Block) had been categorized as 'semi-critical' and the India Water Tool prepared by the World Resources Institute (WRI) has recognized the area as low groundwater availability and extremely high baseline water stress;
- The Neemuch site has been identified to fall within a high vulnerable zone for flooding as indicated in the Flood Vulnerability Index developed by Government of India National Remote Sensing Centre (NRSC);
- Applicability of Free Prior Informed Consent (FPIC) to determine potential impact on private and patta land in Kawai and Badi Village has been identified; and
- Applicability of Critical Habitat (CH) for the transmission lines from all projects that could potentially affect vulture (*Gyps bengalensis*, *Sacrogyps calvus* and *Neophron percnopterus*) habitat[2] has been identified.

The defined list of impacts has been revisited during the ESIA study to confirm/validate the scoping study outcome as provided in ***Section 6***.

1.2 Objective and Scope of the Assessment

The key objective of this assignment is to conduct an ESIA with a view to identify the critical environmental, ecological and social concerns of the proposed Neemuch Solar Park, including the internal transmission line, and address them as an integral part of Project design.

The specific scope of work includes:

- To assess the existing environment and social status in the study area and area of influence and to identify issues which have potential to adversely impact important environmental, ecological and social features of the Project influence area.
- Carry out environmental, ecological and social assessment of Solar Park area and potential activities envisaged under the Project including internal evacuation infrastructure and associated transmission lines up to pooling sub-station.
- Analyse various options available in the site layout and arrangements for ancillary facilities, like water supply, with special reference to sources – whether local groundwater or water from distant sources would be used; in case of the latter situation, conveyance facilities will also be analyzed for impacts, drainage, access, etc. to minimize adverse impacts and enhance positive impacts, where feasible.

(1) Patta land comprises of land assigned to certain households in the project area by the Government.

[2] Note that the Transmission Lines of the projects are being covered in a separate ESIA assessment for all Solar Parks under the aggregate 1500 MW.

- Conducting labour influx risk assessment with key impacts on local community associated with the temporary influx of labour during construction activities;
- Based on final land footprint and georeferenced site boundaries of the Project, the ESIA will also include a Resettlement Action Plan (RAP) and a Livelihood Restoration Plan (LRP) with an identification of the Project affected households; assessment of loss of livelihood/ common property resources for affected communities and/or using the proposed site and in its immediate vicinity and also covering transmission line alignment through primary surveys covering all Project affected families/ consultations.
- Assess impacts on the indigenous/marginalized communities within the site and its influence area. Involve the services of a suitably experienced Indigenous People Expert to assist with the development of the approach and implementation of a Free, Prior, Informed Consent (FPIC) process. The overall principles, engagement process, and criteria for obtaining FPIC should be agreed on with the affected Indigenous People (IP) communities. Therefore, the focus of this task will be on seeking consent from affected IP communities for a draft package of proposed impact mitigation measures and benefits.
- To undertake consultations with potentially affected people to understand their views/concerns, taking into account perspectives from different social groups, women and men, to obtain their inputs regarding environmental and social issues, and to take these into account during the preparation of the plans that would be executed before the developers start working on the site.
- To provide technical inputs to the client in establishing the site boundary on-site by integrating the total station outputs (available with client department) with the baseline study output, based on impact avoidance/minimisation in environmental, ecological and socioeconomic terms.
- To identify the environmental and social issues associated with implementation of Solar Park and develop environmental codes of practices for common activities that need to be followed during various stages, such as planning, construction and operation & maintenance.
- Preparation of ESIA report, in line with agreed Environment and Social Management Framework (ESMF) already in place for RUMSL.
- To prepare an Environmental and Social Management Plan (ESMP); Resettlement Action Plan (RAP); Gender Action Plan (GAP) and /or Indigenous Peoples Development Plan (IPDP); Stakeholder Engagement Plan, in line with agreed Environment and Social Management Framework (ESMF) and, Grievance Redress Mechanism for the mitigation/enhancement activities that will be undertaken by RUMSL. The ESMP / RAP /GAP /IPDP will include the description of relevant activities, institutional responsibilities, budgetary allocations, timelines and reporting arrangements for the same.
- To identify portions of the codes of practice/management framework that need to be integrated with the bidding documents to ensure that the prospective bidders are aware of what all will be required during Project implementation and operation from an environmental, health and safety, as well as social perspective.

1.2.1 Applicable Framework

The applicable reference framework for the ESIA study are as follows:

- Relevant environmental, land labour and other relevant policies, laws, regulations and rules of the state of MP, and the Government of India;
- World Bank Environmental and Social Framework - Environmental and Social Standards;
- IFC Performance Standards, 2012;
- Environmental and Social Management Framework by Ministry of New and Renewable Energy Department, February 2017;

- IFC/WB General EHS Guidelines and sector specific guidelines for Electric Power Transmission and Distribution;
- IFC/EBRD Guidance note for Worker's Accommodation, 2009; and
- IFC Project Developer's Guide to Utility-scale Solar Photovoltaic Power Plants.

1.3 Approach and Methodology

The approach and methodology followed for the ESIA Study has been described in the relevant sections of this report and summarised below.

1.3.1 Kick-off Meeting

ERM undertook a kick-off meeting with RUMSL, IFC and WB on 21 October 2019, prior to site reconnaissance visit. A discussion was held with regard to the expectations from this assessment in terms of scope of work, deliverables, timeline and the methodology to be followed for the same.

1.3.2 Desk-based Review

ERM undertook a desk-based review of the Project to identify any environmental, social and ecological sensitivities around the Project site. The key sources of information that was reviewed as part of the study has been provided below.

Table 1.1 Key sources of information reviewed for the desk-based study

S.N.	Source
1.	Environmental and social scoping study conducted in 2018 for the proposed 1500 MW Solar Park Project
2.	Topographic Sheets 450/4 and 450/8 and other mapped data relevant for the site
3.	Detailed Project Report for the Project, July 2020
4.	Project details provided by RUMSL- Khasra and sub-khasra maps with ownership, 3 June 2020
5.	The Project boundary map. layout and Area statement, 3 June 2020
6.	Land Allotment letters for government land

1.3.3 Inception Report

A site reconnaissance study for the entire 1500 MW Solar Park was undertaken from 22 October 2019 to 25 October 2019. The purpose of the site reconnaissance was to understand the Project setting, associated facilities, confirm discussion outcomes of the kick-off meeting, undertake limited documentation review and conduct onsite discussions with the RUMSL team. Post reconnaissance site visit, an Inception report for the complete 1500 MW Project was prepared and submitted to client. This inception report provided an understanding of the following:

- An understanding of the Project and Project setting and the associated facilities based on the kick-off meeting, documentation review, discussions with RUMSL and reconnaissance site visit undertaken;
- The status of ongoing activities related to the Project;
- Validation of earlier screening and scoping carried out for the ESIA of Solar Parks and Transmission Lines and identification of any changes since previous studies were conducted;
- The proposed work plan and methodology for next step in assignment including status of other inter- linked Project activities.

1.3.4 Site Visit and Baseline Data Collection

An ERM team comprising of environment, biodiversity, hydrology and social experts undertook the site visit during 19- 22 November, 2019, 3-6 December, 19-25 December and 7-9 January, 2020 to

understand the site setting, environmental and social sensitivities, baseline data collection and to identify the relevant local stakeholders.

The activities undertaken during the site visits has been summarized below:

- Identification of key social and environmental risks/receptors in the study area;
- Understanding of prevailing community engagement processes;
- Understanding aspects of community health and safety, if any, linked to the proposed Project;
- Understanding land-based impacts, livelihood impacts, issues of vulnerable groups, cultural heritage issues;
- Understanding significance of impacts on biodiversity and natural resource management; and
- Consultations with the local communities and focused group discussions in the vicinity to understand their views and concerns of the Project.

Environmental baseline data was collected through primary monitoring and surveys of the study area (5 km distance from Project area) during 19- 25 December 2019. Secondary information through literature surveys was also collected for the study area of the Project. The primary baseline study undertaken included the following.

- Ambient air quality monitoring at 2 locations within the study area;
- Ambient noise quality monitoring at 5 locations within the study area;
- Ground water quality at 3 locations and surface water quality at 2 locations;
- Soil quality covering different land uses at 5 locations; and
- Traffic count at 1 location for 24 hours.

The details of environmental and social baseline conditions in the study area is provided in **Section 4** of this report. Photo-documentation of the site visit has been provided in ***Appendix A.***

1.3.5 Stakeholders Consultation

The consultations with various stakeholders during site visit, has been guided by an internal stakeholder engagement strategy developed by ERM, to streamline the communication and messaging, for the ERM teams engaged for various tasks, viz, ESIA, RAP and IPP. During site visit, the team undertook consultations with various stakeholders of the Project. The summary of the stakeholder consultations undertaken for the Project has been provided in ***Appendix B*** and a detailed identification and categorization and analysis is provided in ***Section 5.*** This will be further updated in RAP, based on the in-depth consultations undertaken as a part of the RAP study.

1.3.6 Impact Assessment

Assessment of potential impacts on the various environmental, ecological and social elements due to the Project activities were carried out for this ESIA study. The likely impacts on loss of land, land-based and non-land based livelihoods, vulnerable groups (women, youth etc.), labour, water environment, air environment, biological environment and socio-economic environment has been identified based on the actual and foreseeable events/Project activities. For the impact assessment, wherever necessary, professional judgement, experience and knowledge on similar projects have been used. The extent and potential consequences of the impacts have been compared against applicable standards and guidelines. Mitigation measures have been suggested for each of the identified potential impacts. The detailed Impact Assessment is provided in **Section 5** of this report.

1.3.7 Environmental and Social Management Plan

The Environmental and Social Management Plan (ESMP) has been developed to include the following:

- Introduction of purpose and objectives of the ESMP;
- Summary of significant adverse impacts and potential risks;
- Mitigations and control technologies as well as safeguards etc. to minimize adverse impacts on air, water, soil, ecological and socioeconomic environment;
- Institutional mechanism - roles and responsibilities for ESMP implementation including training of ESMP implementation team;
- Action Plans for effective control measures to minimize adverse impacts/risks; and
- Monitoring program for effective implementation of the mitigations and ascertain efficacy of the environmental management and risk control systems in place.

1.3.7.1 Management Plans

As part of ESMP, Project specific management plans have been identified and developed. Following management plans have been developed for the Project:

- Waste Management Plan;
- Water Management Plan;
- Occupational Health and Safety Plan;
- Disaster Management and Emergency Response Plan;
- Contractor and Labour Management Plan;
- Gender Action Plan; and
- Stakeholder Action Plan

The Management Plans have been provided in ***Appendix F*** of this report. The Resettlement Action Plan and Indigenous People Plan (IPP) will be prepared as separate deliverables.

1.4 Limitations

This ESIA report is based on scientific principles and professional judgment applied to facts with resultant subjective interpretations. Professional judgements expressed herein are based on the currently available facts within the limits of the existing data, scope of work, budget and schedule. We make no warranties, express or implied, including, without limitation, warranties as to merchantability or fitness for a particular purpose. In addition, the information provided to the Client in this report is not to be construed as legal advice. The report was prepared with the following limitations:

- The ESIA report has been prepared based on the site assessment undertaken till 9 January 2020 and information provided until 3 June 2020. The final DPR for this site was received from RUMSL on 9 Sept 2020. All public domain information source also been accessed until 31 August 2020. If there is any change in the site conditions, documented information and/or public domain information post the above cited dates, then the same has not been captured in the report.
- Solar projects do not require an Environmental Clearance under the EIA Notification, 2006 and as amended. The ESIA has therefore been prepared based on international standards defined in ***Section 1.2.1***.
- The details pertaining to temporary facilities (batching plants, contractor facilities, labour accommodation and storage yards) were not determined at the time of the ESIA visit. ERM conducted a reconnaissance of environmental, social and ecological sensitivities associated with the entire land parcel being procured for the Project but has not identified any site-specific sensitivities associated with the temporary facilities in absence of their details.
- The land maps for the Project site were being developed during the course of the ERM site visits and were not finalized, at the time of writing this report. It is understood that the land requirement provided to ERM is subject to change. The identification of environmental, social and ecological

impacts has therefore been identified based solely on the last version of land requirements and site boundary maps received on **3 June 2020**. Avoidance criteria used for identifying the final land requirement may also result in changing the type/ significance/ extent/ duration/ magnitude of the assessed impacts.

- As per the ToR, ESIA study had assessed impacts due to the Project during Construction and Operation phases;
- There is a water body adjacent to Unit 3 in South East direction. As per land allotment letters, this area is not allotted for the Project and Khasra no. 921, Village Badi does not have any water body in on this land. Same is also verified by Revenue Department. However, the drone imagery and related GIS maps shows this water body within Khasra no. 921. This is possibly due to some distortions and overlaps in the overlaying of data layers in the maps. After discussion with RUMSL, the water body is not considered within the Project boundary for impact assessment, though the maps used in the report show it with in boundary. The GIS maps will be revised by the SPPD or its contractors prior to construction, as part of the confirmation survey.

1.4.1 Uses of the Report

ERM is not engaged in consulting or reporting for the purpose of advertising, sales promotion, or endorsement of any client interests, including raising investment capital, recommending investment decisions, or other publicity purposes. Client acknowledges that none of its advertising, sales promotion, or other publicity matter containing information obtained from this assessment and report will mention or imply the name of ERM. Nothing contained in this report shall be construed as a warranty or affirmation by ERM that the site and property described in the report are suitable collateral for any loan or that acquisition of such property by any lender through foreclosure proceedings or otherwise will not expose the lender to potential environmental or social liability.

1.5 Structure of the Report

The structure of this ESIA report (as defined in ESMF) is given in ***Table 1.2.***

Table 1.2 Structure of the report

Section	Title	Description
	Executive Summary	
Section 1	Introduction	*(this section)* Introduction to the Project and ESIA methodology
Section 2	Project Description	Technical description of the Project & related infrastructure and activities
Section 3	Policy, Legal and Institutional Framework	Discussion of the applicable environmental and social regulatory framework and its relevance for the Project.
Section 4	Environmental and Social Baseline	An outline of the Environmental, Social and flora & fauna baseline status in the area of the Project.
Section 5	Stakeholder Identification, Information disclosure, Consultation and Participation	Identification and engagement with the key stakeholders, in order to assess the impact of the Project on them and their influence on the Project.
Section 6	Environmental and Social Impacts	This section includes details of identified environmental impacts and associated risks due to Project activities, assessment of significance of impacts and presents mitigation measures for minimizing and /or offsetting adverse impacts identified.
Section 7	Analysis of Alternatives	This sections provides an analysis of alternatives considered for the project w.r.t to location, technology etc.

Section	Title	Description
Section 8	Environmental and Social Management Plan	Outline of the Environmental and Social Management Plan (ESMP) taking into account identified impacts and planned mitigation measures and monitoring requirements. This section also includes details of institutional arrangements for the Project, monitoring and reporting indicators for performance of ESMP and budgetary allocation.
Section 9	Grievance Redressal Mechanism	This section provides the grievance redressal mechanism proposed for the Project.
Section 10	Conclusion	This section summarize the conclusion of ESIA study
Section 11	References	-
Appendices		
Appendix A	Photo- Documentation	
Appendix B	Details of Consultations undertaken during Neemuch ESIA preparation	
Appendix C	Note on Land Requirement and Procurement Process	
Appendix D	Environmental Monitoring Results	
Appendix E	Flood Likelihood Assessment	
Appendix F	ESMP- Management Plans	

2. PROJECT DESCRIPTION

This section provides an overview of the proposed Project in terms of location, Project components and associated infrastructure, resource requirements, land requirement and activities to be performed during the construction and operation stages of the project. A brief description of the Project is given in ***Table 2.1.***

Table 2.1 Brief Description of Project

S. No.	Particulars	Description
1.	Project Village location	Badi, Kawai and Bardawada
2.	Tehsil	Singoli
3.	District Name/State	Neemuch / Madhya Pradesh
4.	Location Coordinates	Latitude: 24°59'39.78"N and 25° 0'38.51"N Longitude: 75°13'26.82"E and 75°14'48.53"E
5.	Capacity	Unit 1: 160 MW Unit 2: 170 MW Unit 3: 170 MW
6.	Pooling Stations and Power Evacuation	Three Pooling substations of 33/220 kV (PSS), one in each Unit; Power evacuation through proposed 220/400 kV ISTS substation of PGCIL at Badi village located in north of Project site in between Unit 2 and 3.
7.	Climatic zone	Agro-climatic
8.	Average Elevation	Elevation ranges from 396 to 440 m amsl High gradient land area (>7°): Nil
9.	Site Conditions	Agricultural land, scrub land
10.	Road Accessibility	SH 9A (Bhilwara to Modak) is between 1 to 2.5 km south of the southern boundaries of Neemuch Project site. The individual units of the Project is connected through existing village roads
11.	Roads crossing Project site	Village roads
12.	Nearest Airport	Udaipur Airport (~140 km, WSW)
13.	Nearest Railway station	Mandalgarh, Rajasthan ~ 25 Km (N)
15.	River/ pond present in project footprint	Nil (refer Section 1.4)
16.	Number of Power line (66 KV and above) present in Project footprint	2 Transmission Line of 400 kVA and 220 kVA respectively.
17.	Protected areas (National Park/ Sanctuary)/ Forest land	The closest legally protected area (National Park or Wildlife Sanctuary) is Gandhi Sagar Wildlife Sanctuary located ~ 50 Km southeast of Unit 3; and The closest forest land is Arnea Reserve Forest block located 300m north of Unit 2
18.	Land Area	Total: 1065.7 hectares
19.	Water Requirement	Construction Phase: 250-300 KLD for civil works and 80-100 KLD for domestic use of labour at site; and Operation Phase: ■ 308 KLD for solar panel cleaning; ■ 10 KLD domestic water; ■ 7 KLD for green belt maintenance; ■ 32 KL for firefighting and miscellaneous
20.	Source of Water	Construction: Tanker water Operation: Ground water

S. No.	Particulars	Description
21.	DG sets	For backup power requirement during construction phase; No. and capacity yet to be determined.
22.	Soil Characteristics	Loamy sand – Project area
23.	Seismic Zone	Zone II (Low damage risk zone)
24.	Flood prone zone	High vulnerable zone
25.	Wind zone	High Damage Risk Zone

Source: RUMSL, DPR July 2020, site visit and secondary literature; land data taken from Area statement sheet shared by RUMSL in June 2020

2.1 Project Location

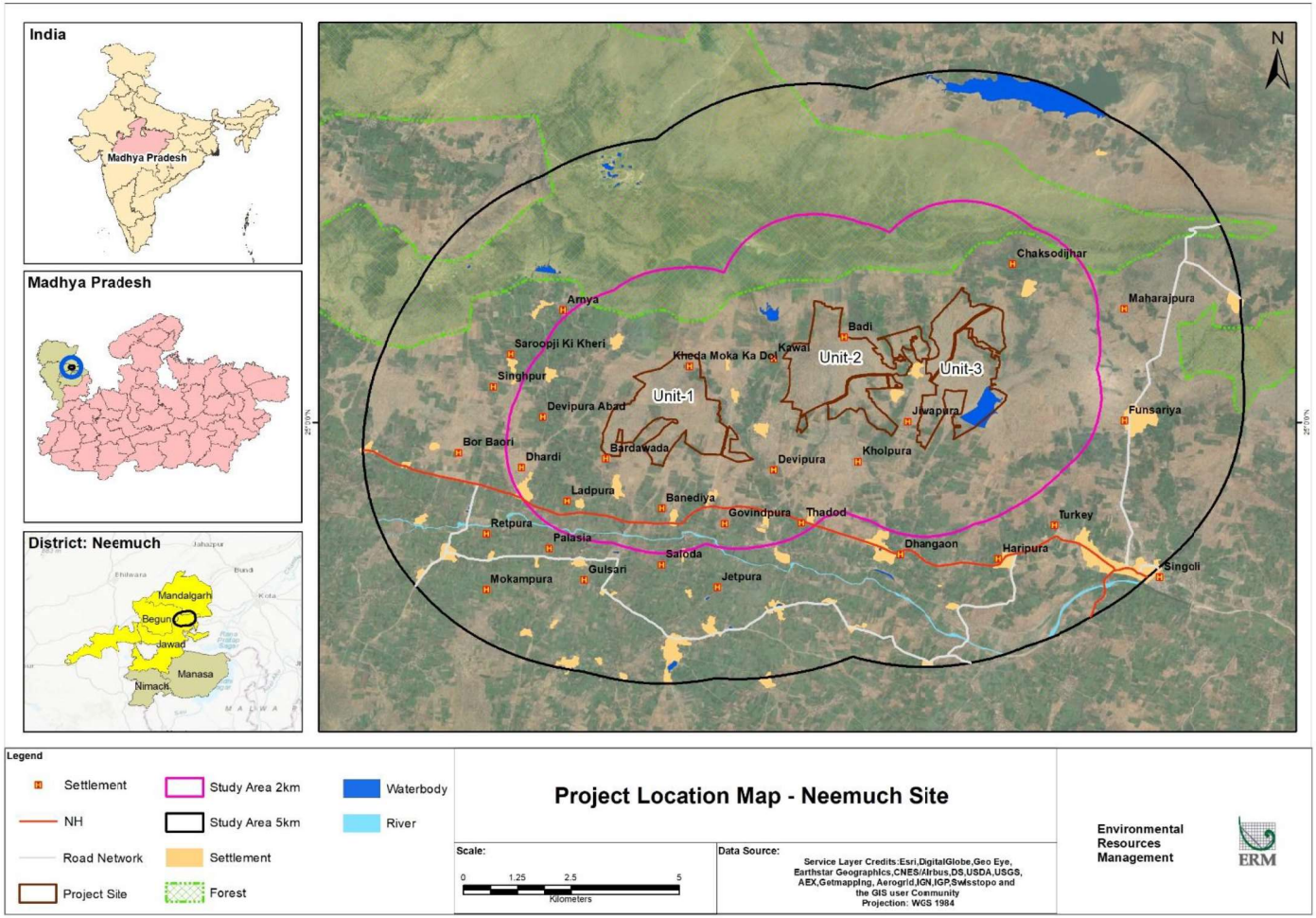
The proposed 500 MW Solar Park is proposed to be developed on 1065.7 Ha of land area spread across three villages namely, Badi, Kawai and Bardawada of Singoli Tehsil of Neemuch District in the state of Madhya Pradesh. The Solar Park is divided into three units (Unit 1, Unit 2 and Unit 3) and lies between 24°59'39.78"N and 25° 0'38.51"N latitude and 75°13'26.82"E and 75°14'48.53"E longitude.

Nearest village is Badi village located adjacent to Unit 2. Kawai village is present at a distance of ~ 450 m (W) from Unit 1. Site is located near Madhya Pradesh (MP) and Rajasthan border (~1.5 km aerial distance from Unit 1 and Unit 3). Neemuch town is present at an aerial distance of ~ 70 km in south-west direction. Mandalgarh, Rajasthan is the nearest railway station located at a distance of ~ 25 km (N) and the Udaipur Maharana Pratap airport is the nearest airport at a distance of ~ 140 km (SW) from the Project site.

The Project is connected through State Highway (SH) - 9A (Bhilwara to Modak) and followed by village roads. National Highway (NH) – 76 connecting Kota and Chittorgarh is at a distance of ~ 7 km from the site.

The project site location map is presented as ***Figure 2.1***

Figure 2.1 Project Site Location



Site Setting

The Project site lies between 24°59'39.78"N and 25° 0'38.51"N latitudes and 75°13'26.82"E and 75°14'48.53"E longitudes. Proposed project site is mostly flat and irregular in shape with elevation ranging from 396 to 440 m amsl. The site is primarily scrub land (used by local communities as grazing land for their livestock), part of the land is used for agriculture (in terms of ownership, agriculture is practised on private land *patta land, by* holders of the 'patta' and on encroached or squatted upon land). The proposed site also contains some structures of religious significance, structures /infrastructure for irrigation- bore wells, water channels and boundary walls made of stone slabs, the details of which are presented in **Section 4.4.**

There is no natural water body in the proposed Project site. A water body is present adjacent to Unit 3 in South- East direction. As reported this water body serves the purpose of recharging groundwater aquifers and irrigation. Other similar manmade lakes present in the study area include Kawai Lake and Arnya Lake at a distance of ~ 700 m from unit 2 (west), and ~ 3 km (north-west of Unit 1) respectively. Proposed Project site has number of dug wells in all the three Units. River Brahmani flows in South of the proposed site at a distance of ~ 2 km. Rana Pratap Sagar Reservoir is present at an aerial distance of ~32 km towards South-East.

Two transmission lines, 400 kV and 220 kV are present in the Southern and South East portion of Project site passing across few of the land parcels of the proposed Project. 400 kV transmission line passes through all the three Units however 220 kV transmission line passes through Unit 1.

There are no places of archaeological importance within the study area. There are no National Parks/ Wild Life Sanctuaries within 5 km radius. The Arnea Reserve Forest block is present within 5 km radius of the proposed site towards North. The site photographs are shown in ***Figure 2.2.***

Figure 2.2 Photographs of Project Site and Surroundings

View of Unit 1

View of Unit 2

View of Unit 3

Kuccha road in Unit 3

View of Water Body adjacent to Unit 3 in SE direction

View of village road in the Project area

Source: ERM Site Visit

2.2 Overview of the Project

The Neemuch Solar Park of capacity 500 MW is proposed to have three units, Unit 1- 160 MW, Unit 2- 170 MW and Unit 3- 170 MW. Each Unit land parcel will be designed in consideration of MNRE guidelines.

2.2.1 Project Components

The project is in the planning phase and comprehensive technical details pertaining to project components (including make, model and number) of the PV modules, inverters, transformers are yet to be finalized. As per Detailed Project Report (DPR), July 2020, solar module and inverter as described below are proposed.

- Solar PV Modules
  - Solar PV Modules based on Poly/Mono Crystalline and/or Thin Film (CdTe) technologies of different rated capacities with fixed tilt and single axis tracking Module mounting structure are proposed to be installed.
- Power Conditioning Unit (PCU) or Inverter
  - ABB make Inverter of 1000 kW rating is proposed to be installed. This would be finalized by SPD.
- Cables
  - The cable rack method is envisaged to be adopted by Solar Project Developers to connect plant to 33 kV outdoor air insulated substation for the solar projects because of increased internal grid availability, low cost, lower losses and no impact of shading on generation etc.
- Main Control Room Infrastructure
  - The control rooms are envisaged at the pooling substation. This will have the facility for gathering data on monitoring, forecasting, scheduling and dispatching for the submission to the load dispatch center. The Main Control Building has been proposed to have the Switchgear Room, SCADA/ Control Room, telecommunication infrastructure, Battery/ Auxiliary Room apart from rooms for staff, supervisor and administrative purposes, one Pantry along with Toilets, Stores etc. Air conditioning shall be provided in the SCADA/ Control Room and Heat Ventilation System shall be provided in the Switchgear Room, Auxiliary Room, Battery Room and Toilets. The entire building shall be provided with fire protection and detection system.

2.2.2 Associated Facilities

2.2.2.1 Evacuation Infrastructure

Pooling Substations (PSS)

RUMSL plans to develop three 33/220 kV Pooling Substations (PSS), with one PSS at each individual unit. The Solar Project developer will be responsible to connect plant to 33/220 kV Pooling Substation through appropriate 33 kV cable arrangement.

ISTS Substation

The power generated from the Solar Park will be evacuated through the proposed 220/400 kV ISTS substation of PGCIL (Power Grid Corporation of India Limited) planned in Badi village, north of the Project site. The connection of internal pooling substation and grid substation will be established through proposed 220 kV single circuit transmission line.

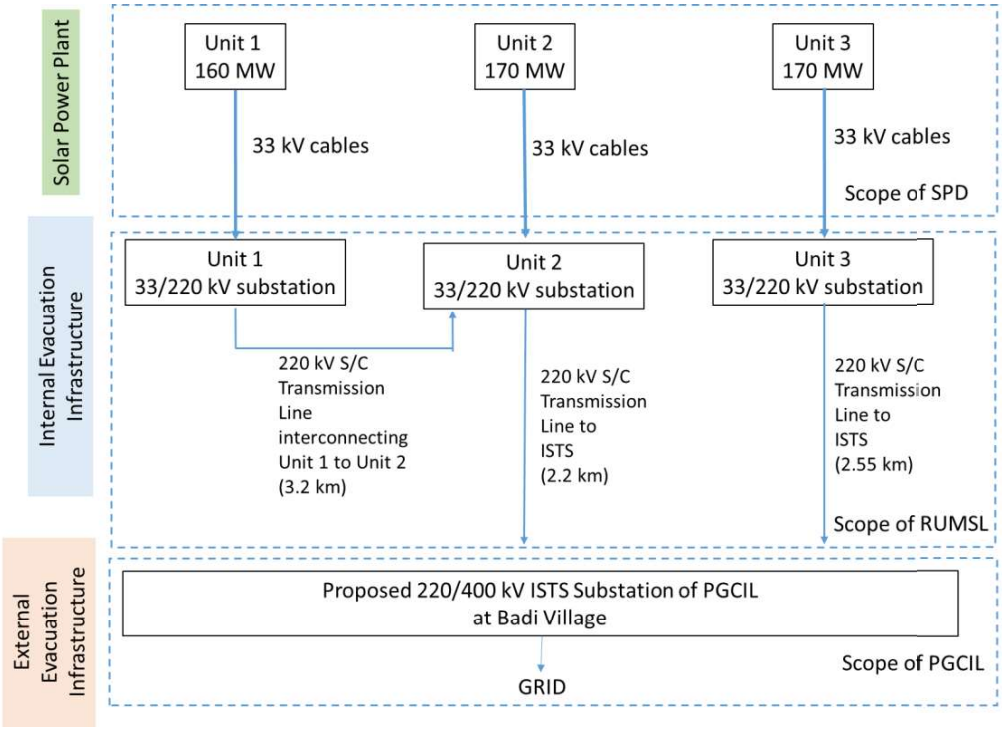
Transmission Line

It is proposed to erect Transmission Lines from Unit 2 (length-2.2 km) and Unit 3 (length-2,55 km) PSS connecting to PGCIL ISTS station. There will be a Transmission Line of length 2.2 km interconnecting Unit 1 PSS to Unit 2 PSS. Total length of Transmission Line will be approximate 8 km. The route of Transmission Line is under planning and not yet finalised.

Note: Environmental and Social impacts of Transmission Lines will be assessed as separate ESIA study.

Power evacuation arrangement for the project is as presented in ***Figure 2.3*** below.

Figure 2.3 Power Evacuation Arrangement



Source: RUMSL, August 2020

2.2.2.2 Access and Internal Roads (Source: DPR, July, 2020)

The access to the all the three parcels of land shall be through the road connecting to the Bhilwara Modak road (nearest state highway). The existing road from this state highway is a single lane village road having width of ~4 to 5 meter. However for Solar Park utility, during the construction stage, heavy equipment such as transformer, SS equipment, containers of solar panel in huge quantity etc. would be required to be transferred to the site. This would require the strengthening and widening of the existing road.
The access road shall be provided as follows:-

- Access to Unit 1 substation- It is proposed to develop a bituminous road of width 7.5 meter including 500 mm shouldering on both the sides having estimated length of 5.5 km.
- Access to Unit 2 & 3 substations- It is proposed to develop a single lane bituminous road of width 7.5 m including 500 mm shouldering on both the sides having estimated total length of 10 km (Unit 1:- 2.1 km, Unit 2:-4.7 km and Unit 3:- 3.2 km)

The total length of road infrastructure to be developed is estimated as 15.5 km (Primary road connecting providing the main access, 5.5 km and Secondary road of width 7.5 m is 10 km).

The internal roads of each unit shall be designed & developed by the respective unit Developers. The widening/ strengthening of access roads will be done by RUMSL.

2.2.2.3 Green Belt

A Greenbelt is proposed to be developed close to utility area and near fencing & boundaries by SPD.

2.2.2.4 Common Facilities

The utility area is proposed near the internal pooling substation located at the Unit 3, adjacent to the 33/220 kV pooling substation. Facilities proposed to be provided at Neemuch Solar Park includes street lighting, drainage, RUMSL office building, firefighting, telecommunication infrastructure, sewage, medical dispensary, weather monitoring station, etc.

Temporary labour camps shall be set up within the boundary of the land identified for the project during the construction phase of the Solar Park, which is expected to be around 21 months. At present no additional need for external labour camps has been identified.

2.3 Summary of Project Activities

Key project activities during different phases of the Project have been summarised below:

2.3.1 Planning and Pre-Construction Phase

The planning phase includes the following components:

- Identification of land area and site;
- Site surveys as topographic, geo-technical investigations, solar radiation and yield study, electrical grid studies, etc.;
- Obtaining all necessary approvals/clearances;
- Land procurement;
- Selection of Solar Project Developers (SPDs); and
- Appointment of contractors.

Identification and land procurement is a key component of the planning and pre-construction phase. The process of land procurement can be divided into following

(a) Land survey and final land area demarcation;

(b) Land title verification;

(c) Land compensation; and

(d) Land procurement.

The land survey and final demarcation of land footprint was under process at the time of assessment and shall be handed over to the SPPD.

2.3.2 Construction Phase

Construction phase of project activities will include the following:

- Contractor mobilization;
- Establishment of labour camps;
- Site Preparation including fencing, clearing of bushes, pit filling, levelling and grading;
- Construction of site office and internal roads;
- Construction of temporary storage facilities;
- Foundation laying for ground mounted structures;
- Storage of PV modules delivery and their installation;
- Laying of internal electrical cables; and
- Construction of sub-station and office buildings.

2.3.3 Operation and Maintenance

The list of activities to be carried out in the operation and maintenance phase would be:

- Routine cleaning of PV modules;
- Control of vegetation viz. weeds, bushes etc. within the site and those immediately surrounding it;
- Routine inspection of all PV modules and associated structures viz. cables, transformers, inverters, mounting structures etc.;
- Operation and maintenance of pooling substation; and
- Inspection and maintenance of internal site pathways/access roads.

The Project proposes to have a dedicated operations and maintenance (O&M) team comprising of technical staff to conduct the aforesaid maintenance activities. This will also require additional resources in the form of water (for module cleaning), consumable spares and insurance.

2.4 Resource Requirement

As mentioned above, the proposed project is in early stage of planning, details on the resources such as raw materials, man power requirement, definite water sources, power supply and backup etc. are not yet decided. Hence, a tentative estimation of these resources are given in subsequent sections.

2.4.1 Raw Materials

2.4.1.1 Construction Phase

The major raw materials for the Project include cement, aggregates, sand, electrical installations, capacitors, stringing wires, transformers, transmission tower components such as steel tower structure, circuit plates etc. As informed, construction materials such cement, aggregates, sand etc. will be procured from local market. The project specific components will be purchased from selected vendors via procurement tendering process.

2.4.1.2 Operation Phase

There will not be any major raw material required during operation except for repair and maintenance purpose viz. consumable spares.

2.4.2 Water Requirement

2.4.2.1 Construction Phase

Based on industry practices, it is estimated that approximately 250 - 300 KLD of water would be required for civil works during peak construction stage. Water will also be required for domestic use by workers at Project site. Considering average worker requirement of 500-600 workers, daily water requirement is estimated as 80- 100 KLD including labour camp. The water requirement will be met through tanker water supply. Bottled water will be used for drinking purpose.

2.4.2.2 Operation Phase

The water required during operation phase of the Project will be mainly for washing of solar modules. Apart from the module cleaning, water will be required for the other purposes such as domestic use for manpower deployed at site, green belt, firefighting, etc.

As per DPR July 2020, total workforce during operation phase is estimated to be 225. Total water requirement is estimated as 357 KLD (~360 KLD) and described below

- ~308 KLD for solar panel cleaning, assuming 2.5 litres per sq.m for panel cleaning and considering 12 cleaning cycles per year;
- 10 KLD domestic water, assuming 225 no. of O&M staff and 45 LPCD;
- 7 KLD for green belt maintenance (as per DPR);
- 32 KL for firefighting and miscellaneous

Water requirements for the Solar Park is proposed to be met by bore-wells within each unit after the approval of CGWA/CGWB and from nearby surface water bodies.

2.4.3 Power Requirement

2.4.3.1 Construction Phase

Construction Power shall be met through individual D.G. sets for each unit.

2.4.3.2 Operation Phase

Based on initial assumptions, power requirement during daytime would be met through auxiliary generation. During the night time power requirement would be met through the grid as per applicable regulations. DG sets would also be kept at the control room for emergency power backup.

2.4.4 Fire Safety and Security

2.4.4.1 Construction Phase

Appropriate firefighting system and equipment shall be provided throughout the construction period. The fire extinguishers will be placed at all strategic locations such as site office, storage yard, near construction area, welding area, etc. Besides this, emergency contact numbers shall also be displayed onsite.

2.4.4.2 Operation Phase

The Solar Park shall be equipped with suitable Fire Protection and Fighting Systems for all common infrastructure and Pooling Sub-station as per the National Fire Protection Association (NFPA) and CEA Fire Safety Standards and requirements of Government of Madhya Pradesh. Following firefighting protection system are proposed:

- Portable Fire Extinguishers of DCP, CO2, Foam type.
- Fire Buckets, painted red with additional handle at the bottom with fine sand and fixed on an angle iron frame as per requirement of Local Authorities.
- Automatic Fire Detection cum Alarm System in the Switchyard, Main Control Building and Administration Building.
- Fire Detection and Alarm System integrated with required cabling to a single Fire Alarm Control Panel with long range audible alarm facility.
- Manual Call Points and Hooters integrated with the Fire Alarm Control Panel in the respective Control Rooms.

2.4.5 Manpower Requirement

Currently, manpower requirement for construction, labour camp requirement etc., are under planning stage. It is estimated that average 500-600 workers will be deployed on site.

During the operation phase, approximately 165 technicians would be deployed at site. Apart from these, project will also deploy housekeeping and security guards. Total work force during operation phase is estimated to be ~225.

2.4.5.1 Labour Accommodation

As reported by RUMSL, during construction phase, labour accommodation will be provided by SPD within the Solar Park site area. According to RUMSL, the IFC/EBRD guidelines for Worker's Accommodation shall be followed during establishment of the labour camp for the project.

Box 2.1 IFC/EBRD Guidelines for Worker's accommodation- Summary

- Living facilities shall be located to avoid flooding and other natural hazards. Where possible, living facilities are located within a reasonable distance from the worksite;
- Transport from the living facilities to worksite is safe and free;
- The living facilities shall be built with adequate materials, kept in good repair and kept clean and free from rubbish and other refuse;
- The building site shall be adequately drained to avoid the accumulation of stagnant water;
- Heating, air-conditioning and ventilation should be appropriate for the climatic conditions;
- Access to an adequate and convenient supply of free potable water shall be always available. Drinking water shall meets national/local or WHO drinking water standards;
- Wastewater, sewage, food and any other waste materials shall be adequately discharged, in compliance with local or World Bank standards;
- Specific containers for rubbish collection shall be provided and emptied on a regular basis;
- Rooms/dormitories shall be kept in good condition, aired and cleaned at regular intervals;
- A separate bed for each worker shall be provided. The practice of "hot-bedding" should be avoided;
- Sanitary facilities shall be provided separately for men and women. Sanitary and toilet facilities shall be constructed of materials that are easily cleanable;
- An adequate number of toilets, facilities for washing and bathing shall be provided to workers;
- Canteen, cooking and laundry facilities shall be kept in a clean and sanitary condition. If workers can cook their own meals, kitchen space is provided separate from sleeping areas;
- An adequate number of staff/workers shall be trained to provide first aid;
- Security at worker's accommodation shall be ensured.
- In addition, National/State/Local guidelines shall be followed amid of COVID Pandemic

Source: Workers' accommodation: processes and standards, A guidance note by IFC and the EBRD.

2.5 Land Requirement and Allotment Process

The key land requirements for the project pertain to the permanent land requirement for the Solar Parks, the tower footing for the transmission lines; the land use restrictions within the RoW and the temporary land requirements (if not located within the identified project footprint) during the construction phase. ***Table 2.2*** provides the summary of the land requirement for all the three units of the project based on the information available. The discussion on the existing land use in the villages within which the project is situated and the potential dependence of communities on the land identified is discussed in ***Sections 4.4.6*** and ***4.4.7***.

2.5.1 Land Details

The Neemuch Solar Park will be spread across three villages in Singoli Tehsil, Neemuch District. The land required for 500 MW Solar Park including solar fields, roads, and transmission and distribution network is 1065.7 hectares (including 21.4 hectares of private land and 81.7 hectares patta land). The Neemuch Solar Park plot comprises of three proximate but non-contiguous land parcels. The three categories of the land in terms of their ownership (Government Land, Private Land and Patta Land) are detailed in the table below.

Private Land – Private Land is largely the land owned by the local population ancestrally and the ownership is backed by land documents in the name of the owners;

Patta Land – Patta land comprises of land assigned to certain (at the time) landless households in the project area by the State Government. The understanding of allotment of land under a particular scheme or to specific groups of community is not documented; however, it is understood that households from landless and constitutionally recognised socio- economic backward communities (SCs and STs) have been assigned the Patta Land by the GoMP. This land cannot be sold as per

conditions of the patta though special circumstances may be considered by the District Collector, who can allow its sale. This land can be purchased by the Government under the MP Mutual Consent Land Purchase Policy.

Government Land – Government Land is the land under ownership of Government but is not necessarily under use by the Government. This land types comprises the majority in the identified land parcel for the project; however it is reportedly being used for cultivation by local community as encroachers and for livestock grazing.

The following table provides a summary of the land requirement by village and land category.

Table 2.2 Neemuch- Village Wise Land Allotment details

Land Category	Unit 1 (ha.)		Unit 2-(ha.)		Unit 3 (ha.)	Total land (Hectare)
	Bardawada	**Kawai**	**Kawai**	**Badi**	**Badi**	
Government Land (both NRED allotted & identified)	201.8	89.6	156. 1	163.2	351.7	962. 5
Private Land	5.1	4.2	0	1.7	10.4	21.4
Patta Land	50.7	0	22.4	3.6	5	81.7
Sum	**351.5**		**347**		**367**	**1065.7**

Source: Land Data provided by RUMSL, 3 June 2020

The private land comprises of 2 percent land of Solar Park, whereas Patta land comprises 7.6 percent of the total land identified for Neemuch Solar Park. As part of the latest update, the total land parcel being considered for the Neemuch Solar Park is 1065.7 ha after feasible avoidance of land being used for agriculture, habitation, structures and access spaces/ routes, etc. Some portion of the government land identified for the Neemuch Solar Park, though classified as government land is currently (informally) used/ encroached by the village community for agriculture or 'private' fodder lots; however this use/status is not indicated in the land records. The government land identified in the villages consists of land classified as Charnoi, Charagah, Kamdal, Germumkin, Danta and Kavil Kast[1]. The land identified for the project is approximately 1092.7 ha. which is higher than the actual land requirement for the project (as presented in Table 2.3). The *Table 2.3* presents the beak up of private and patta land owners identified for the project land; such that 35.5 ha private land belongs to 48 private land owners and 73 patta holders possess 87.7 ha patta land. Out of the total land identified for the project, only 1065.7 ha land will be used and there is a chance that not all of the land owners identified below will be affected; however the detail of the exact numbers are not known yet.

Table 2.3 Ownership details of Private & Patta land identified for the project

Villages	Bardawada	Kawai	Badi	Total
Private Land (ha)	5.1	13.9	16.5	35.5
Patta Land (ha)	50.7	26.2	10.8	87.7
Total Land	55.8	40.1	27.3	123.2
Private land owners (No.)	6	12	30	48
Patta Land Owners (No.)	43	22	8	73
Total Land Owners	49	34	38	121

Source: Land Data provided by RUMSL, 3 June 2020

As per the data provided there are 6 female private land owners and 12 female Patta land owners out of 48 private land owners and 73 Patta land holders. Out of the private and patta land identified for the

[1] According to the discussions with the Revenue department officials conducted in 2018 (scoping stage), these land categories pertain to land classified for community use such as grazing, fire wood collection etc.

project, the combined ownership by women (Private +Patta land) is 5.2% in Badi village, while 26.4% in Kawai and 14.2% Bardawada villages.

2.5.2 Land Procurement Process

The land procurement process for the Solar Park commenced in 2016-17, where RUMSL identified potential land parcels, with large chunks of unused government land. This was driven by the intent to use Government land for the project to the extent possible and minimize the use of Private or Patta lands.

The land identification was followed by screening and scoping exercises, in order to identify the possible exclusions and avoidances on the identified land, comprising avoiding certain settlements/ clusters of structures, potential Bhil settlements, etc. Based on the recommendations from the scoping exercise, another drone survey of the identified land parcels was undertaken, to further optimize the land requirement in a manner, that impacts to private and patta land owners and associated livelihoods are minimized. The details of the land identification, screening, scoping and optimization process are presented in **Appendix C** along with description of next steps to be taken during land procurement. The section below outlines the brief procurement process to be followed for each type of land identified in the project area.

2.5.2.1 Process for procurement of Government Land

A Land Use Permission Agreement (LUPA) will be signed between New and Renewable Energy Department, Government of MP and RUMSL for the life of the project. The duration of construction phase will be incorporated in the project life to ensure that the LUPA is for a period of 25 years from the day of commissioning. M/S RUMSL will sign the LUPA with the Govt. of Madhya Pradesh for the Government land. The transfer of rights is undertaken once the allotment is finalized and approved by the Superintendent of Land Records (SLR) of the district. Subsequently, M/S RUMSL will have a back-to-back Land Use Permission Agreement with the Solar Project developers, which would enable them to use the land for development of solar project as per the agreed terms of the LUPA.

2.5.2.2 Process for procurement of Private and Patta Land

The private land for the project shall be purchased as per prevailing laws and policies in the State of Madhya Pradesh (through MP Mutual Consent Land Purchase Policy dated 14 November, 2014. M/S RUMSL will have the ownership of the land and sign the sub lease agreements with the Solar Project developer for a period of 25 years from the commissioning date, which is the anticipated life of the project.

The broad steps under the MP Mutual Consent Land Purchase Policy 2014, are given below:

- The Designated official from the Department/ Enterprise (in this case RUMSL) will submit an application to the collector for the purchase of the land as per the MP Mutual Consent Land Purchase policy 2014. RUMSL to undertake land survey and demarcate the land to be acquired and submit the information to the District Collector for verification;
- The application would include the following particulars:
  - Name of the project and purpose';
  - Area of the land proposed to be purchased;
  - Details of budget availability with the Department/ Enterprise for the purpose of land purchase for the project, as assessed, based on the Policy;
  - Land details (survey number, plot number, nazool sheet number, area, village, tehsil and map)
  - Land owner details;

- Estimated land value based on the prevailing market rates, also known as the Collector Guideline Rate;
- Estimated value of the assets available on the land
- Any other details which Department/ Enterprise would like to provide;

- In case of land requirement for the purpose of the infrastructure and development projects of various projects and enterprises of the state government, the collector will firstly allocate suitable government land available as per the established rules.
- The District Collector (DC) identifies private land parcels (only after government land options have been exhausted);
- Private land to be identified and shortlisted. The rate for the same to be decided, based on the guidelines issued by the District Collector's office;
- The District Collector after receiving the application from the concerned department/ enterprise:
  - Will require the Tehsildar to submit a report ascertaining claims over the land and whether the land title is clear or not. A team from the district and the tehsil visit the parcel and undertake an inventory of the assets thereon;
  - The District Collector will also ask the concerned departments (Forest, horticulture, Public work s dep to measure the assets, as relevant (house, well, trees boundary wall, etc.) and undertake the valuation of the assets.
  - As per the guideline, the land value (double the district level official market rate which is technically known as the Collector Guideline Rate plus a one-time Solatium) and the asset value (double the value of the asset assessment) will together form the final value to be offered to the sellers
- After verification of land use of the private land parcels, if the DC feels that the land is suitable for purchase, then the collector office submits a "Bhoomi Kray Prastav" or an Initial Offer to the land owner which has the proposed price. After being notified through the Bhoomi Kray Prastav (prastav), the landowner has 15 days to provide consent. This timeline can however be extended by the DC as per need.
- In addition to providing the (first) consent, the land owner will also need to provide an undertaking that the land is free of any litigations and/or encumbrances (sahmati patra); and in case there are encumbrances or other claims, the land owner will provide all the necessary details to the DC.
- After the undertaking has been received from all landowners, the DC to publish a Public Notification to raise any concern, within a timeline of fifteen (15) days from the date of publication of notification. The publication to be published in a local newspaper, and available with the Panchayat or an equivalent village level administration office, Tehsil office and the District Collector's Office;
- If any objection is received regarding ownership disputes of the identified land (defective title), or regarding the compensation amount, the land procurement would not proceed. In case of no objections are received, the DC will allow the land purchase to proceed;
- After seeking land owner and public consent, the payment of the consideration amount to the land seller should be completed within one year from the date of consent provided by the landowner. Any expenses pertaining to the land registration such as stamp duty, registration cost will be borne by the concerned government Department/ Agency;
- After the registration, the Mutation process (to update the land records) will be completed in the name of the MP government and the name of the concerned department/ agency will also be mentioned;

- In case the proposed project for which the land is purchased fails or does not move forward for any reason, the concerned Department/ Agency will transfer this land to the Revenue Department, and Revenue Department will be free to give it for any other project, as required.
- Any Government land given on patta for agriculture by the Government will be treated like private land for the purpose of seeking consent and payment of the purchase price to the patta holder.
- The required private land for the Project M/S RUMSL will hold ownership of all such private land parcels and sign sub-lease agreements with Solar Project Developers.

RUMSL intends to procure all private and patta land through the MP Mutual Consent based Land Purchase Policy. The RFCTLARR 2013 Act may only be used for land parcels that do not have clear titles, or have ownership related disputes.

Any additional private land, if required for temporary use outside the project footprint, during the construction phase will be taken on lease based on negotiations with landowners. However, no such need for temporary land has been assessed, as RUMSL intends to use the land within the project boundary for all temporary requirements, such as temporary labour camps, lay down and storage areas etc., during the construction phase. According to the discussion with the project team, to the extent possible, the temporary land requirement for the construction phase will be accommodated within the identified project footprint.

The land area and land boundaries finalised during this stage will be further assessed as part of RAP and FPIC resource mapping surveys, in terms of extent of economic losses, confirmation on the number and types of Project affected families (General, SC, ST, Women Headed Households, etc.), nature of impacts and whether landlessness is arising out of the land procurement for the project.

2.6 Pollution Stream

Pollution streams during construction and operation phase of Solar Park will include air emissions, noise generation, wastewater generation and solid waste generation.

2.6.1 Solid Waste Generation

2.6.1.1 Construction Phase

The solid waste generated by the Project will consist of domestic solid waste, packaging waste, metal scrap and construction debris. The main types of waste that would likely be generated and its sources are shown in ***Table 2.4.***

Table 2.4 Waste generated, source of waste and method of disposal to be adopted for the Project

S. No	Waste Type	Source	Method of disposal
Non-Hazardous Waste			
1.	Domestic solid waste	Temporary site office, storage area, labour activities	Waste shall be segregated onsite and shall be disposed of as approved by local authority.
2.	Construction debris	Construction activities within Solar Park including construction of access road, substation, storage yard etc.	Excavated materials shall be used for backfilling and levelling and other construction debris shall be used for road construction.
3.	Packaging waste containing wood, cardboard and other recyclables.	Packaging material from solar panels, cables and accessories	Return back to the supplier or used as storage boxes/ racks at site.
4.	Sludge from Septic Tank	Site Office and labour camp	Collected and disposed off through contractors.
5.	All non-recyclables waste	Construction activities	Collected and disposed off by the contractor at designated municipal landfill site.
6	Plastic waste	Packaging material	Shall be collected and disposed of through recycler
7	Biomedical waste	First aid kits kept at construction site and site office	Shall be collected, transported and disposed through an authorised agency as prescribed in *Bio-Medical Waste (Management and Handling) Rules 2016, as amended*.
8	Broken solar panels and other electronics waste (E waste)	Solar Park, PSS and Site Office	Shall be sent back to vendor as a buy back arrangement
9	Batteries	Solar Park, PSS and Site Office	Batteries shall be disposed through manufacturer under the buy-back arrangement.
Hazardous Waste			
1.	Used oil/waste oil, lubricants and oil contaminated rags	DG set, construction machinery	Hazardous wastes shall be stored onsite at separate designated covered area provided with impervious flooring and secondary containment. The storage containers/ bins/ drum will be clearly marked and identified for their hazards. Before completion of 90 days, hazardous waste materials shall be sent to MPPCB/CPCB authorised vendor for eventual disposal at the Common Hazardous Waste Treatment, Storage and Disposal Facility (CHWTSDF). The

S. No	Waste Type	Source	Method of disposal
			nearest CHWTSDF facility is located in Pithampura, ~ 300 km away from the site.

2.6.1.2 Operation Phase

Waste expected to be generated during operation phase from the Project will include domestic waste at site office, scrap materials like scrap tools, damaged personal protective equipment (PPEs) etc.; hazardous waste like waste oil, lubricants, used transformer oil; damaged batteries; damaged PV modules etc. Main types of waste generation and its disposal is as presented in table below.

Table 2.5 Waste Management during Operation Phase

S. No	Waste Type	Source	Method of Disposal
Non Hazardous Waste			
1	■ Domestic solid waste and office waste	Site Office	Will be disposed of through local municipal corporation
2	■ Metal Scrap	Site Office and PSS	Will be disposed of with the help of authorised scrap dealer
3	■ Damaged PPEs	Site Office and PSS	Through authorised vendor
Hazardous Waste			
4	Used oil/waste oil, lubricants and oil contaminated rags	Maintenance activities at site	stored temporarily onsite at separate designated covered area provided with impervious flooring and secondary containment and will be disposed in accordance with Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016, as amended
5	Broken solar panels, batteries (dry type or wet type), electronics	Site office and PSS	will be sent back to the vendor as part of buyback arrangement

2.6.2 Air Emissions

2.6.2.1 Construction Phase

There will be impact on air quality due to onsite construction activities. The likely emissions from construction activities would include the following:

- Fugitive dust emissions from site clearance, piling work, handling of construction materials, emission due to movement of vehicles on unpaved roads, plying of vehicles, etc.
- Vehicular emissions due to increased traffic movement on site and on the approach roads;
- Exhaust emissions from construction machinery and other equipment such as batching plant, if any; and
- Emissions from diesel generators required to be run for construction power purposes
- To control air emission during construction phase from operation of D.G. sets, adequate stack height as per CPCB norms will be provided to ascertain regulatory compliance. Fugitive dust emission arising from various activities such as piling, transportation of material (loading and unloading), vehicular movement (on unpaved roads) will be minimized through sprinkling of water

and maintaining vehicular speed to 10-15 km/hr. Vehicular emission will be controlled through proper maintenance of vehicles and vehicles with proper PUC will be operated at project site.

2.6.2.2 Operation Phase

Under normal operating conditions there would be no gaseous emissions from the operating areas. However, there is a likelihood of gaseous and fugitive dust emissions, albeit in smaller concentrations, owing to the operating of maintenance vehicles. As a means of best practice and adherence to country regulations, well maintained vehicles with proper PUC will only be used for operation and maintenance purposes.

2.6.3 Wastewater Generation

2.6.3.1 Construction Phase

Liquid effluents generated during the construction phase will include domestic sewage from temporary site office as well as from labour camps. As part of the site preparation stage, a drainage and sewerage system will be constructed for the site office. The sewerage system will consist of soak pits for the collection of wastewater from the kitchen and washing areas and Office facility. Sewage from the toilets shall be discharged into lined septic tanks. Sewage disposal trucks shall be used to periodically remove the sludge/sewage from the site.

2.6.3.2 Operation Phase

The operational phase will have ~8 KLD of wastewater generation at site office. Septic tank and soak pits will be provided at the site offices, pooling substations of each Units for disposal of sewage.

2.6.4 Noise Emission

2.6.4.1 Construction Phase

During the construction phase noise will be generated primarily during the day time. Noise will be generated from pilling activities, construction equipment and machineries, D.G. sets and vehicular movement in the area. Since there are settlements in the near vicinity of the construction site, the receptors of noise pollution will be the residents of the settlements and the construction workers.

As a control measure it will be ensured that noise emission from the vehicles and equipment's shall not exceed 91 dB(A) (for Passenger or commercial vehicles with gross vehicle weight above 12000 kg as specified in Central Motor Vehicles Rules, 1989, as amended). D.G. sets will be provided with acoustic enclosures and workers near noise generating machines will be provided with earplugs as safeguard against high noise hazards.

2.6.4.2 Operation Phase

Under normal operations, none of the activities of Solar Park will generate noise. Any noise generating activities during maintenance work will be restricted to daytime only.

3. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

This section presents key environmental and social rules and regulations as well as international safeguard requirements that will be applicable to the Project, during different phases with respect to the following reference framework:

- Applicable Indian (national, state and local) Environmental and Social Regulations;
- Applicable Permits (licences, approvals and consents) and permitting agencies;
- IFCs Performance Standards on Environmental and Social Sustainability (2012) (IFC, 2012);
- World Bank Environmental and Social Safeguard Policies;
- IFC/ WB General EHS Guidelines (2007) (IFC, 2007);
- IFC EHS Guidelines for Electric Power Transmission and Distribution, 2007; and
- MNRE Environmental and Social Management Framework for Solar PV Park, February, 2017.
- Applicable National Environmental Standards for Ambient Air, Noise, Water etc.

3.1 Applicable Reference Framework

A list of applicable environmental legislations and their specific application for the proposed Project are given in ***Table 3.1***. The International Standards and their applicability for the Project is provided in ***Table 3.2***. Earlier, a preliminary review of applicable regulations was conducted in the scoping stage. The present table has been built upon that and is an outcome of revised review. The table shall be updated as the Project progresses.

Table 3.1 Applicability of Key Legislations in India and Reference Framework in the different phases of life cycle of the Project

Applicable Indian Legislation/Guidelines/International Conventions	Pre-construction	Construction	Operations	Agency Responsible	Remarks
Environment Protection					
Environment Protection Act, 1986 and as amended	X	√	√	Madhya Pradesh Pollution Control Board (MPPCB) Central Pollution Control Board (CPCB) Ministry of Environment Forest and Climate Change (MoEFCC)	Permissible limits for ambient air quality, water quality, noise limits has been laid down by CPCB under EP Act, 1986 which requires to be complied with during Project lifecycle.
Noise Pollution (Regulation and Control) Rules, 2000 and the Noise Pollution (Regulation and Control) (Amendment) Rules, 2010	X	√	√	MPPCB	Per the Act, ambient noise levels are to be maintained as stipulated in the rules for different categories of areas such as residential, commercial and industrial and silence zones. Considering the context of the project, the rules for residential areas would need to be followed.
The Water (Prevention and Control of Pollution) Act, 1974, as amended	X	√	√	MPPCB	The conditions within the Water and Air Act need to be followed through construction and operation of the project. As per MPPCB Notification no. 4551 dated 27.12.2016, Solar Parks are listed under White Category and does not require Consent to Establish/Operate.
The Air (Prevention and Control of Pollution) Act 1981, as amended	X	√	√	MPPCB	
Guidelines/Criteria for Evaluation of Proposals/Requests for Groundwater Abstraction, 2012 as amended	X	√	√	MPPCB	Per the guidelines, any ground water abstraction for project will require permission from Central Ground Water Authority (CGWA). Presently, DPR of the Project has identified tanker water and ground water as source of water to meet water requirements of the Project during construction and operation phases respectively.

Applicable Indian Legislation/Guidelines/International Conventions	Pre-construction	Construction	Operations	Agency Responsible	Remarks
Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016, as amended	X	√	√	MPPCB	Generation of used oil/diesel, paint cans, oil contaminated rags transformer oil, oil contaminated materials at Solar Park and substation site attracts the provisions of Hazardous and Other Waste Rules, 2016. As per amendment vide G.S.R 178 dated 1st March 2019, Project does not require HW authorisation as the project does not require consent to establish and consent to operate under white category provided. HW and other wastes generated from the project shall be given to the actual user, waster collector or operator of the disposal facility in accordance with CPCB guidelines.
Explosive Rules 2008	X	√	X	Chief Controller of Explosives, Petroleum and Explosives Safety Organisation	If any controlled blasting is proposed in the project for site levelling, these Rules will be applicable. The Project will have to obtain a license for storage and use of explosives from the Chief Controller. The rules with respect to storage requirements, safety, labelling and records/submission of annual returns needs to be followed as indicated in the explosive rules.
Batteries (Management and Handling) Rules, 2001, as amended	X	√	√	MPPCB	Batteries need to be managed and stored with respect to the Batteries Management and Handling Rules and disposed through an authorized recycler.
E-waste (Management) Rules, 2016, as amended	X	√	√	MPPCB	Electrical and electronic waste needs to be managed and stored with respect to the electronic waste rules and disposed through an authorized recycler.
Construction and Demolition (C&D) Waste Management Rules, 2016	X	√	X	MPPCB	If there is any demolition for structures in the Project during construction and decommissioning activities, these Rules will be applicable. The C&D waste has to be disposed as per the Rules.
Manufacture, Storage & Import of Hazardous Chemical Rules, 1989 as amended	X	√	√	MPPCB	Storage and handling of hazardous chemicals in the form of diesel and transformer oil will be carried out in accordance to the relevant provision of this Rule. All chemical storage to be appropriately labelled with Material Safety Data Sheets (MSDS) available and displayed.

Applicable Indian Legislation/Guidelines/International Conventions	Pre-construction	Construction	Operations	Agency Responsible	Remarks
The Madhya Pradesh Bhumi Vikas Rules, 1984	X	√	√	Local Fire Authority	The Project will require Fire NOC for substations if the height of control room qualifies category of High rise building (height of building above 18 m) as given in the Rules.
The Motor Vehicles Act, 1988 as amended	X	√	√	Ministry of Road Transport and Highways State Transport Authority	■ Compliance of stipulated standards under Rule; ■ Display of emergency information panel by vehicles carrying hazardous substances as per Rule 134; ■ Vehicular pollution control measures; ■ Other environmental and safety compliance under the Rules.
Social					

Applicable Indian Legislation/Guidelines/International Conventions	Pre-construction	Construction	Operations	Agency Responsible	Remarks
The Madhya Pradesh Land Revenue Code,1959 and amendment 2018	√	X	X	District Collector and Revenue Department	This Act provides guidance on the evaluation of land and assets impacted; According to this Act, "Market Value" means the value of land assessed according to guidelines issued by the Collector under the Madhya Pradesh Bajar Mulya Margdarshak Siddhanton ka Banaya Jana Tatha. Unka Punrikshan Niyam, 2000 made under the Indian Stamp Act, 1899 Chapter 18 of the Act puts in place the provisions for the declaration of Nistar rights by the Sub-Divisional officer, for each village. The Nistar Patrak may include matters such as: ■ Terms and conditions on which grazing of livestock in the village may be permitted ■ The terms and conditions on which and the extent to which any resident may obtain - Wood, timber, fuel or any other forest produce - Mooram, kankar, sand, earth, clay, stones or any other minor mineral etc. The Wajib-ul-arz document, also with the Sub-Divisional Officer, is a record of customary land on non-vacant land- rights suck as easements and wayleaves, rights of water use for irrigation, fishing etc. The code also allows for the Collector to set apart unoccupied land for uses including timber and fuel reserve, pasture grass bir or fodder reserve, gaothan, encamping ground, threshing floor etc.

Applicable Indian Legislation/Guidelines/International Conventions	Pre-construction	Construction	Operations	Agency Responsible	Remarks
MP Mutual Consent Policy, 2014 *(Aapasi sehmati se Bhu kraya Niti, 2014)*	√	X	X	Revenue department	The government agencies requiring land for various infrastructure projects can procure land with the mutual consent of the land owners as it saves time, ensure timely payment of land value to owners and the procedures are less cumbersome. The objective is to purchase land from owners with their consent and making them understand the social and economic benefits as a result of the project. The policy will facilitate speedy procurement of land and the sellers will get the land and asset value as per the provisions of the policy in a timely manner.
The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act 2013	√	X	X	District Collector and Revenue Department	This act is only planned to be used for private or patta land parcels that do not have clear titles or have ownership disputes. All other private and patta land will be procured using the MP Mutual Consent based Land Purchase Policy 2014. Such parcels within the area required for the project will not exceed 100 acres for any unit The Section 45.1 and 45.2 of the Act require that in case the land for acquisition is => 100 acres; a R & R Committee will be formed, with the collector as the Chairman. The purpose of the committee will be to monitor and review the progress of the implementation of the R & R Scheme and to undertake post-completion audits in consultation with the GS and municipalities.
The Indian Telegraph Act, 1885	√	X	X	Department of Telecommunication, Govt. of Madhya Pradesh	■ The Electricity Act and Telegraph Act define the compensation payable for damages to crops/ trees and structures along the transmission line route

Applicable Indian Legislation/Guidelines/International Conventions	Pre-construction	Construction	Operations	Agency Responsible	Remarks
Seventy Third Constitution Amendment Act,	√	X	X	Department of Panchayati Raj, State Government	■ The Act enables participation of Panchayat level institutions in decision-making. Panchayats at the village level will be involved for preparation and implementation of the project.
MoP Guidelines for Payment of Compensation Towards Damages in regard to RoW, 2015	√	X	X	Revenue Department	Guidelines for payment of compensation towards damages in regard to Right of Way for transmission lines. The guidelines have proposed compensation to be paid for the base area in between the transmission tower (between four legs) and towards diminution of land value in the width of the RoW corridor due to laying of transmission line @ 85 % and 15 % respectively of the land value as determined by the District Magistrate or any authority based on circle rate/ guideline value/ stamp value/ stamp act.
Labour					
Minimum Wages Act 1948	√	√	√	Labour Department	The act ensures minimum wages for each category of workers

Applicable Indian Legislation/Guidelines/International Conventions	Pre-construction	Construction	Operations	Agency Responsible	Remarks
Equal Remuneration Act 1976; The Payment of Wages Act, 1936, amended in 2005 and 2017; Maternity Benefit Act, 1961 & The Maternity Benefit (Amendment) Act, 2017 The E.P.F. and Miscellaneous Provisions act, 1952 and The Madhya Pradesh Labour Laws (Amendment) And Miscellaneous Provisions Act 2015 was passed under the Madhya Pradesh Act (21 of 2015) in November 2015; Payment of Bonus Act, 1965 and rules and subsequent amendment Payment of Gratuity Act, 1972; ESI Act , 1948 (Employees State Insurance Act, 1948) Workmen's Compensation Act, 1923	√	√	√	Labour Department	Puts in place rules and regulations governing the remuneration payable to workers and employees
Child Labour (Prohibition and Regulation) Act, 1986 and subsequent amendments	√	√	√	Labour Department	Prohibits employment of children below 14 years of age

Applicable Indian Legislation/Guidelines/International Conventions	Pre-construction	Construction	Operations	Agency Responsible	Remarks
Contract Labour (Regulation & Abolition) Central Act 1970 and Rules, 1971	√	√	√	Labour Department	Ensure basic welfare measures to be made available to the contract workers by the employer
The Bonded Labour System (Abolition) Act 1976;	√	√	√	Labour Department	Abolishes Forced labour in the country
Inter-state Migrant Workmen Act 1979.	√	√	√	Labour Department	Regulate the condition of service of inter-state labourers in Indian labour law
The Building and other Construction Workers Act, 1996	√	√	√	Labour Department	Ensure safety measures at construction work site and other welfare measures such as canteens, first-aid facilities, ambulance, housing accommodation for Workers near the Workplace etc.
The Sexual Harassment of Women at Workplace (Prevention, Prohibition and Redressal) Act, 2013	√	√	√	District Officer	Ensure prevention of Sexual Harassment against women and provides for forums for raising these grievances and their independent evaluation
Indigenous People					

Safeguards in the Indian Constitution					"Scheduled Tribes" means such tribes or tribal communities or parts of or groups within such tribes or tribal communities as are deemed under article 342 to be Scheduled Tribes for the purposes of the Constitution. As it is stipulated in the constitution, the President (President of India) may with respect to any State or Union Territory, and where it is a State, after consultation with the Governor thereof, by public notification, specify the tribes, or tribal communities or parts of or groups within tribes or tribal communities which shall for the purposes of this Constitution be deemed to be Scheduled Tribes in relation to that State or Union Territory, as the case may be. With regard to inclusion or exclusion, Parliament may by law include in or exclude from the list of Scheduled Tribes specified in a notification, any tribe or tribal community or part of or group within any tribe or tribal community. Prohibition of Discrimination As per this provision, the States shall not discriminate against any citizen on grounds only of religion, race, caste, sex, place of birth or any of them. Other provisions are; No citizen shall, on grounds only of religion, race, caste, sex, place of birth or any of them, be subject to any disability, liability, restriction or condition with regard to (a.) access to shops, public restaurants, hotels and places of public entertainment; or (b.) the use of wells, tanks, bathing Ghats, roads and places of public resort maintained wholly or partly out of State funds or dedicated to the use of general public. Nothing (clause (2) of article 29) shall prevent the State from making any special provision for the advancement of any socially and educationally backward classes of citizens or for the Scheduled Castes and the Scheduled Tribes. Nothing (sub-clause (g) of clause (1) of article 19) shall prevent the State from making any special provision, by law, for the advancement of any socially and educationally backward classes of citizens or for the Scheduled Castes or the Scheduled Tribes in so far as such special provisions relate to their admission to educational institutions including private educational institutions, whether aided or unaided by the State, other than the minority educational institutions referred to in clause (1) of article 30.

The SCs and the STs (Prevention of Atrocities) Act, 1989					The act was passed in 1989 to prevent Scheduled Castes and Scheduled Tribes from atrocities. The act suggests Precautionary and Preventive Measures under which State Government shall identify the area where it has reason to believe that atrocity may take place or there is an apprehension of reoccurrence of an offence under the Act: The state shall order the concerned officer to visit the identified area and review the law and order situation. If deemed necessary, in the identified area cancel the arms licenses of the persons, not being a member of the Scheduled Castes or Scheduled Tribes, their near relations, servants or employees and family friends and get such arms deposited in the Government Armoury. The act suggests constitution of a high-power State-level committee, district, and divisional level committees or such number of other committees as deemed proper and necessary for assisting the Government in implementation of the provisions of the Act; The act has made provision to set-up a vigilance and monitoring committee to suggest effective measures to implement the provisions of the Act. The state can set-up Awareness Centres and organise Workshops in the identified area or at some other place to educate the persons belonging to the Scheduled Castes and the Scheduled Tribes about their rights and the protection available to them under the provisions of various Central and State enactments or rules, regulations and schemes framed there under. Under the act, Non-Government Organisations are encouraged for establishing and maintaining Awareness Centres and organizing Workshops and provide them necessary financial and other sort of assistance. As per the provision of the act, the State Governments shall set up a Scheduled Castes and the Scheduled Tribes Protection Cell at the State head quarter under the charge of Director General of Police/Inspector General of Police. This Cell shall be responsible for (i) conducting survey of the identified area; (ii) maintaining public order and tranquillity in the identified area; (iii) recommending to the State Government for deployment of special police force or establishment of special police post in the identified area; (iv) making investigations about the probable causes leading to an offence under the Act; (v) restoring the feeling of security amongst the members of the Scheduled Castes and the Scheduled Tribes; (vi) informing

Applicable Indian Legislation/Guidelines/International Conventions	Pre-construction	Construction	Operations	Agency Responsible	Remarks
					the nodal officer and special officer about the law and order situation in the identified area; (vii) making enquiries about the investigation and spot inspections conducted by various officers; (viii) making enquiries about the action taken by the Superintendent of Police in the cases where an officer in-charge of the police station has refused to enter an information in a book to be maintained by that police station; (ix) making enquiries about the wilful negligence by a public servant.
Biodiversity Conservation					
Wildlife Protection Act, 1972, 2002 and Rules, 2003 and as amended	√	√	√	Wildlife Warden, State Forest Department	If any protected/ endangered flora or fauna (as listed in Schedules of WP Act, 1972) are found in the project area, the proponent should implement conservation measures for their protection.
Forests (Conservation) Act, 1980 and Rules 1981 as amended	√	√	√	District and State Forest Department MoEFCC.	None of the Project components were being sited on forest land at the time of the ESIA study. However, the exact route of the external transmission line was not confirmed at the time of the ESIA and the unit pooling substations were located less than 500m from the boundaries of the Arnea Reserve Forest block. If the finalized transmission line route or any access roads to the Project require the clearing of vegetation within a declared forest area then the provisions of the Forest Conservation Act, 1980 and amendments would be applicable and the Project would need to go in for a forest clearance.

Table 3.2 International Standards- IFC Performance Standards and WB Environmental and Social Standards

S. No.	IFC PS (2012)	WB- Safeguard Policies	Requirement	Standard Triggered	Applicability/ Compliance
1.	PS 1: Assessment and Management of Environmental and Social Risks and Impacts	OP 4.01: Environmental Assessment	Social and Environmental Assessment and Management Systems for managing social and environmental performance throughout the life cycle of the Project and runs through all subsequent standards. World Bank compliant ESMF is already developed for the project and will guide the impact assessment and management plans. (***Section 6 and 8***) Identification of the area of impact, types of impacts and affected stakeholders, to be addressed/ mitigated/ managed and consulted, respectively. Conducting environmental and social assessment of the Project to identify E&S risks and impacts of the project. It shall inform the design of the project, and be used to identify mitigation measures and actions	Yes	The Project will have moderate impacts on environment, health, safety and social aspects throughout its lifecycle and will need to be managed and monitored through the implementation of policies and procedures in compliance with IFC PS 1 and WB OP 4.01.
2.	PS 2: Labour and Working Conditions	OP 4.01: Environmental Assessment	The economic growth through employment creation and income generation is recognised and balanced protecting the basic rights of workers. This standard outlines the minimum requirements of working conditions, protection to the workforce (including issues of child and forced labour) and ensuring occupational health and safety of both its employees as well as non-employees' working through contractors.	Yes	The construction and operation phase for the Project will include employment of labour for varying activities such as widening of access roads, site preparation, boundary wall construction and module installation The Project will also require the establishment of temporary labour camps during the construction phase at all sites and staff accommodation during the operation phase that fall within the purview of IFC PS 2 and WB OP 4.01.
3.	PS 3: Resource Efficiency and Pollution Prevention	OP 4.01: Environmental Assessment	The Standard outlines the approach to pollution prevention and abatement in line with internationally disseminated technologies and practices.	Yes	Some air emissions and pollution discharge is anticipated from the Project including use of D.G. sets, use of groundwater in project activities (both during construction and operation phase) and labour camp, impact on drainage, wastewater discharge from labour camps, solid waste disposal such as broken solar

S. No.	IFC PS (2012)	WB- Safeguard Policies	Requirement	Standard Triggered	Applicability/ Compliance
					panels, general office waste, waste generated during repair and maintenance during project life cycle. Water requirement during construction and operation phase, will also lead to stress on available water resources. The above activities fall within the purview of PS 3 and WB OP 4.01.
4.	PS 4: Community Health, Safety & Security	OP 4.01: Environmental Assessment	The Standard requires a project to evaluate risks and impacts to the health and safety of the affected community during the Project life cycle and establish measures to avoid minimize and reduce risks and impacts from the Project.	Yes	The construction and operational phases of the project will have impacts on neighbouring communities particularly traffic safety risks during movement of construction materials and machinery. Electrocution risk linked to transmission line and substations during operation phase. In addition, there will be interaction of community with security personnel during construction and operation phases. These falls under purview of PS 4 and WB OP 4.01.
5.	PS 5: Land Acquisition and Involuntary Resettlement	OP 4.12: Involuntary Resettlement	The PS-5 applies to physical or economic displacement resulting from the following types of land transactions: ***Type I:*** Land rights for a private sector project acquired through expropriation or other compulsory procedures; ***Type II:*** Land rights for a private sector project acquired through negotiated settlements with property owners or those with legal rights to land, including customary or traditional rights recognised or recognisable under the laws of the country, if expropriation or other compulsory process would have resulted upon the failure of negotiation; The OP applies to permanent or temporary physical and economic displacement resulting from the following types of land acquisition or restrictions on	Yes (for Private and Patta land) Yes- for encroached/ squatted upon land	The Project will involve land procurement (Government Patta and Private land) for development of Solar Park and its associated facilities. The IFC PS and WB OP 4.12 are likely to be applicable on the project if land is taken in the types of transactions identified and will result in physical or economic displacement. This will in turn guide the land procurement process, the Resettlement Action Plan and Livelihood Restoration Plan for the project. It is RUMSL's intention to use the MP Mutual Consent-based Land Purchase Policy, 2014 for land procurement of private and patta land. However, the land acquisition act may be used for the parcels that do not have clear titles or have ownership during disputes, if any are found the MP Mutual Consent process.

S. No.	IFC PS (2012)	WB- Safeguard Policies	Requirement	Standard Triggered	Applicability/ Compliance
			land use undertaken or imposed in connection with project implementation: (a) Land rights or land use rights acquired or restricted through expropriation or other compulsory procedures in accordance with national law; (b) Land rights or land use rights acquired or restricted through negotiated settlements with property owners or those with legal rights to the land, if failure to reach settlement would have resulted in expropriation or other compulsory procedures; (c) Restrictions on land use and access to natural resources that cause a community or groups within a community to lose access to resource usage where they have traditional or customary tenure, or recognizable usage rights. This may include situations where legally designated protected areas, forests, biodiversity areas or buffer zones are established in connection with the project; (d) Relocation of people without formal, traditional, or recognizable usage rights, who are occupying or utilizing land prior to a project specific cut-off date; (e) Displacement of people as a result of project impacts that render their land unusable or inaccessible; (f) Restriction on access to land or use of other resources including communal property and natural resources such as marine and aquatic resources, timber and non-timber forest products, fresh water, medicinal plants, hunting and gathering grounds and grazing and cropping areas; (g) Land rights or claims to land or resources relinquished by individuals or communities without full payment of compensation; and (h) Land acquisition or land use restrictions occurring prior to the project, but which were undertaken or		The process of land procurement is understood to be through negotiated settlement hence, PS 5 is applicable. There will be economic displacement for Graziers using the Government land for livestock grazing and Agricultural labourers working on the identified private Patta or occupied (encroached or squatted upon) land parcels that they do not have rightful claims on the land. These economic displacement impacts will also be covered through the RAP-LRP.

S. No.	IFC PS (2012)	WB- Safeguard Policies	Requirement	Standard Triggered	Applicability/ Compliance
			initiated in anticipation of, or in preparation for, the project.		
6.	PS 6: Biodiversity Conservation and Sustainable Management of Natural Living Resources	OP 4.04: Natural Habitats	The Standard aims at protecting and conserving biodiversity, the variety of life in all its forms, including genetic, species and ecosystem diversity and its ability to change and evolve, is fundamental to sustainable development.	Yes	The Neemuch site Unit 3 is located immediately adjacent to [Water Body Unit 3]. As observed during the site assessment, this water body supports flocks of migratory and resident bird species. The proximity of the water body to the Project site can pose collision and electrocution risks for birds taking off and landing from the [Water Body Unit 3].The birds may also mistake the operational solar modules as a part of the water body due to its reflective surface ("lake effect") and therefore contribute to the collision risk. The three substation units and external transmission line are proposed along the northern end of the Project site. The units are therefore located less than 500m from the Arnea Reserve Forest block. Anthropogenic movement and development in close proximity to a forest block can have impacts associated with human-wildlife conflict, noise, stress on resident species and habitat modification of forest edge areas.
7.	PS 7: Indigenous Peoples	OP 4.10: Indigenous Peoples	The Standard acknowledges the possibility of vulnerability of indigenous people owing to their culture, beliefs, institutions and living standards, and that it may further get compromised by one or other project activity throughout the life cycle of the project.	Yes	The villages in the project footprint area are comprised of ST population (primarily Bhil) who may be impacted by the project activities, in terms of loss of Common property resources, loss of structures and impact on livelihoods. The PS is thus applicable for all three sites. The FPIC approach paper has identified two locations (villages) where the processes will be carried out to seek consent for the project.(Details are included in the Draft FPIC approach note, submitted 3rd Sept 2020)

S. No.	IFC PS (2012)	WB- Safeguard Policies	Requirement	Standard Triggered	Applicability/ Compliance
8.	PS 8: Cultural Heritage	OP 4.11: Physical Cultural Resources	The Standard aims to protect the irreplaceable cultural heritage and to guide clients on protecting cultural heritage in the course of their business operations. In addition, the requirements of this PS on project's use of cultural heritage are based in part on standards set by the Convention on Biological Diversity	No	Presently the Standard is not expected to be triggered for the project. However, structures or places with religious or cultural significance may be identified during the resource mapping process for FPIC and during the RAP survey, the applicability of the Standard will be reviewed and management plans prepared, if avoidance is not feasible.
			WB/IFC EHS Guidelines		
9.	General EHS Guidelines		The IFC/WB General Environmental, Health and Safety (EHS) Guidelines documents Good International Industry Practices (GIIPs) by covering the ambit of environmental, social and ecological concerns associated with establishing and managing a project. The aspects covered in the guidelines include ambient air quality monitoring, energy conservation, wastewater management, water conservation processes, hazardous materials management, waste management, noise reduction processes, occupational health and safety, community health and safety and project phase-specific concerns.	Yes	General EHS Guidelines will need to be followed during the construction and operation phase of the project.
10.	Electric Power Transmission and Distribution		The IFC/WB EHS Guideline for Electric Power Transmission and Distribution covers industry-specific issues associated with laying, operation and dismantling of transmission towers, lines and substations. Key issues covered in the guidelines include terrestrial habitat alteration, right-of-way access, right of-way maintenance, electrocution risk to bird and bat species, health and safety of working with or near electric and magnetic fields, storage and	Yes	Aspects of the EHS guidelines with respect to occupational health and safety, right of way maintenance and hazardous materials management as is relevant for internal transmission lines and the pooling substation infrastructure has been covered in the report.

S. No.	IFC PS (2012)	WB- Safeguard Policies	Requirement	Standard Triggered	Applicability/ Compliance
			maintenance of hazardous materials (e.g. oils, fuels, preservatives) and aircraft navigational safety.		
11.	IFC/EBRD Workers' accommodation: processes and standards		This guidance note, provide guidance on the provision of housing or accommodation for workers by employers and the issues that arise from the planning, construction and management of such facilities.	Yes	These guidelines will need to be followed during establishment of labour camps for the project.

3.1.1 Environmental and Social Management Framework of Ministry of New and Renewable Energy

MNRE have framed an Environmental and Social Management Framework for Solar PV Park, dated February 2017. The framework had identified the following key environmental and social issues/ impacts to be kept in consideration for sub-projects:

- Impacts on biological environment, especially forest land;
- Impacts due to water requirements as most projects are located in water scarce regions;
- Impacts on livelihoods of land owners and land users;
- Impacts on common property resources;
- Impacts due to soil erosion and dust.

In keeping with the impacts identified, the ESMF requires the formulation of a project specific Environmental and Social Management Plan, which would include relevant management plans, such as (not limited to) the following:

- Resettlement Action Plan/ Framework
- Gender Action Plan
- Indigenous Peoples Policy Framework
- Stakeholder Engagement Plan; and
- Grievance Redressal Mechanism

3.2 Applicable Environmental Standards

3.2.1 National Level Standards

The Central Pollution Control Board (CPCB) has stipulated different environmental standards w.r.t. with respect to ambient air quality, noise quality, water and waste water quality for the country as a whole under EP Act, 1986. Following standards are applicable for the project and needs to be complied with during the project life cycle.

- National Ambient Air Quality Standards (NAAQ Standards), as prescribed by MoEF&CC vide, Gazette Notification dated 16th November, 2009;
- Drinking water quality- Indian Drinking Water Standard (IS 10500: 2012);
- General standards for discharge as prescribed under the Environment Protection Rules, 1986 and amendments (G.S.R 422 (E) dated 19.05.1993 and G.S.R 801 (E) dated 31.12.1993 issued under the provisions of E (P) Act 1986);
- Noise standards specified by the MoEF&CC vide gazette notification dated 14th February, 2000 (Noise Pollution (Regulation and control) Rules, 2000)

3.2.2 IFC/ WB Standards

The General EHS Guidelines (30th April 2007) of IFC/ WB have outlined following environmental standards which needs to be complied for the project.

- IFC/WB Air Emissions and Ambient Air Quality Standards;
- IFC/WB Guidelines for treated sanitary sewage discharges; and
- IFC/WB Noise Standards.

4. ENVIRONMENTAL AND SOCIAL BASELINE

This section describes the existing environmental and social sensitivities of the study area (described below). The sensitivities include the relevant components of the physical, biological and socio-economic environment. The purpose of describing the environmental and social sensitivities of the study area is to:

- To describe the environmental characteristics of the Project site and surrounding areas to identify key resources and receptors that will be affected by the Project during the scoping process;
- To determine if any nearby communities or structures will be affected by the Project establishment; and
- To understand the significance of the different habitats within the study area and its importance for sustaining species of conservation importance, in terms of providing habitat contiguity to the surrounding region and dependency of surrounding communities.

4.1 Study Area

The area of up to 5 km radius from the Project boundary (Solar Park area) has been demarcated as study area for the Project by considering the extent of project impact in terms of air quality, noise, water resources, human settlement, cultural heritage sites, location of labour sites, location of the access roads besides considering the actual land area which has been procured for the project and its utilities footprints.

4.1.1.1 Project footprint area

The Project footprint is the area that may reasonably be expected to be physically touched by Project activities, across all phases. The Project footprint for Project includes land used for the setting up the Solar PV panels, transformer rooms, site office, access roads, storage of material and equipment, labour camps and pooling substation at Solar Park site. It was informed by RUMSL that all temporary structures during construction phase, i.e. material storage area, labour camp, site office etc. will be established only within the Solar Park area. The Project footprint details provided by RUMSL dated 3 June, 2020 has been considered for this report.

4.1.1.2 Project Area of Influence (AoI)

The effects of the Project and Project activities on a particular resource or receptor will have spatial (distance) and temporal (time) dimensions, the scale of which is dependent on a number of factors, including:

- Nature of the activity;
- Specific resource or receptor;
- Sensitivity of that resource or receptor; and
- Whether the impact is direct or indirect (e.g. a secondary effect).
- The Project area of influence refers to the Project footprint area as well as to a larger area in its immediate vicinity. This includes the footprint of the associated Project components, such as access road as well as the immediate surroundings that will see increased movement of vehicles, personnel and land-use change. Most of the impacts will occur within the Project footprint area as identified above. However, certain impacts can be further reaching in terms of expected impacts.
- The AoI considered for Project with respect to the environmental and social resources was based on the following reach of impacts:
- **Environmental parameters**: Project site boundary, immediate vicinity, access road and surroundings, i.e. a study area of approximately 2 km distance from the Solar Park site.

- *Air Quality*: Dust emissions, fugitive dust –typically up to 500 m from major construction areas;
- *Noise*: Noise impact area (defined as the area over which an increase in environmental noise levels due to the Project can be detected) – typically 500 m from construction site;
- *Soil environment*: The impacts on soil and land- typically up to 500 m from project foot print area;
- *Water Environment:* The impacts on water quality of water bodies – on the water bodies present in nearby area of project activities.

- **Flora and Fauna (Terrestrial and Aquatic)**: This includes: (a) the direct footprint of the Solar Park and Transmission Line; (b) The areas immediately adjacent to the Project footprint within which a zone of ecological disturbance is created through increased dust, human presence and project related activities (e.g., trampling, transportation activities).This kind of disturbance has been estimated to occur within 500 m of the project footprint;
- **Social**: The project footprint is spread across 3 villages (excluding the Transmission Line, the alignment for which is presently being finalised). Roads for movement of materials and people during the construction phase will be included in the Area of influence, based on volume and intensity. This is taken as the area of influence, though social impacts are likely to largely remain confined to the villages falling in the project footprint or in the Project villages, as defined in ***Section 4.4.2***. Other villages/groups may come to be included if it emerges during RAP surveys and consultations that there is economic dependence on the proposed project areas and details shall be covered in the RAP report. The detailed sub-categorization of Study Area considered for Social baseline and assessment is presented in ***Section 4.4.2.***

4.2 Physical Environment

4.2.1 Site Visit

ERM team undertook a site survey from 19 to 22 November 2019 to understand the site setting and to map environmental sensitivities in the area. The primary environmental monitoring data was collected during 19 to 25 December 2019.

4.2.1.1 Primary Baseline Data Collection

M/s Netel India Private Limited, an MoEF&CC and NABL (National Accreditation Board for Testing and Calibration Laboratories) accredited laboratory was engaged for collection of baseline information on ambient air quality, surface water quality, ground water quality, ambient noise quality, soil quality and traffic count. The primary baseline data was collected for aspects detailed out in ***Table 4.1.***

Table 4.1 Primary Baseline Data Collection

S. No	Environmental Attribute	No. of Locations/ Area	Frequency	Remarks
1	Ambient Air Quality	2	24 hourly, twice a week for one week	Ambient air quality at nearby villages were monitored to understand baseline of AAQ of the area
2	Ambient Noise Quality	5	Once for 24 hours during monitoring period	Ambient noise samples were collected over a 24 hour period from the nearby villages
3	Ground Water Quality	3	Once during monitoring period	Water was collected from hand pump installed in villages in the study area to analyse ground water quality
4	Surface Water Quality	2	Once during monitoring period	Water was collected from surface water bodies/ ponds present in the villages in the study area

S. No	Environmental Attribute	No. of Locations/ Area	Frequency	Remarks
5	Soil Quality	5	Once during monitoring period	Soil samples covering different land uses were collected from the study area
6	Traffic Count	1	Once during monitoring period	Traffic count was done on hourly basis for 24 hours at the road proposed to be used for transportation of raw material and manpower during construction phase

Map showing monitoring locations is present in ***Figure 4.1***.

4.2.1.2 Secondary Baseline Data Collection

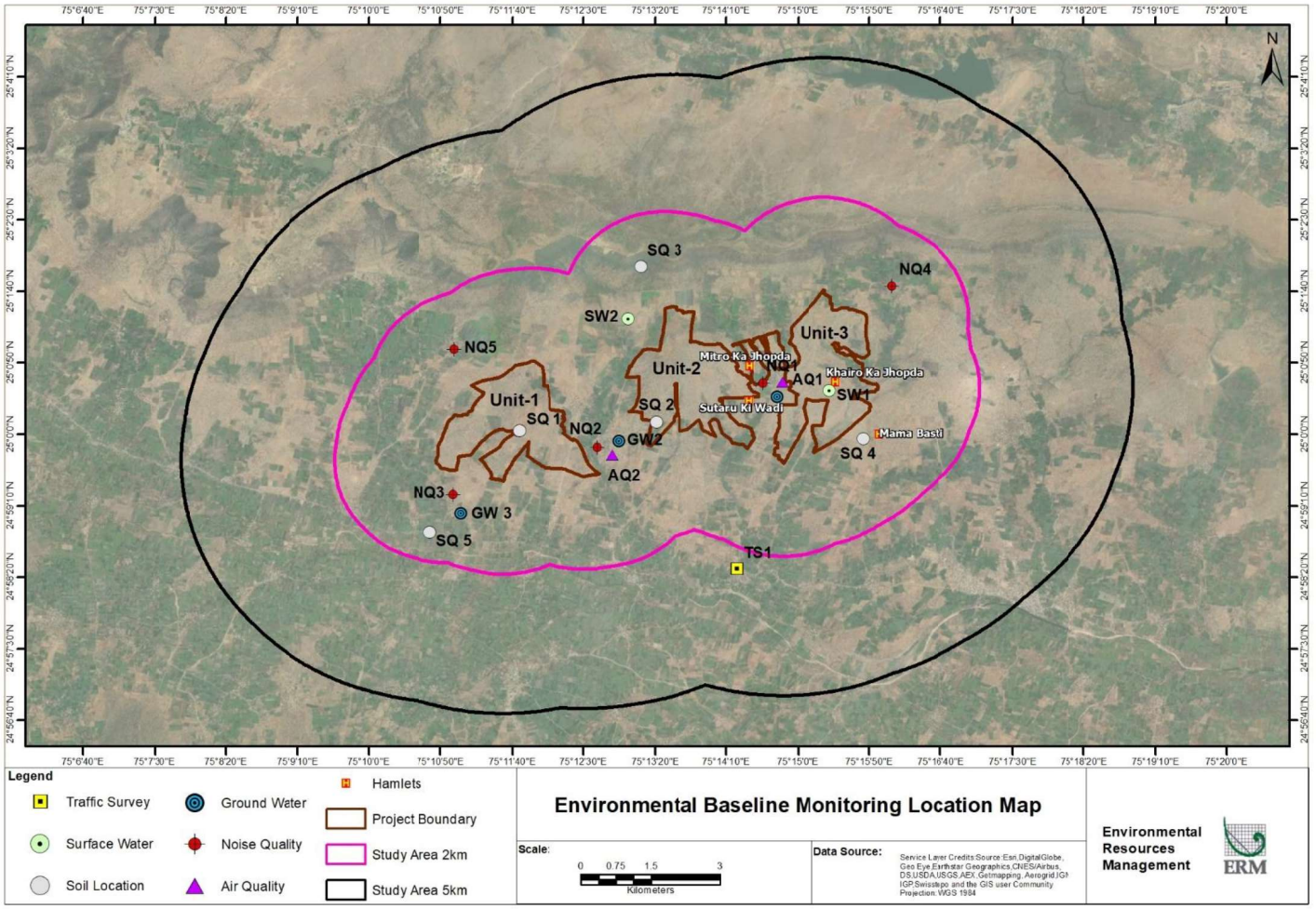
Secondary baseline data collection involved identifying and collecting existing published materials and documents. Information on various environment aspects (like geology, hydrology, drainage pattern, ecology etc.), meteorology were collected from different institutions, government offices and literatures etc. Secondary data was collected for the aspects as given in ***Table 4.2.***

Table 4.2 Secondary Baseline Data Collection

S. No	Attribute	Source of Data Collection
1	Meteorological data	India Meteorological Department (IMD)
2	Geology, geomorphology, hydrogeology and hydrology	U.S. Department of the Interior, U.S. Geological Survey, 2017 National Remote Sensing Centre (NRSC)-Bhuvan services Central Ground Water Board (CGWB) Geological Survey of India (GSI) India Water Tool - Ministry of Water Resources, 2014
3	Land use	Through Satellite Imageries
4	Natural Hazards	National Flood Vulnerability Assessment System World Resource Institute (WRI) Vulnerability Atlas of India Building Materials and Technology Promotion Council

Environmental baseline data was collected through primary surveys as well as through secondary sources by literature survey and discussions with the concerned departments/agencies. Details of data collected are summarized in subsequent sections.

Figure 4.1 Map showing environment baseline monitoring stations in the Project AoI



4.2.2 Land Use and Land Cover

The land is primarily used for agricultural practices in the study area (5 km) of Solar Park contributing to 39.04% of geographical extent, followed by scrub land of 36.05%. The other land uses in the study area are forest area, contributing 23.14 % followed by water bodies contributing 1.0%, settlements 0.34% and road network contributing 0.19% of the total geographical extent. The breakup of land use within 5 km distance of the Solar Park site and within project footprint is provided in ***Table 4.3*** and ***Table 4.4.*** Land use map of the study area is presented as ***Figure 4.2.***

Table 4.3 Land use/ Land cover details of 5 km study area

S. No	Land use Type	Area in %
1	Agriculture Land	39.04%
2	Scrub Land	36.05%
3	Forest	23.14%
4	Water Body	1.0%
5	Settlement	0.34%
6	River	0.25%
7	Road Network	0.19%
	Total	100%

Source: GIS based assessment for the Project; Data Source: GIS based assessment for the Project , Data Source: Esri, Digital Globe, Geo Eye, Earthstar geographics, CNES/Airbus, DS, USDA, AEX, Getmapping, Aerogrid, IGN,IGP,Swisstopo and the GIS user community

Table 4.4 Land use/ Land cover of Project Boundary

S. No.	Land use Type	Area in %
1.	Agriculture Land	8.78
2.	Scrub Land	88.31
4.	Water Body/streams*	2.91
	Total	100%

Source: GIS based assessment for the Project; Data Source: GIS based assessment for the Project , Data Source: Esri, Digital Globe, Geo Eye, Earthstar geographics, CNES/Airbus, DS, USDA, AEX, Getmapping, Aerogrid, IGN,IGP,Swisstopo and the GIS user community

* The percentage of water body/streams also includes water body near Unit 3 which appears within the site boundary due to some distortion in maps provided by RUMSL. Refer Section 1.4 for detail). This shall be revised after receiving maps corrected for distortion.

4.2.3 Topography and Slope

The topography and slope information plays a vital role in understanding land use and runoff-recharge characteristics of the terrain. The topography within the region surrounding Neemuch Site varies from 396- 440 m above mean sea level (amsl). The slopes of watersheds were classified into following categories: Flat (0-2%), gentle (2- 9%), moderate (9 -15%), steep (15 -30%) and very steep (above 30%). The major portion of the study area (5 km around the Project site) was observed to be very gently sloping (0 – 5% slope) and scattered pockets of gently sloping (5 - 10 %). The general slope of the study area was observed to be from North to South. Steep and very steep slopes were observed in the northern portion along the ridges which for the northern boundary of the micro-watersheds. The Project site and its immediate surroundings were observed to have very flat to gentle slopes with slopes varying between 0 – 10%.

Based on the topography and slope maps, the Site area does not appear to have any pockets of 'low lying areas' with potential for water logging and inundation during rainy season which may be attributed to very gentle slopes. The DEM map and slope map of the study area of Solar Park is presented as ***Figure 4.*** and ***Figure 4.4.***

Figure 4.2 Land use and land cover map of study area of Neemuch Solar Park

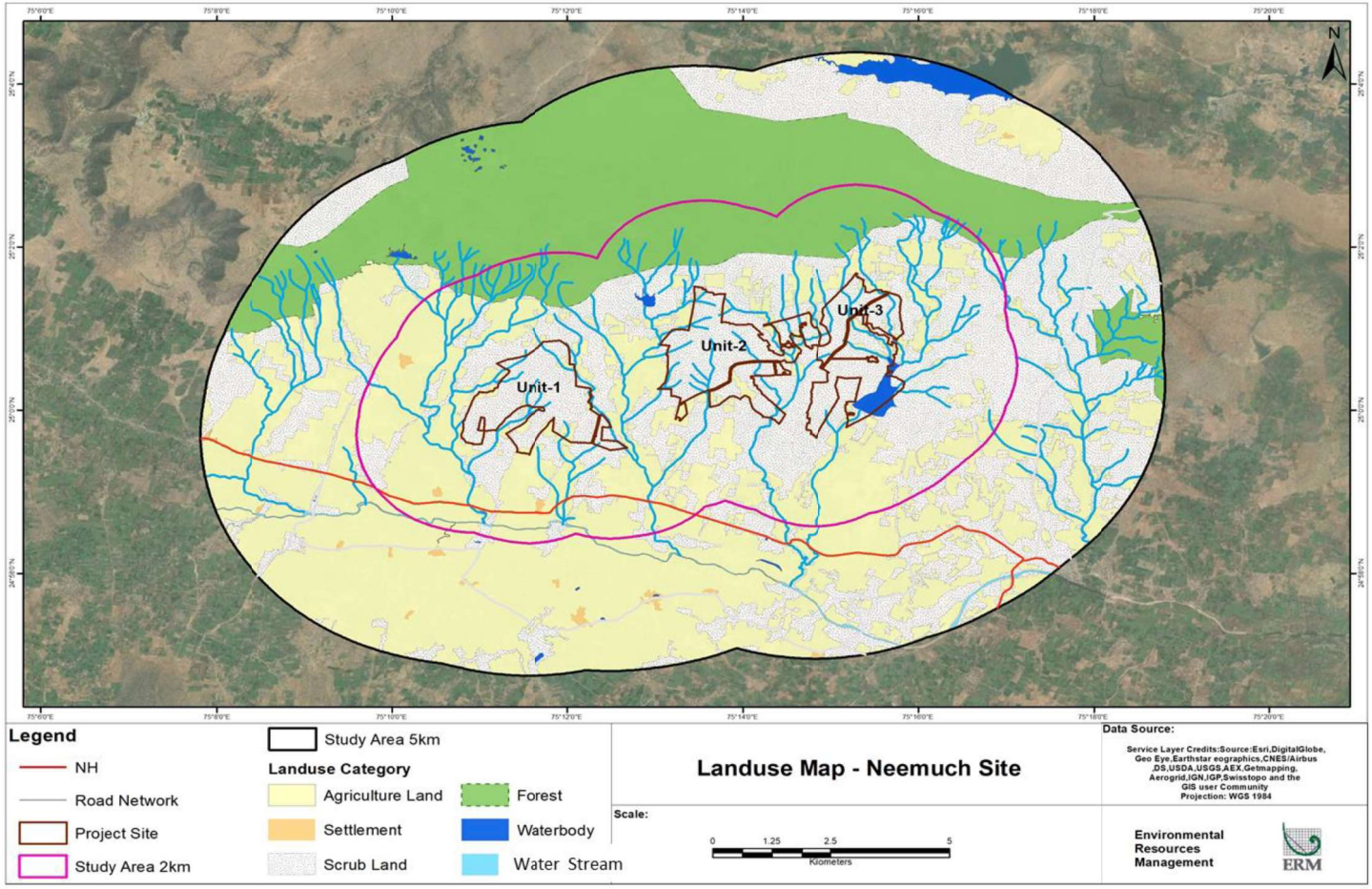


Figure 4.3 DEM map of study area of Neemuch Solar Park

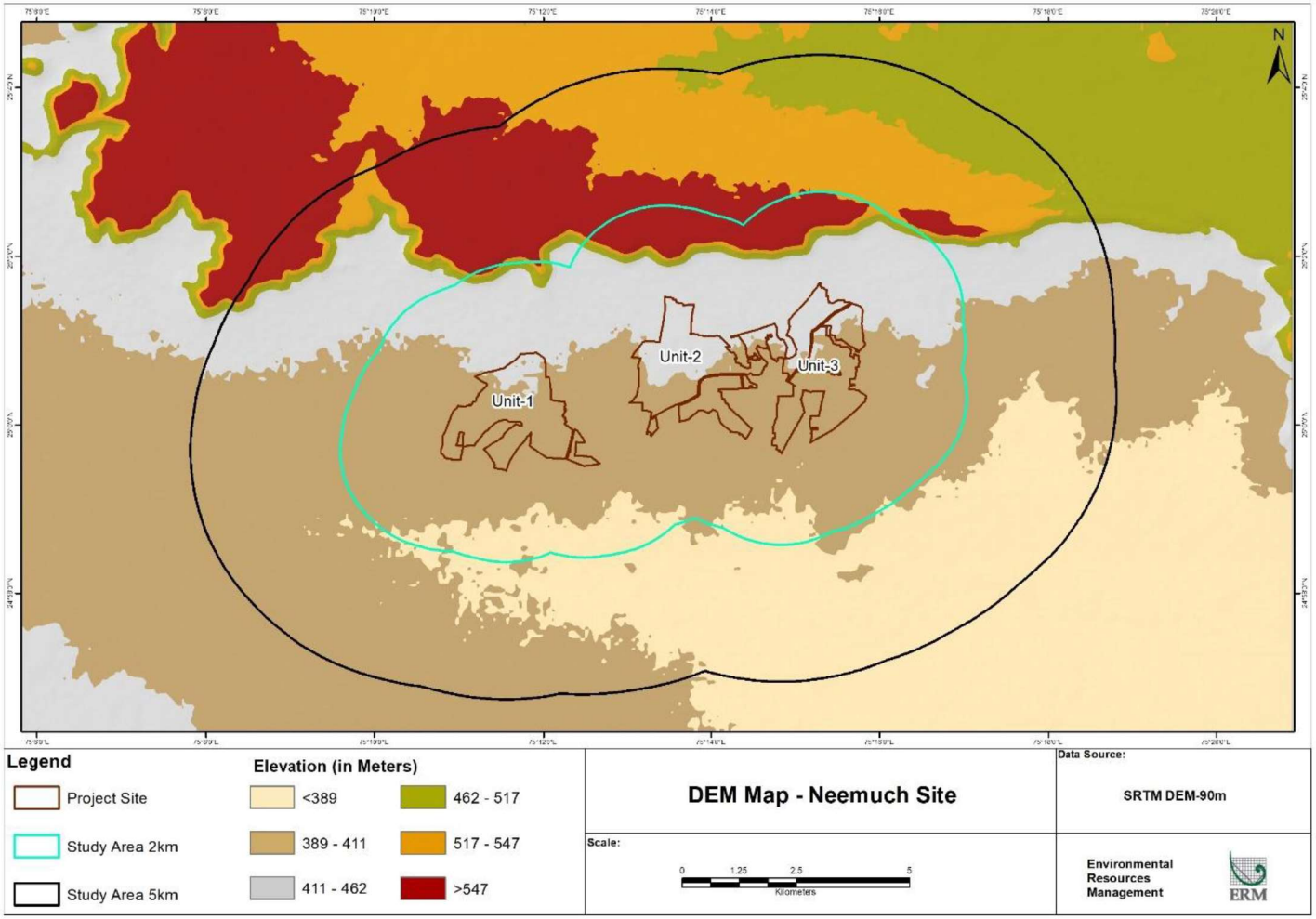
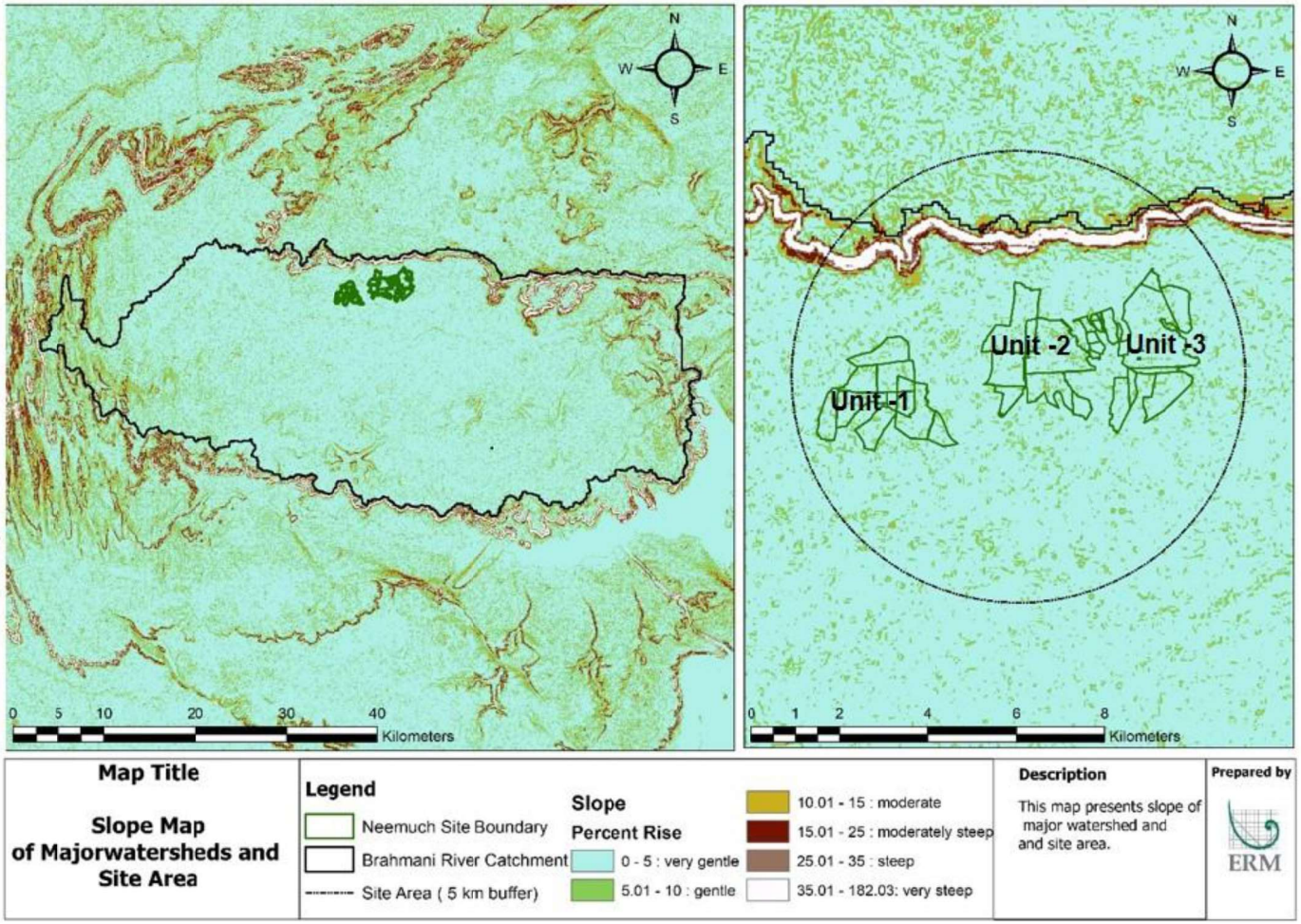


Figure 4.4 Slope map of the area



4.2.4 Hydrology

Based on the geographical location of the Project site, the corresponding drainage network and watersheds (major and micro) were delineated using the SRTM data. The delineated watersheds fall in Chambal River watershed or sub-basin, which further falls under Yamuna Basin. A major stream flowing from west to east, divides the macro-watershed into two parts. The stream eventually joins Chambal River at downstream of Rana Pratap Sagar reservoir at Bainsororgarh village. The Project area falls in multiple micro-watersheds which are located in the north of the major stream. The surface water flow direction was anticipated from north to south towards the major stream. The base map of the Project site and its corresponding watersheds is presented in ***Figure 4.5***. The reconnaissance survey corroborated the presence of ridges in the west which dictate the flow of surface water towards the east.

The Project area is drained by a network of seasonal streams/nallas flowing mainly in the North to South direction, which eventually drain into the Brahmani River to the South. Drainage map of the area is shown in ***Figure 4.6***.

Unit-1: South-western portion and south-eastern portion were evaluated to be the lowest level in the unit at 390-400 m amsl (above mean sea level). The excess runoff from the western portion of the Site unit is likely to drain into a minor nalla that flows through Bardwada Pond and drains into S1. Surplus runoff from the eastern portion is drained by S2;

Unit-2: South-eastern portion of Unit-2 was evaluated to be the lowest level within the Site unit at 390-400 m amsl. The elevated portions along the central portion of the Site unit divides the flow direction. Surplus water from the western portion of the Site unit is drained by S2. Excess runoff from the eastern portion of the Site unit is drained by S3; and

Unit-3: South-western and south-eastern portions of Unit-3 were evaluated to be lowest level at 390-400 m amsl. Surplus water from the central, eastern and south-western portions of the Site unit is drained by S4 and routed through adjacent water body. The excess runoff from north-western portion of the Site is drained by S3.

Figure 4.5 Base map of Site's Watershed

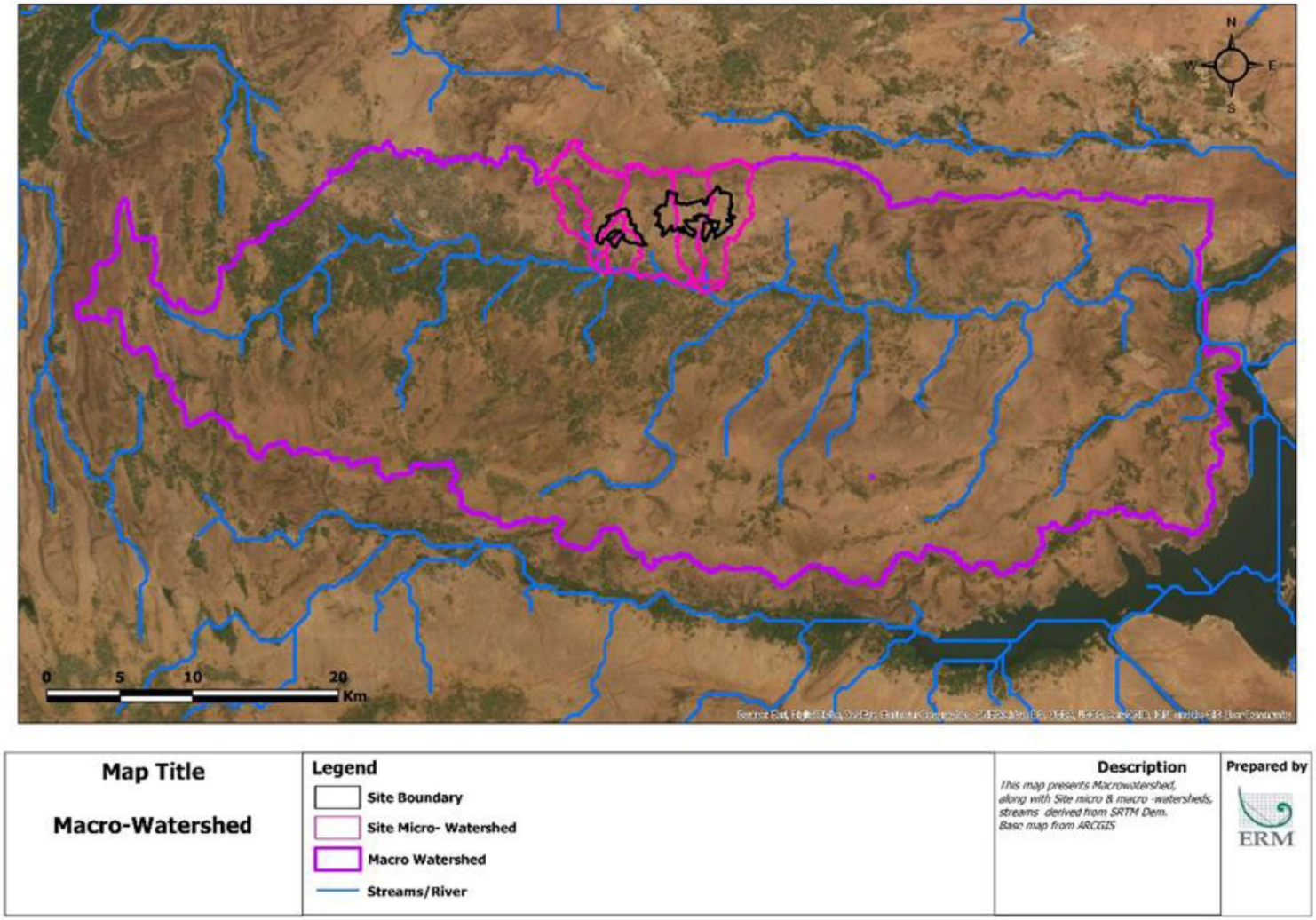
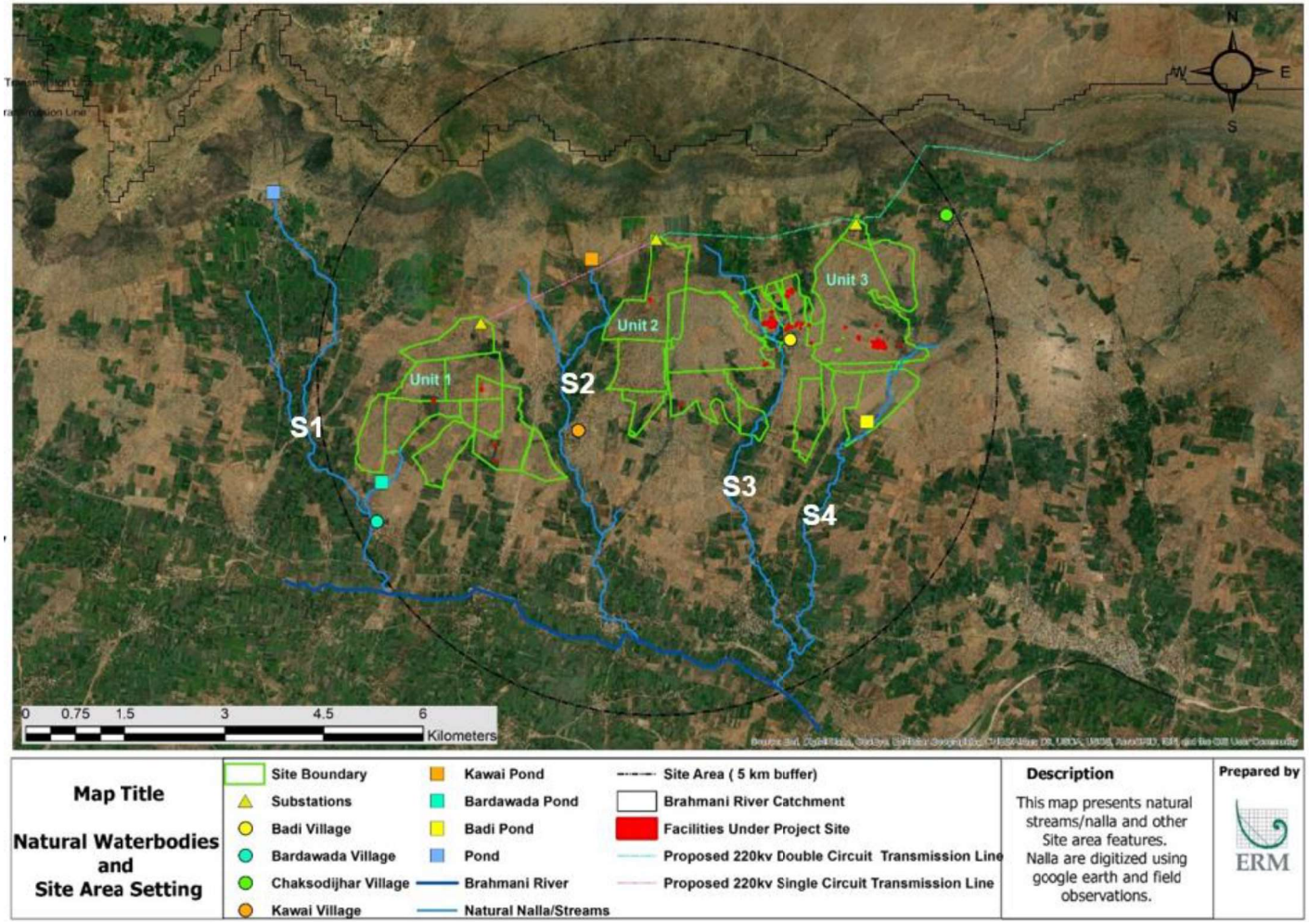


Figure 4.6 Drainage Map of the Area



4.2.5 Geology and Geomorphology

4.2.5.1 Geology

The Chambal watershed region is a junction between the north-western lobe of the Vindhyan watershed and the south-eastern fringe of the Aravalli range such that the younger formations of the Vindhyan period have truncated and faulted against the Gwalior formation.

The north-western part comprises the intensely folded Archean formations while the south-eastern part is composed of horizontally reposing Vindhyan system. The Vindhyans of the southern part are covered by the Deccan Trap. In particular, the study region comprising of district Neemuch is located in Malwa region of Madhya Pradesh and is underlain by rocks of Vindhyan Super Group (Pre-Cambrian) and the Deccan Traps (Upper Creteceous to lower Eocene). ***Table 4.5*** presents the geology of the region.

Table 4.5 Stratigraphic succession of the Region

Age	Super Group	Member
Sub-Recent to Recent	Laterite, Quaternary	Alluvium, Laterite
Lower Eocene to Upper Creataceous	Deccan Traps	Basaltic lava flow
Pre-Cambrian	Lower Vindhyan	Limestone and conglomerate

4.2.5.2 Geomorphology

Neemuch district forms the part of Malwa plateau. It can broadly be divided into two physical divisions; northern plateau consists of Vindhyan rocks and southern Malwa plateau, under trap with gentle sloping topography. The highest elevation of 573 m amsl in the district is recorded at north-western corner of the district in Jawad tehsil, comprising of upper Vindhyan rocks. Almost entire district is falling under Chambal sub-basins area of the Ganga Basin. (1)

Geomorphic features integrated with geology and hydrogeology controls the occurrence, movement and quality of groundwater. The geomorphological features of the Site's watershed were extracted from National Remote Sensing Centre (NRSC)- Bhuvan services[2] and are presented in ***Figure 4.7***. Most of the region was observed to be under pediment complex of structural and denudational origin. Denudational origin features were reported along the flow of the major stream as such their topography is influenced by weathering caused due to the flow of water. The other parts of the watershed were reported to have structural origin- the topographic features were formed by the differential wearing away of rocks and the deposition of the resulting debris under the influence of exogenic geomorphic forces. The geomorphology of the region is not indicative of much groundwater recharge due to presence of structural features in large parts of the watershed. This is likely to result in poor yield and limited scope for groundwater development in the watershed. However, existence of major fractures/lineaments/ faults might influence the groundwater yield.

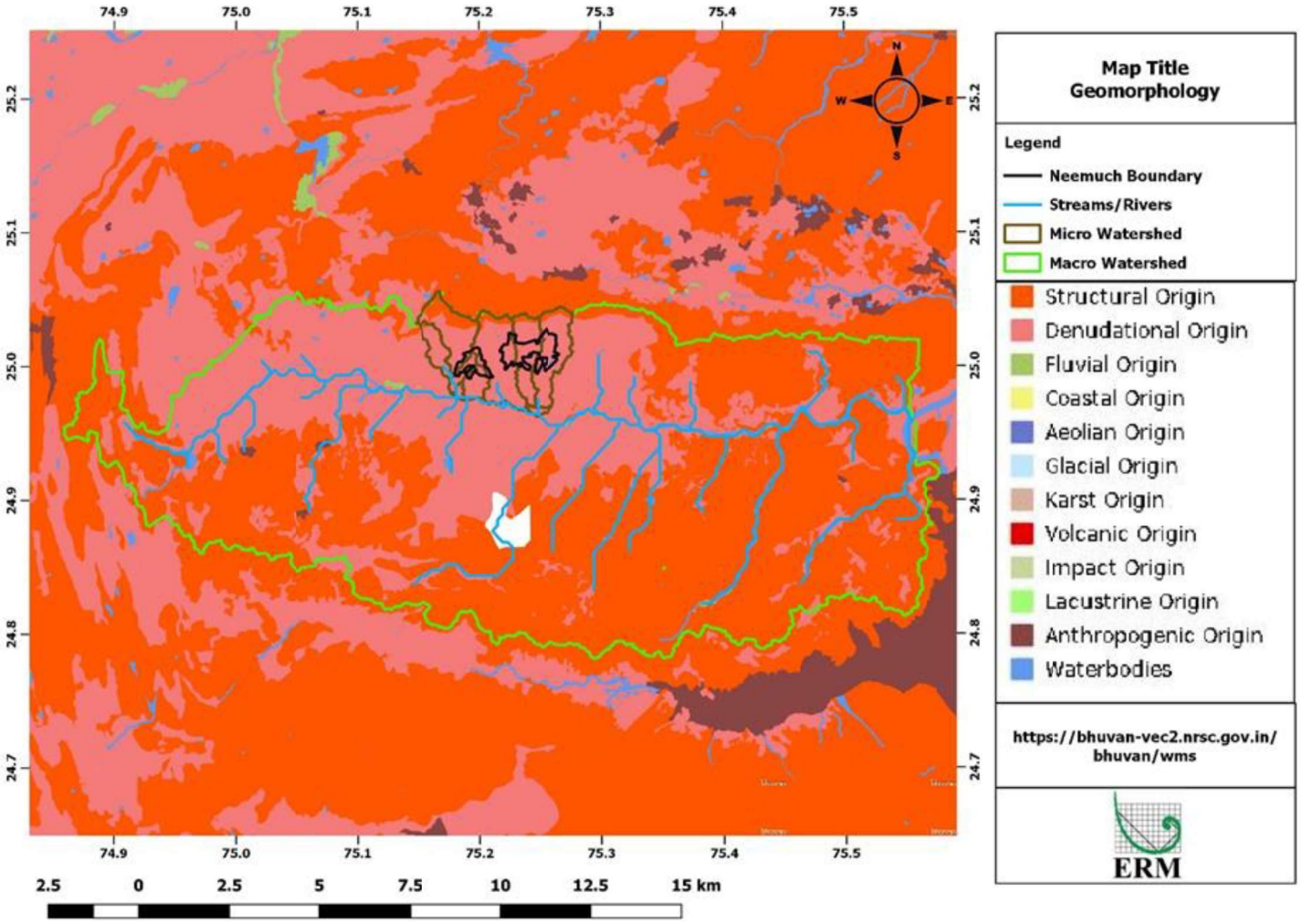
Within the Site's micro-watersheds, topography is mainly influenced by denudational features with structural features present along the northern periphery. The prospects of groundwater recharge and occurrence are anticipated to be low resulting in limited scope for groundwater development.

The lineaments are developed generally due to tectonic stress and strain and provide an important clue on surface features that are responsible for infiltration of surface run off into sub-surface and movement/ storage of groundwater. Lineaments in the pediplain or valley fill are considered significant in groundwater prospects. Further, the flood plains along the river course are expected to have good groundwater prospects.

(1) http://cgwb.gov.in/District_Profile/MP/Neemuch.pdf

[2] http://bhuvan.nrsc.gov.in/bhuvan_links.php

Figure 4.7 Geomorphology map of site



4.2.6 Natural Hazards

Various relevant natural hazards were analysed based on secondary information. This includes earthquake, high wind and cyclones and flood hazards.

4.2.6.1 Earthquake Risk

As per the Earthquake Hazard/Zoning Map[1] , India is classified into four (4) zones based on the severity of probable earthquake on the Medvedev-Sponheuer-Karnik Scale (MSK), as shown below:

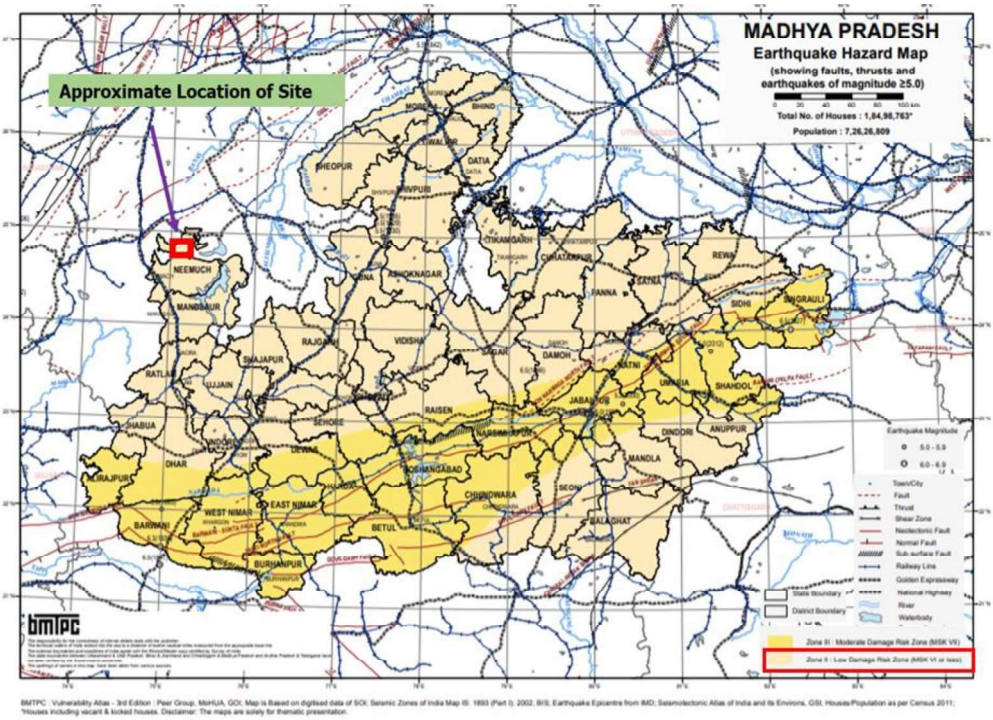
- Zone V: Very High Damage Risk Zone (MSK IX or more);
- Zone IV: High Damage Risk Zone (MSK VIII);
- Zone III: Moderate Damage Risk Zone (MSK VII); and
- Zone II: Low Damage Risk Zone (MSK VI or less)

MSK Intensity Scale is a macro-seismic intensity scale used to evaluate the severity of ground shaking on the basis of observed effects in an area of the earthquake occurrence. The MSK scale comprises of twelve (12) intensity degrees ranging from I to XII, where 'I' represents least severe and XII represents most severe intensity. The zoning was defined primarily depending on the known seismic history of the region, the postulated seismic activity of the future, and the indicative time intervals between two (2) consecutive occurrences in the same area[2] . The earthquake hazard map is presented in ***Figure 4.8.*** Based on the review of the earthquake data and map, the location of the Project site falls under Zone II (low damage risk zone/ degree VI or less earthquake hazard on the MSK scale). Hence the risk of earthquake in the Site and its study area is anticipated to be '***Low***.

[1] Building Materials and Technology Promotion Council (BMTPC), Ministry of Housing and Urban Affairs, Government of India. Earthquake Zoning Map: http://bmtpc.org/DataFiles/CMS/file/VAI2019/MAP/eqmap/EQ_JPG/EQ_INDIA.jpg

[2] Building Materials and Technology Promotion Council (BMTPC), 2019. Vulnerability Atlas of India, Ministry of Housing and Urban Affairs, Government of India: http://bmtpc.org/DataFiles/CMS/file/VAI2019/index.html

Figure 4.8 Earthquake hazard/zoning map for Madhya Pradesh



Source: Building Materials and Technology Promotion Council (BMTPC), 2019. Vulnerability Atlas of India, Ministry of Housing and Urban Affairs, Government of India: http://bmtpc.org/DataFiles/CMS/file/VAI2019/index.html

4.2.6.2 Wind and Cyclones

Wind hazard for Project site was evaluated based on two (2) wind hazard maps. These are Average Wind Speed Map (available in Global Wind Atlas 2.0 and developed by DTU) and Basic Wind Speed Map of India (developed by BMTPC). Basic Wind Speed is defined as the peak wind velocity over a 50 years return period, and is considered to be an extreme and conservative estimate of wind speed at the Site and in surrounding areas. On the other hand, the average wind speed is defined as long term annual mean wind velocity.

The macro-level wind speed zones of India have been formulated and published in IS: 875 (Part 3) - 1987 entitled as 'Indian Standard Code of Practice for Design Loads (other than earthquakes) for Buildings and Structures, Part 3, Wind Loads'. The six (6) wind speed zones and extent of likely damage corresponding to each wind speed zone are presented in ***Table 4.6***. ***Figure 4.9*** presents the basic wind hazard map of the study region. The basic wind speeds are applicable to 10 m height above mean ground level in an open terrain with a return period of 50 years[1] . The basic wind speeds (as per BMTPC) were compared against the Beaufort Scale of Wind Classification[2] as presented in ***Table 4.7***. The Beaufort scale is an empirical measure that relates wind speed to observed conditions at sea or on land. The scale classifies mean speeds, usually averaged over 10 minutes by convention, and does not capture the speed of wind gusts. The quoted wind speed is that measured at 10 m above ground, not at the surface (which, at 2 m, may be only 50-70% of these estimates).

[1] Building Materials and Technology Promotion Council (BMTPC), 2019. Vulnerability Atlas of India, Ministry of Housing and Urban Affairs, Government of India:
http://bmtpc.org/DataFiles/CMS/file/VAI2019/index.html

[2] The Beaufort Scale. Royal Meteorological Society: https://www.rmets.org/resource/beaufort-scale

Table 4.6 Wind hazard categorisation

S. No	Wind Speed (m/s and km/hr)	Wind Damage Zone
1	55 m/s (198 km/h)	Very High Damage Risk Zone - A
2	50 m/s (180 km/h)	Very High Damage Risk Zone - B
3	47 m/s (169.2 km/h)	High Damage Risk Zone
4	44 m/s (158.4 km/h)	Moderate Damage Risk Zone - A
5	39 m/s (140.4 km/h)	Moderate Damage Risk Zone - B
6	33 m/s (118.8 km/h)	Low Damage Risk Zone

Source: Building Materials and Technology Promotion Council (BMTPC), 2019. Vulnerability Atlas of India, Ministry of Housing and Urban Affairs, Government of India: http://bmtpc.org/DataFiles/CMS/file/VAI2019/index.html

Figure 4.9 Basic wind speed map of Madhya Pradesh with overlaid with study area

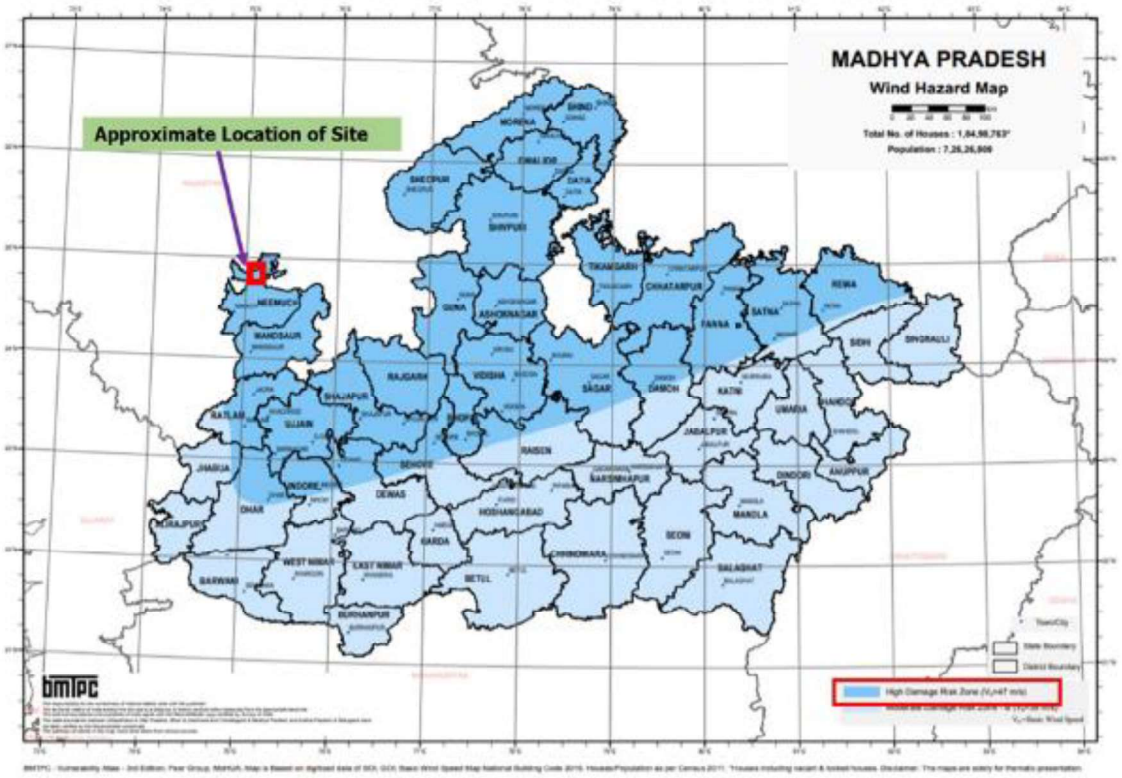


Table 4.7 Beaufort scale of wind speed characterisation

Wind Force	Description	km/h	mph	knots	Specifications
0	Calm	<1	<1	<1	Smoke rises vertically
1	Light Air	1-5	1-3	1-3	Direction shown by smoke drift but not by wind vanes
2	Light Breeze	6-11	4-7	4-6	Wind felt on face; leaves rustle; wind vane moved by wind
3	Gentle Breeze	12-19	8-12	7-10	Leaves and small twigs in constant motion; light flags extended
4	Moderate Breeze	20-28	13-18	11-16	Raises dust and loose paper; small branches moved
5	Fresh Breeze	29-38	19-24	17-21	Small trees in leaf begin to sway; crested wavelets form on inland waters
6	Strong Breeze	39-49	25-31	22-27	Large branches in motion; whistling heard in telegraph wires; umbrellas used with difficulty.
7	Near Gale	50-61	32-38	28-33	Whole trees in motion; inconvenience felt when walking against the wind.
8	Gale	62-74	39-46	34-40	Twigs break off trees; generally impedes progress.
9	Strong Gale	75-88	47-54	41-47	Slight structural damage (chimney pots and slates removed).
10	Storm	89-102	55-63	48-55	Seldom experienced inland; trees uprooted; considerable structural damage
11	Violent Storm	103-117	64-72	56-63	Very rarely experienced; accompanied by widespread damage
12	Hurricane	118 plus	73 plus	64 plus	Devastation

The Project site falls in the region with average wind speed of <5 m/s while wind speed ranging between 5-10 m/s was reported along the ridges of the macro-watershed. In a conservative scenario, these wind speeds are representative of gentle breeze with constant motion of leaves and twigs based on the Beaufort scale.

From wind damage viewpoint, the Project site falls in the region with a basic wind speed of 47 m/s (169.2 km/h) which is classified as 'high risk zone', considering the damage it can cause on built and natural environment. Based on the basic wind speed maps, the likelihood of risk at the Project site was evaluated as ***High*** based on BMTPC scale and Beaufort scale of wind classification.

Table 4.8 Summary of wind hazard categorisation

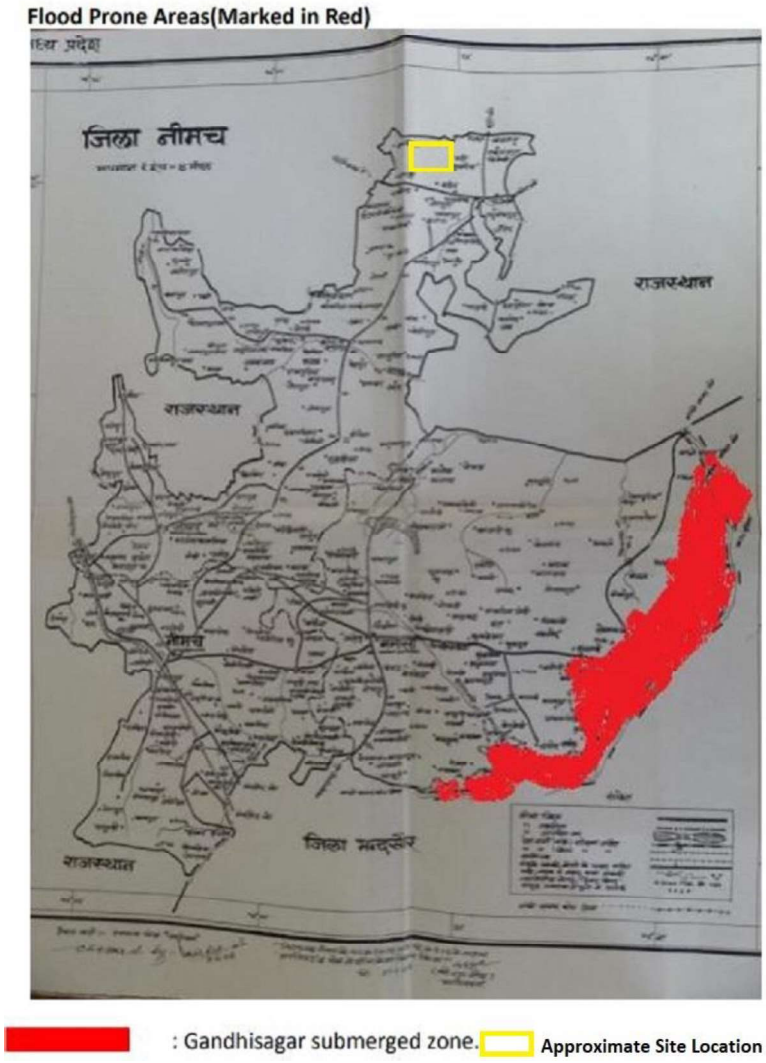
Asset Name	(A) Wind Hazard Zone per BMTPC Map	(B) Beaufort Scale as per Basic Wind Speed	Wind Hazard Category (higher of (A) and (B)
Neemuch Solar Park	High Damage Risk Zone	High	High

4.2.6.3 Flood Risks

As per the District Disaster Management Plan for Neemuch District[1] report prepared by MP School of Good Governance and Policy Analysis, floods and droughts are the major natural hazards of the district. Flood prone areas in the district due to overflow from Gandhisagar Dam (40 km south-east of the Project site, along Chambal River) have been marked out (in red) as shown in the ***Figure 4.10***. Per the map, the Project site ***does not fall*** under the flood prone area. The detail flood likelihood assessment is provided in ***Section 6.2.4***.

[1] https://cdn.s3waas.gov.in/s334173cb38f07f89ddbebc2ac9128303f/uploads/2019/07/2019070330.pdf

Figure 4.10 Flood affected area of Neemuch district



Source: District Disaster Management Plan, Neemuch District

4.2.7 Climate and Meteorology

Regional Meteorology

The long term meteorology (period 1961-1990) of the region based on data recorded at the nearest observatory station of India Meteorological Department (IMD) at Neemuch is presented in ***Table 4.9*** and described in subsequent sections.

Table 4.9 Climatological Data, Neemuch

Months	Temperature (°C)		Mean Wind Speed (kmph)	Predominant Wind Direction		Relative Humidity		Rainfall
	Mean Max	Mean Min		Morning	Evening	8.30 hrs	17.30 hrs	Monthly Total (mm)
January	24.5	9.8	5.5	NE	NE	53	28	2.5
February	27.3	12.3	6.3	NE	NE	43	21	2.3
March	32.6	17.2	7.2	NE	W	33	16	4.4

Months	Temperature (°C)		Mean Wind Speed (kmph)	Predominant Wind Direction		Relative Humidity		Rainfall
	Mean Max	Mean Min		Morning	Evening	8.30 hrs	17.30 hrs	Monthly Total (mm)
April	37.5	22.7	9.0	W	W	29	15	1.5
May	39.6	25.7	12.7	W	W	43	19	11.1
June	36.9	25.7	16.1	W	W	67	41	84.6
July	31.3	23.9	14.2	W	W	83	68	211.9
August	29.4	23.0	12.0	W	W	87	75	289.4
September	31.3	22.3	9.1	W	W	78	59	125.8
October	33.2	19.6	5.6	CALM	NE	52	31	18.5
November	29.5	14.9	4.4	NE	NE	48	30	25.7
December	25.6	10.9	4.9	NE	NE	56	32	4.7
Average total or mean	**31.6**	**19.0**	**8.9**			**56**	**36**	**782.4**

Source: Climatological Table 1961-90, India Meteorological Department; Observatory Coordinates: 24°28' N, 74°54' E

- **Temperature:** Temperatures vary considerably from season to season. The summers are generally hot and winters are cool. Mean maximum temperature ranges between 24.5°C during January to about 39.6°C during May and the mean minimum temperatures vary between 9.8°C during January and 25.7°C during May - June.
- **Wind Speed and Wind Direction:** The average wind speed in the area is 8.9 kmph, with highest in June Month (16.1 kmph) and lowest in November (4.4 kmph). The predominant wind directions in the area are North East (November to March) and West (April to October).
- **Relative Humidity:** The Relative Humidity in the area ranges between 15% (April) to 87% (August). The annual average RH is 56% and 36% during morning and evening time respectively.
- **Rainfall:** Long-term (1961 - 1990) average annual total rainfall for Neemuch station is 782.4 mm, as per IMD Climatological Table. Most of the rainfall is received during the month of July (27.08%) and August (36.99%) and minimum in February (0.29%). Rainfall recorded in Neemuch district from 2014 to 2018 has also been presented below which show that July and August are the wettest months whereas February and November are driest months of the year.

Table 4.10 Rainfall Data - Neemuch

Year	January	February	March	April	May	June	July	August	September	October	November	December
2014	1.0	0.0	0.0	0.0	0.0	0.0	248.1	368.3	208.9	4.3	0.0	0.0
2015	8.3	0.0	29.3	0.0	0.0	83.2	465.3	152.8	2.7	0.0	0.0	0.0
2016	2.3	0.0	0.0	0.0	0.0	88.1	222.8	678.0	86.0	36.1	0.0	0.0
2017	1.3	0.0	0.7	0.0	0.0	121.3	386.2	182.3	107.0	0.0	0.0	1.7
2018	0.0	0.0	0.0	0.0	0.0	143.5	355.2	295.0	264.7	0.0	0.0	0.3

Source: http://hydro.imd.gov.in/hydrometweb/(S(zq1q35r5cjodlizybet3jlqn))/DistrictRaifall.aspx

4.2.8 Ambient Air Quality

The existing ambient air quality of the study area was monitored at 2 locations during the study period. The monitoring parameters includes Respirable Particulate Matter (RPM) i.e. PM_{10} (particulate matter of particle size less than 10 micrometres) and $PM_{2.5}$ (particulate matter of particle size less than

2.5 micrometres), Sulphur Dioxide (SO_2), Oxides of Nitrogen (NO_x) and Carbon Monoxide (CO). PM_{10}, $PM_{2.5}$, SO_2 and NO_x were monitored on 24 hourly basis while CO was monitored on 8 hourly basis twice a week for a week during the study period.

Selection of sampling locations

The baseline status of the ambient air quality has been established through ambient air quality monitoring network and is based on the following consideration:

- Meteorological conditions of the area based on information of IMD;
- Topography of the study area; and
- Location of sensitive receptors such as major settlements.

The details of monitoring locations within the study area has been presented in ***Table 4.11*** below. Map showing location of ambient air quality monitoring locations is presented in ***Figure 4.1***.

Table 4.11 Details of Ambient Air Monitoring Stations

S. No	Sampling location	Location Code	Zone	Easting (mE)	Northing (mN)	Direction and distance from project site	Justification for selection of location and its setting
1	Village Badi	AAQ1	43R	524781.45	2766087.45	~ 170 m (W) of Unit 3 ~ 240 m (E) of Unit 2	These stations captures the baseline of AAQ for settlement in the Project area
2	Village Kawai	AAQ2	43R	521597.23	2764645.67	~ 600 m (E) of Unit 1 ~ 650 m (W) of Unit 2	

Source: ERM site visit

The sampling and analysis of ambient air quality parameters was carried out as per the procedure detailed in relevant parts of IS-5182 (Indian Standards for Ambient Air Quality Parameters). The applied testing procedures are given in brief in ***Table 4.12*** below**.**

Table 4.12 Details of Methods and Detection Limits for different Air Quality Parameters

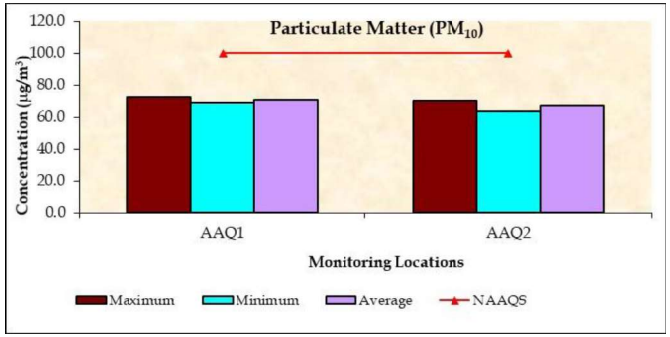
S. N	Parameter	Range/ Detection Limit
1	Particulate Matter (size less than 10 µm or PM10	IS-5182 (Part -23):2006 & CPCB Guidelines Volume 1 (2012-2013)
2	Particulate Matter (size less than 2.5 µm or PM2.5	CPCB Guidelines Volume 1 (2012-2013)
3	Sulphur Dioxide (SO2)	IS-5182 (Part-II):2001
4	Nitrogen Oxide (NOx)	IS-5182 (Part-VI):2006
5	Carbon Monoxide (CO)	CO Analyser

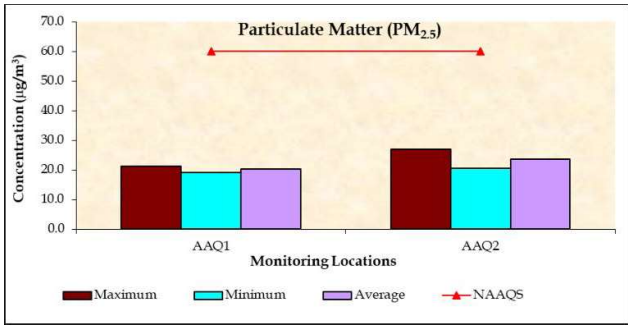
Summarised AAQ results as monitored at various locations are presented in Table 4.13 and Figure 4.11. The detailed ambient air quality results have been presented in **Appendix D**.

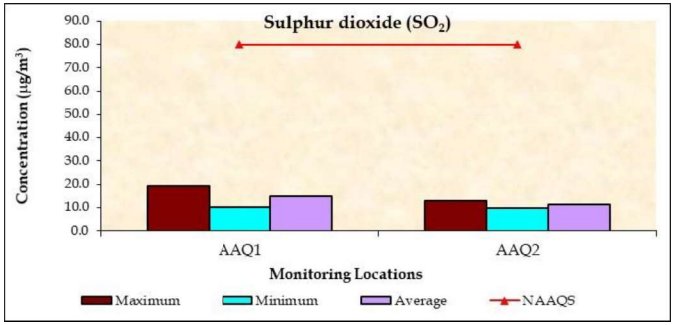
Table 4.13 Ambient Air Quality in the Study Area

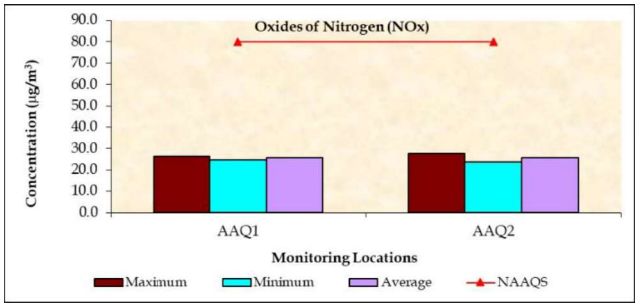
Parameter	Units	Observed	AAQ1 (Village Badi)	AAQ2 (Village Kawai)	Inferences
PM10	µg/m^3	Maximum	72.3	70.1	■ The PM_{10} concentration recorded at both the sampling locations was within the National Ambient Air Quality Standards (NAAQS).
		Minimum	68.9	63.8	
		Average	70.60	66.95	
		98%le	72.23	69.97	
		NAAQS	**100**	**100**	
PM2.5	µg/m^3	Maximum	21.3	26.9	The $PM_{2.5}$ values were observed to be within the prescribed NAAQS standards (60 µg/m^3).
		Minimum	19.1	20.4	
		Average	20.20	23.65	
		98%le	21.26	26.58	
		NAAQS	**60**	**60**	
SO2	µg/m^3	Maximum	19.3	13.1	All the values were observed to be within the prescribed NAAQS standards (80 µg/m^3).
		Minimum	10.2	9.7	
		Average	14.75	11.40	
		98%le	19.12	12.93	
		NAAQS	**80**	**80**	
NOx	µg/m^3	Maximum	26.4	27.7	All the values were observed to be within the prescribed NAAQS standards (80 µg/m^3).
		Minimum	24.8	23.7	
		Average	25.60	25.70	
		98%le	26.37	27.50	
		NAAQS	**80**	**80**	
CO	mg/m^3	Maximum	0.84	0.82	CO values in the study area is well within the prescribed NAAQS standards (2 mg/m^3)
		Minimum	0.59	0.80	
		Average	0.72	0.81	
		98%le	0.84	0.82	
		NAAQS	**2.0**	**2.0**	

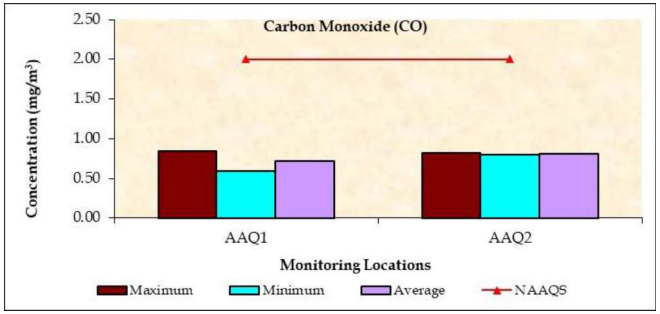
Figure 4.11 Ambient Air Quality in Study Area











4.2.9 Ambient Noise Quality

The ambient noise levels within the study area was monitored at five (05) locations within the study area as provided in ***Table 4.14***. Map showing noise monitoring locations have been presented as ***Figure 4.1***. The Noise monitoring results were given in ***Table 4.15.*** Detailed results are provided in ***Appendix D.***

Table 4.14 Details of Noise Sampling Locations

SN.	Location	Sample Code	Zone	Easting (mE)	Northing (mN)	Distance and direction from Project Site
1	Village Badi	NQ1	43R	524781.45	2766087.45	~ 170 m (W) of Unit 3 ~ 240 m (E) of Unit 2I
2.	Village Kawai	NQ2	43R	521597.23	2764645.67	~ 600 m (E) of Unit 1 and ~ 650 m (W) of Unit 2
3	Village Bardawada	NQ3	43R	518478.85	2763660.27	~ 750 m (S) of Unit 1
4	Village Chaksodijar	NQ4	43R	527070.85	2768162.78	~ 880 m (NE) of Unit 3
5	Village Arnya	NQ5	43R	518497.00	2766787.00	~ 860 m (N) of Unit 1

Source: ERM's Site Assessment
Note: The Coordinates have been presented in the UTM Format

Table 4.15 Noise Level in the study area

SN.	Location	$L_{eq\ day}$	CPCB and WHO limits* Leq	$L_{eq\ night}$	CPCB and WHO limits Leq
1	Village Badi	54.82	55	43.89	45
2	Village Kawai	52.80	55	42.49	45
3	Village Bardawada	49.08	55	40.61	45
4	Village Chaksodijar	51.56	55	44.87	45
5	Village Arnya	53.24	55	37.20	45

* Note: As per CPCB, Day time is considered from 6 am to 10 pm and night time is considered from 10 pm to 6am;

As per WHO limits, Day time is considered from 7 am to 10 pm and night time is considered from 10 pm to 7 am.

Discussion of Results

The observations from noise monitoring at 5 locations in the study area indicate that recorded Leq day and Leq night levels are within the specified standards for residential area i.e. 55 dB(A) and 45 dB(A) during day and night time respectively. The daytime noise levels at Badi village are at the edge of prescribed limits.

4.2.10 Water Availability and Quality

4.2.10.1 Ground Water Resources

Ground Water Levels

Variation of groundwater levels in an area is an important component of hydrological cycle because it is a physical reflection of aquifer systems. As the change in groundwater level is directly related to groundwater balance its continuous records provide direct information to subsurface geo environmental changes due to withdrawal of groundwater. To monitor the seasonal and year-by-year change in quantity and quality of groundwater, CGWB has established 19 National Hydrograph Stations (Jat, Jawad, Morban, Patan, Ratangarh, Singoli, Besla, Chachaor, Gota pipaliya, Jamalpura, Kukrashwar, Kundaliya, Girdola, Harkiyakhal, Nayagaon, Neemuch, Savan & Manasa) and 4 deep Piezometers (Jawad, Kukreshwar, Morban & Nayagaon) in Neemuch district. The monitoring of groundwater levels in these wells is being done by CGWB during the month of May, August,

November and January every year since seventies. It is observed that due to large-scale ground water development in the district the phreatic aquifers are being overexploited which results in erratic water level record from monitoring dug well.

Depth of Water level

The pre-monsoon depth to water level in Neemuch district ranges between 5.3 m bgl and 18.90m bgl. Major part of the district have water level in the range of 5-12 m bgl during the pre monsoon. During post-monsoon period, water level varies from 1.15m bgl to 22.75m bgl. In major part of the district, water level lies between 3 & 10 m bgl. Analyses of Groundwater level data of pre monsoon period indicate that there is declining trend in the range of 0.19 - 0.48 m/yr.

4.2.10.2 Water Availability

Water availability at the watershed/ study area of Project site was evaluated using the online water risk assessment tool Aqueduct Water Risk Atlas developed by World Resource Institute (WRI)[1] and the India Water Tool (IWT). Eight (8) parameters were considered to evaluate water availability which consists of parameters such as Baseline Water Stress (BWS); Baseline Water Depletion (BWD); Inter Annual Variability (IAV); Seasonal Variability (SV); Availability Index (AI); Total Annual Rainfall (TAR), Hydrogeology, and Block Categorisation (BC). and 'low'. ***Table 4.16*** presents the original and new classification of water risk indicators.

Table 4.16 Classification of Water Risk Indicators

Sr. No.	Water Risk Indicator	Original Categorization (2)	Modified Categorization (3)
1	Baseline Water Stress (BWS)	Low: <10%	Low: <20%
		Low-Medium: 10-20%	Medium: 20-40%
		Medium-High: 20-40%	High: >40%
		High: 40-80%	
		Extremely High: >80%	
2	Baseline Water Depletion (BWD)	Low: <5%	Low: <5%
		Low-Medium: 5-25%	Medium: 5-25%
		Medium-High: 25-50%	High: >25%
		High: 50-75%	

[1] Hofste, R., S. Kuzma, S. Walker, E.H. Sutanudjaja, et. al. 2019. "Aqueduct 3.0: Updated DecisionRelevant Global Water Risk Indicators." Technical Note.Washington, DC: World Resources Institute. Available online at: https://www.wri.org/publication/aqueduct-30

(2) Hofste, R., S. Kuzma, S. Walker, E.H. Sutanudjaja, et. al. 2019. "Aqueduct 3.0: Updated DecisionRelevant Global Water Risk Indicators." Technical Note.Washington, DC: World Resources Institute. Available online at: https://www.wri.org/publication/aqueduct; India Water Tool

(3) Modified by ERM

Sr. No.	Water Risk Indicator	Original Categorization [2]	Modified Categorization [3]
		Extremely High: >75%	
3	Inter Annual Variability (IAV)	Low: <0.25	Low: <0.25
		Low-Medium: 0.25-0.5	Medium: 0.25-0.5
		Medium-High: 0.5-0.75	High: >0.5
		High: 0.75-1	
		Extremely High: >1	
4	Seasonal Variability (SV)	Low: <0.33	Low: <0.33
		Low-Medium: 0.33-0.66	Medium:0.33-0.66
		Medium-High: 0.66-1	High: >0.66
		High: 1-1.33	
5	Availability Index (AI)	Extremely Low	High
		Low	
		Low-Medium	
		Medium-High	Medium
		High	Low
		Extremely High	
6	Total Annual Rainfall (TAR)	Low (0-708 mm/year)	High
		Low-Medium (709 -1104 mm/year)	Medium
		Medium (1105-1500 mm/year)	
		Medium-High (1501-1896mm/year)	Low
		High (1896+ mm/year)	
7	Hydrogeological Map (HM)	>40 (Unconsolidated)	Low

Sr. No.	Water Risk Indicator	Original Categorization (2)	Modified Categorization (3)
		25-40 (Unconsolidated)	
		10-25 (Unconsolidated)	Medium
		<10 (Unconsolidated)	
		1-25 (Consolidated/semi-consolidated)	High
		1-10 (Consolidated/semi-consolidated)	
		1-5 (Consolidated/semi-consolidated)	
		<1 (Hilly areas)	
8	Block Categorisation (BC)[1]	Safe	Low

[1] The ground water resources are assessed in units, i.e., blocks/ talukas/ mandals/ watersheds. The blocks are generally be of the same size (or lesser) as the Talukas. These assessment units are categorized for ground water development based on two criteria - a) stage of ground water development, and b) long-term of pre and post monsoon water levels.

The groundwater resources are typically assessed by CGWB (Central Ground Water Board) and categorized for groundwater development based on two (2) criteria:

- Stage of groundwater development; and
- Long-term trend of pre- and post-monsoon water levels

The long-term groundwater level trends are computed generally for a period of ten (10) years. Based on the above, groundwater resource units are typically divided into 'Notified' and 'Non-notified' areas. The Non-notified areas are further divided into the following categories:

- 'Safe' areas which have ground water potential for development;
- 'Semi-critical' areas where cautious groundwater development is recommended;
- 'Critical' areas and 'Over-exploited' areas, where there should be intensive monitoring and evaluation and future ground development will be linked with water conservation measures.

The details of criteria for categorization of assessment units are provided in the table below.

Criteria for groundwater categorisation

Serial No.	Stage of Groundwater Development	Significant Long-term Decline		Categorization
		Pre-monsoon	Post-monsoon	
1.	<= 70%	No	No	Safe
2.	>70% and <=90%	No	No	Safe
		Yes/No	No/Yes	Semi-critical
3.	>90% and <=100%	Yes/No	No/ Yes	Semi-critical
		Yes	Yes	Critical
4.	>100%	Yes/No	No/Yes	Over-Exploited
		Yes	Yes	Over-Exploited

Sr. No.	Water Risk Indicator	Original Categorization (2)	Modified Categorization (3)
		Semi-Critical	
		Critical	Medium
		Over-Exploited	High

The assessment against these parameters are described in ***Table 4.17***.

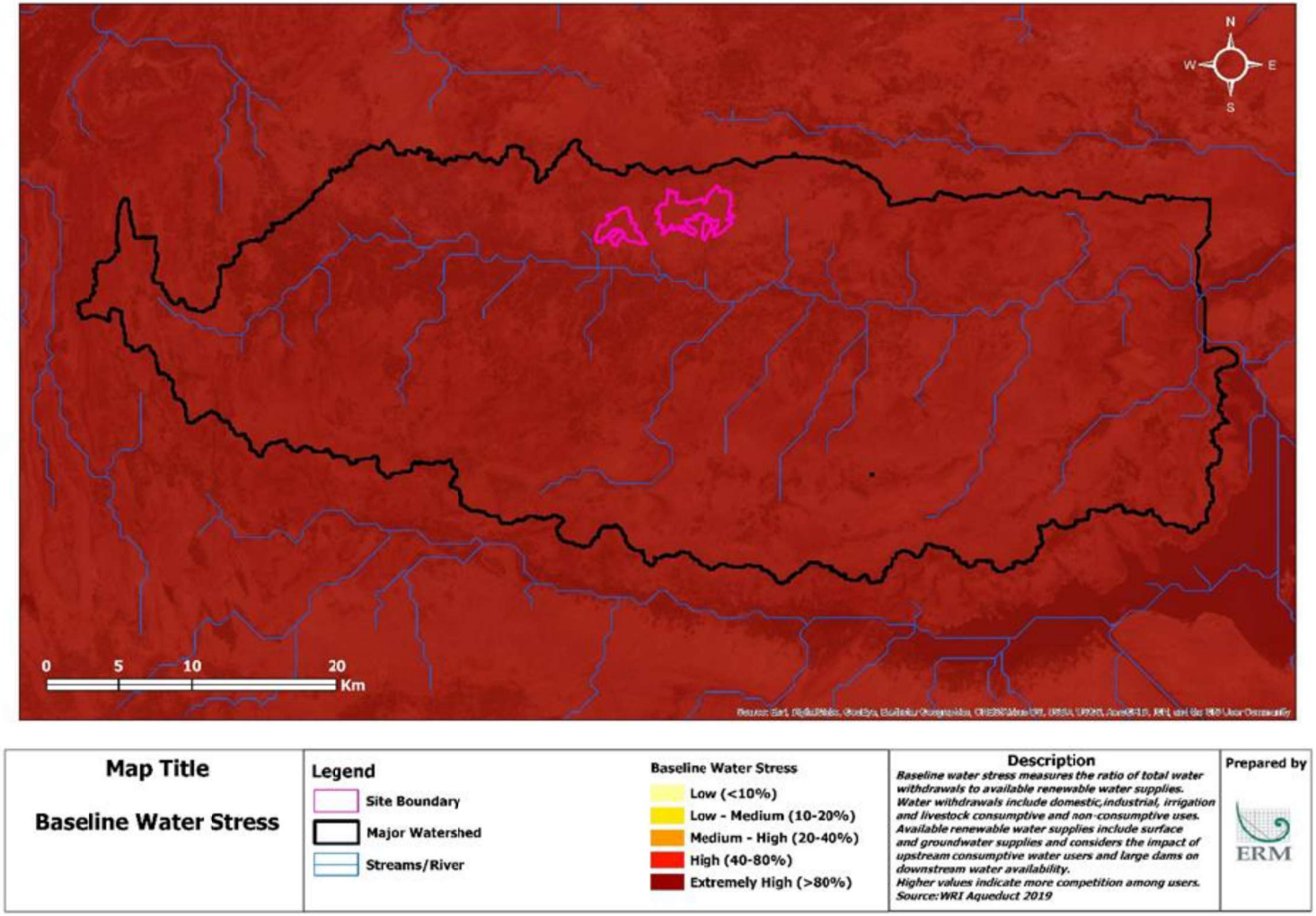
Table 4.17 Parameters included to assess water availability

S. No.	Parameter	Definition	Analysis
1	Baseline Water Stress (BWS) *Aqueduct*	Baseline water stress is defined as the ratio of the total annual water withdrawals to the total available annual water renewable supply, accounting for upstream consumptive use. Higher value indicate more competition among users.	BWS map is presented in ***Figure 4.12***. This map, originally developed for the world, also captures baseline water stress for the Project site. This map was developed based on BWS at the watershed- level for different regions of the world. The Project site fall in the region of extremely high baseline water stress. This indicates '***High***' risk of water stress in these areas.
2	Baseline Water Depletion (BWD) *Aqueduct*	Baseline water depletion measures the ratio of total water consumption to available renewable water supplies. Total water consumption includes domestic, industrial, irrigation and livestock consumptive uses. Available renewable water supplies include surface and groundwater supplies and considers the impact of upstream consumptive water users and large dams on downstream water availability. Higher values indicate larger impact on the local water supply and decreased water availability for downstream users.	BWD map is presented in ***Figure 4.13.*** The Project site falls in the region of low to medium baseline water depletion indicating '***High***' risk of depletion.
3	Inter Annual Variability (IAV) *Aqueduct*	It indicates the variation in water supply from year to year.	Inter Annual Variability (IAV) map is presented in ***Figure 4.14***. This map, originally developed for the world, also captures IAV for study area. The Project site fall in the region of medium to high IAV. This indicates ***'High'*** risk from inter-annual variability.
4	Seasonal Variability (SV) *Aqueduct*	Seasonal variability indicates variation in water supply between months of the year.	SV map is presented in ***Figure 4.15***. This map, originally developed for the world, also captures SV for study area. The Project site fall in the region of medium-high seasonal variability indicating non-uniform availability of water supply over different month/seasons in a year. Hence, the water risk from seasonal variability was estimated to be '***High***'.

S. No.	Parameter	Definition	Analysis
5	Availability Index (AI) *India Water Tool*	This indicator – the Normalised Difference Water Index (NDWI)- is a remote sensing derived index estimating surface water availability by recording water level in open surface water. Positive values are typically open water areas and negative values are non-water features (i.e. terrestrial vegetation, bare soil etc.). Source: National Aeronautics and Space Administration and U.S. Geological Survey, 2001-2016; Data processed with the support of the Earth Genome	AI map is presented in ***Figure 4.16.*** The Site fall in the region of low to medium availability index indicating relatively lower availability of surface water. This indicates '***High***' risk for surface water availability in the area.
6	Total Annual Rainfall (TAR) *India Water Tool*	This indicator is the arithmetic average of the annual rainfall recorded at all Meteorological stations under each district. Source: India Meteorological Department, 2004-2013 Unit: mm	TAR map is presented in ***Figure 4.17***. The Total Annual Rainfall Map indicates 'low to medium' annual rainfall at Site region which is indicative of low replenishment of water in surface and groundwater reservoirs. The risk of water availability is estimated to be '***High***'.
7	Hydrogeological Map *India Water Tool*	The indicator gives the broad types of geological formations – Unconsolidated, Semi-consolidated and Consolidated - that inform the groundwater potential and control the hydraulics of groundwater. This is a relatively qualitative estimate based on the tentative water yielding potential of the geological unit and does not include the groundwater availability in the region. Source: Central Ground Water Board, 2011	Hydrogeological map (HM) for the Project site is presented in ***Figure 4.18***. The map provides information on the aquifer yield of hydrogeological formations in the regions where the Site is located. The Site is located in aquifers with 'low' groundwater yield indicating lower possibility of aquifer recharge and hence has a ***'High'*** likelihood of groundwater risk. This was also corroborated by consultations with the community members Badi, Kavai and Bardawada villages. A total of 200- 250 dugwells and 300-400 tubewells were reported in these villages. General depth of the dugwells was reported in the range of 80-100 feet (24-31 m). General depth of tubewells was reported in the range of 450-800 feet (137- 245 m). Approximately 90 % of the dugwells and tubewells were reported with only seasonal water availability influenced by the rainfall. Only the tubewells located in

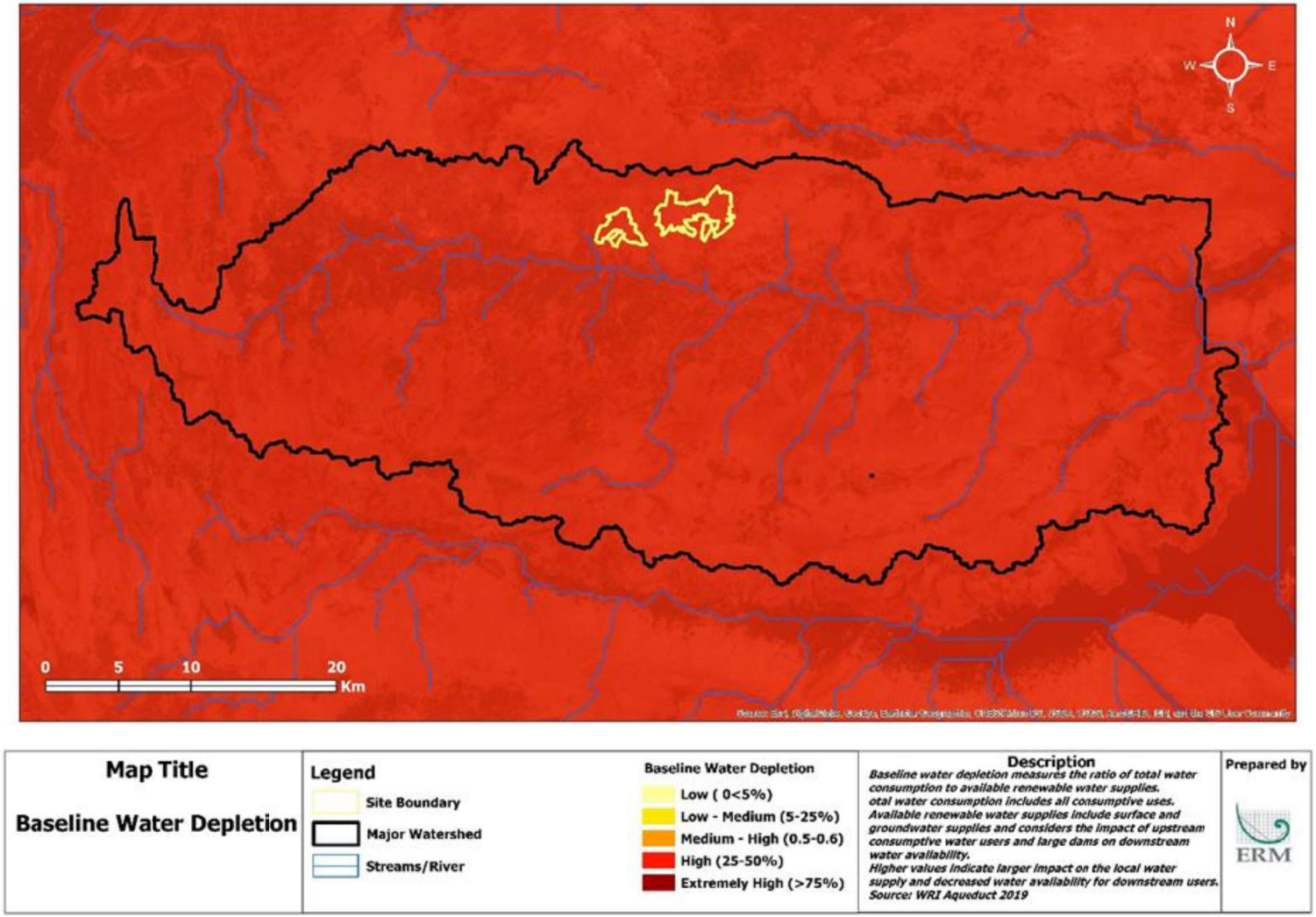
S. No.	Parameter	Definition	Analysis
			the proximity of surface water bodies were reported to provide water to the community throughout the year.
8	Block Categorisation *India Water Tool*	The ground water resources are assessed in units, i.e. blocks/ talukas/ mandals/ watersheds. These assessment units are categorized for ground water development based on two criteria - a) stage of ground water development, and b) long-term of pre and post monsoon water levels. The long term ground water level trends are computed generally for the period of 10 years. The significant rate of water level decline are taken between 10 to 20 cm per year depending upon the local hydrogeological conditions. There are four categories, namely - 'Safe' areas which have ground water potential for development; 'Semi-critical' areas where cautious groundwater development is recommended; 'Critical' areas; and 'Over-exploited' areas, where there should be intensive monitoring and evaluation and future ground development be linked with water conservation measures.	The Block category provides an understanding of the overall status of groundwater in the block. Site region block (Jawad Block) is located a 'Critical' block indicating '***High'*** risk of groundwater in the area as groundwater development in the region is relatively less due to poor aquifers yield and productivity.

Figure 4.12 Baseline water stress map



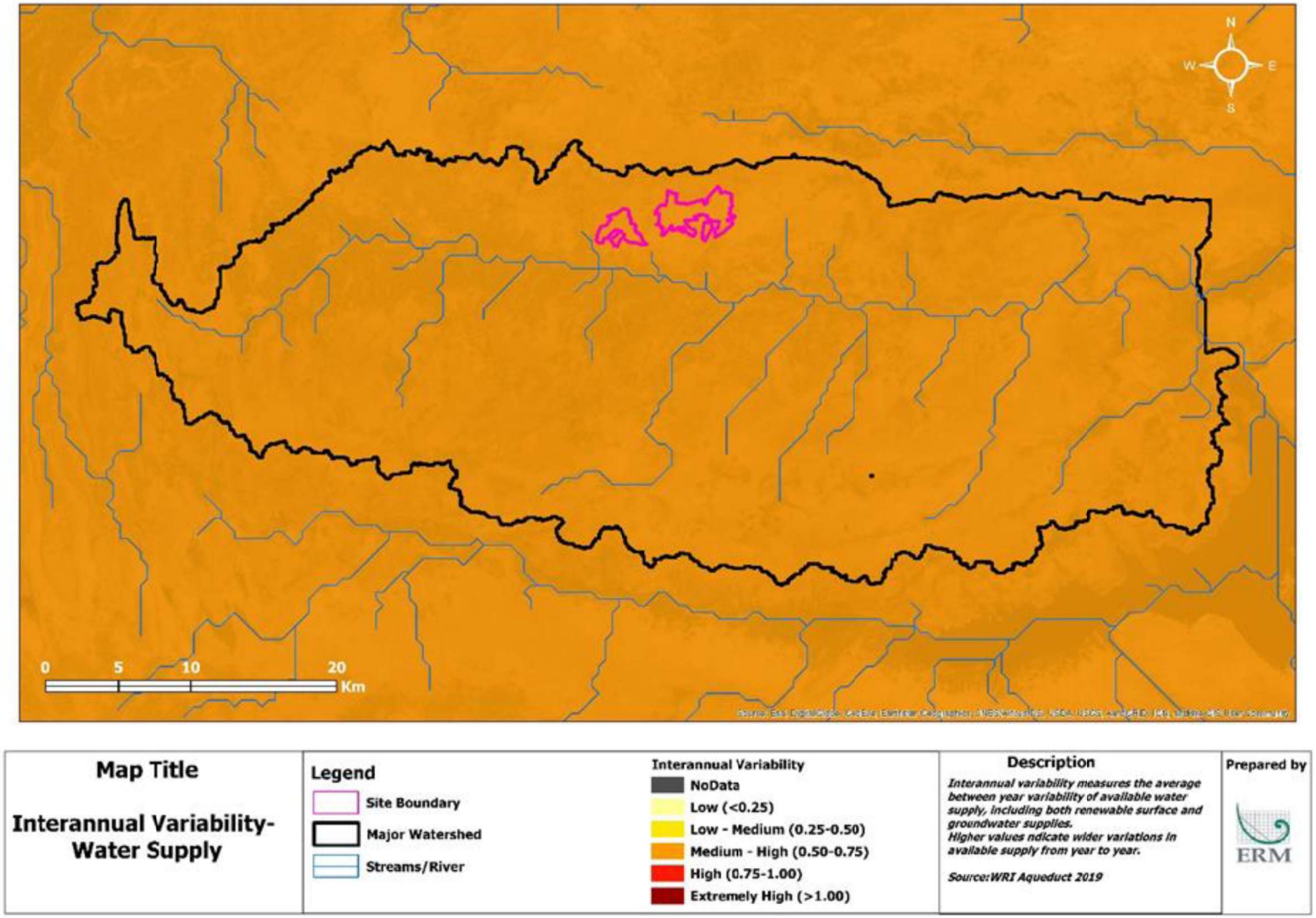
Source: Hofste, R., S. Kuzma, S. Walker, E.H. Sutanudjaja, et. al. 2019. "Aqueduct 3.0: Updated Decision Relevant Global Water Risk Indicators." Technical Note.Washington, DC: World Resources Institute. https://www.wri.org/publication/aqueduct-30

Figure 4.13 Baseline water depletion map



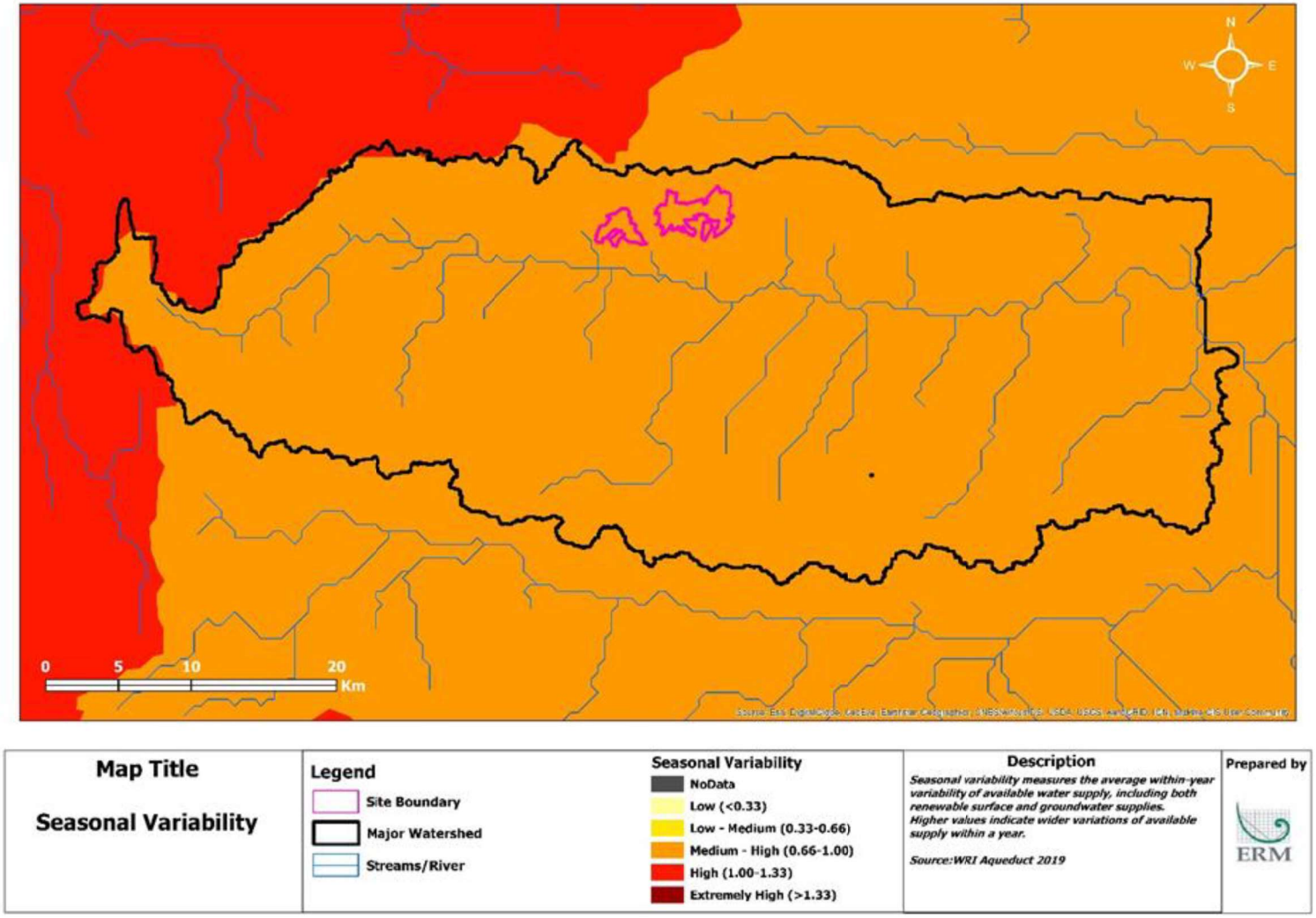
Source: Hofste, R., S. Kuzma, S. Walker, E.H. Sutanudjaja, et. al. 2019. "Aqueduct 3.0: Updated DecisionRelevant Global Water Risk Indicators." Technical Note.Washington, DC: World Resources Institute. https://www.wri.org/publication/aqueduct-30 (2019)

Figure 4.14 Inter annual variability map



Source: Hofste, R., S. Kuzma, S. Walker, E.H. Sutanudjaja, et. al. 2019. "Aqueduct 3.0: Updated Decision Relevant Global Water Risk Indicators." Technical Note.Washington, DC: World Resources Institute. Available online at: https://www.wri.org/publication/aqueduct-30

Figure 4.15 Seasonal variability map



Source: Hofste, R., S. Kuzma, S. Walker, E.H. Sutanudjaja, et. al. 2019. "Aqueduct 3.0: Updated DecisionRelevant Global Water Risk Indicators." Technical Note.Washington, DC: World Resources Institute. Available online at: https://www.wri.org/publication/aqueduct-30 (2019)

Figure 4.16 Availability index map

Figure 4.17 Total annual rainfall map

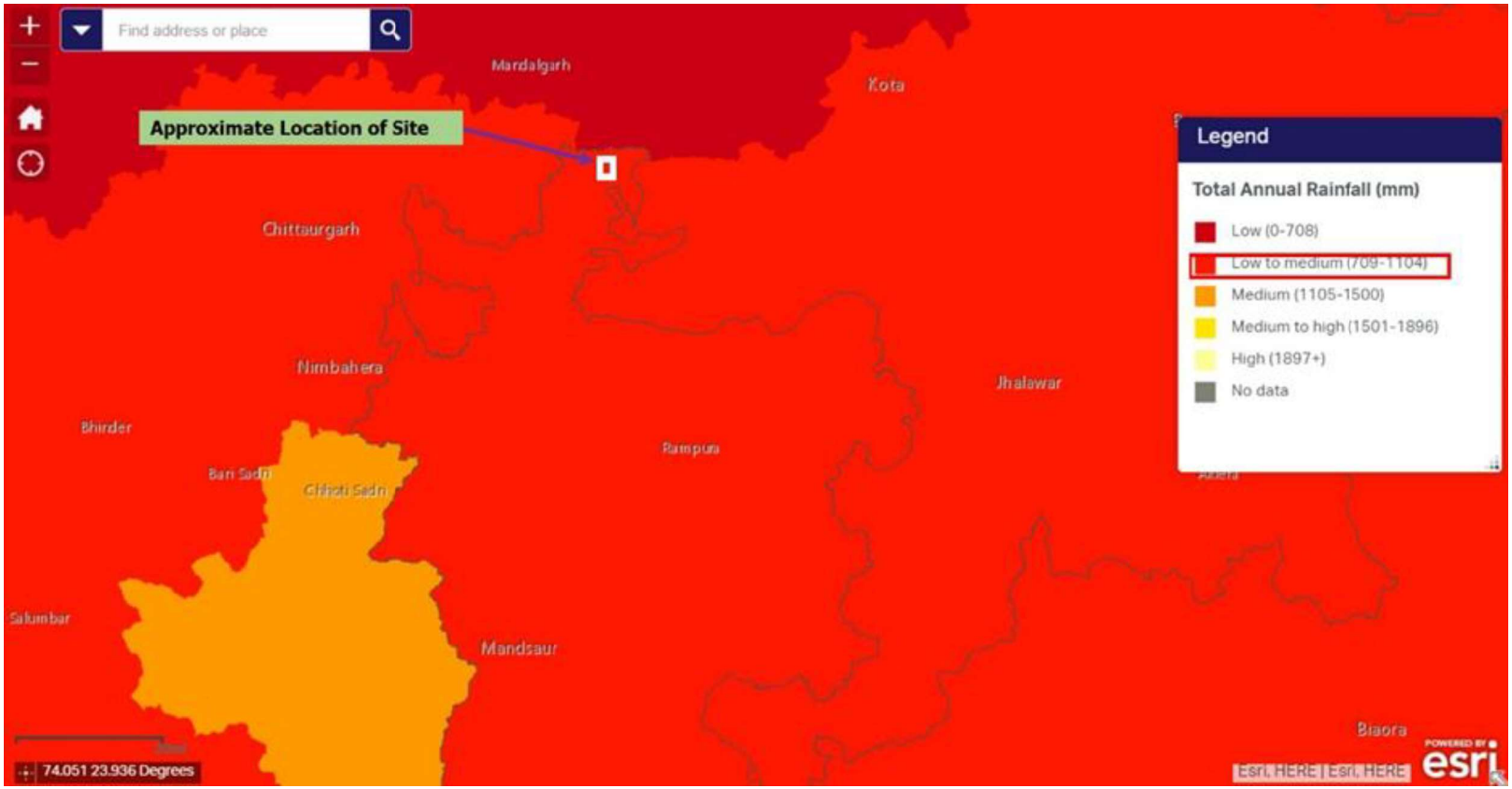
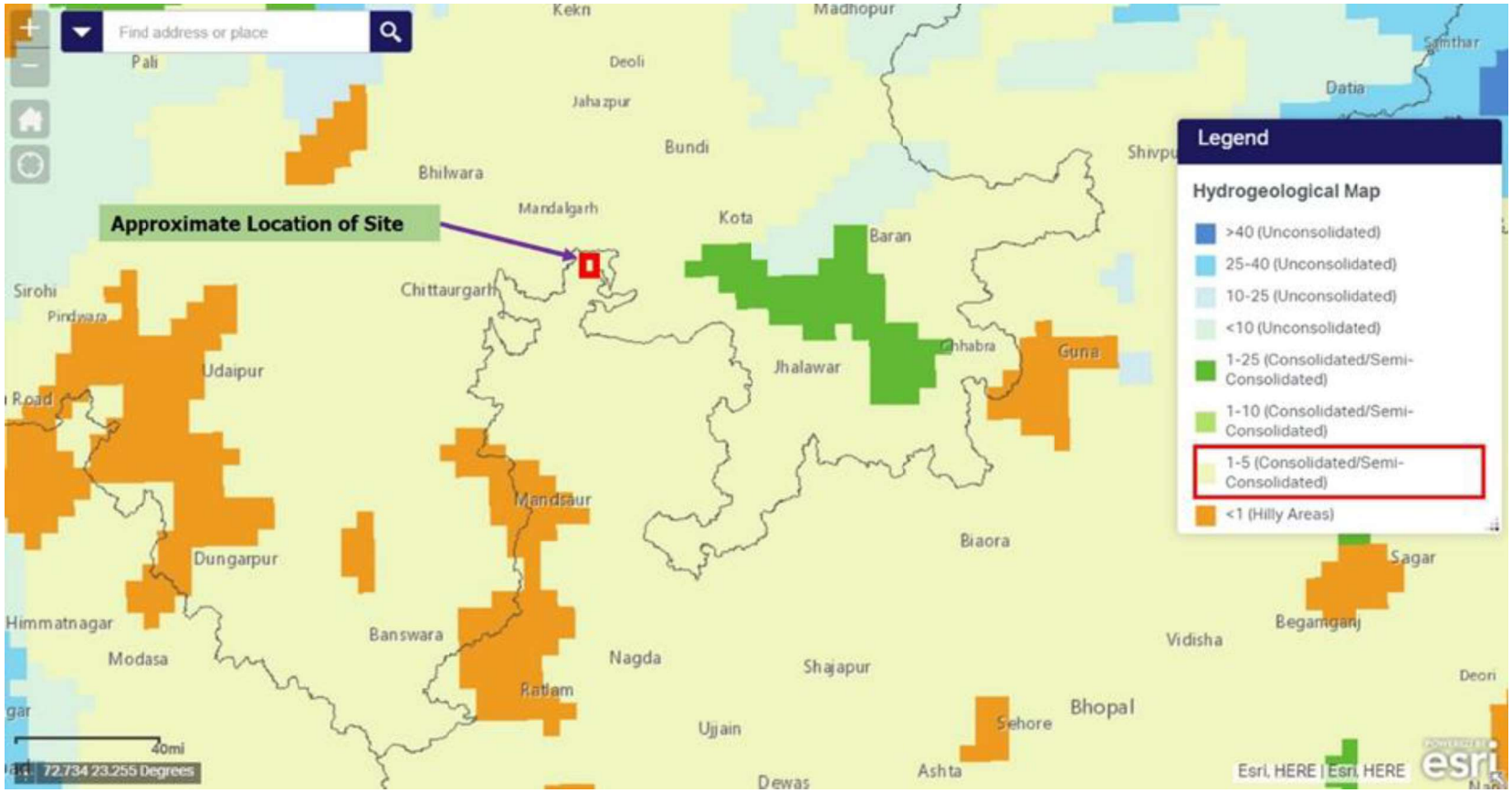


Figure 4.18 Hydrogeological map



Overall Water Resources Availability Risk

The overall water risk was evaluated based on groundwater and surface water risk. Groundwater risk was estimated based on Block Categorization and Hydrogeology while surface water risk was estimated based on Inter Annual Variability, Seasonal Variability, Availability Index and Total Annual Rainfall. Baseline Water Stress and Baseline Water Depletion were evaluated as risk factors common to both groundwater and surface water risk. For each asset, total water risk was evaluated based BWS and BWD while groundwater and surface water risks were evaluated based on the aforementioned individual factors.

- Groundwater risk was estimated to be '***High***' due to high risk of availability of resources, high risk from BC and high risk based on stakeholder consultations.
- Surface Water risk was estimated to be '***High***' due to high risk from AI, SV, IAV and TAR.
- Overall water risk was estimated to be '***High***' due to high to extreme high risk from BWS and high risk from BWD.

4.2.10.3 Water Quality

Ground Water Quality

The groundwater quality assessment was done to understand the baseline water (ground water) quality of the study area. The groundwater samples were collected from three (03) hand pumps from select villages in the study area. A map showing location of ground water sampling is presented in ***Figure 4.1***. The details of water sampling locations are presented in ***Table 4.18.***

Table 4.18 Details of Water Sampling Locations

SN.	Location	Sample Code	Zone	Easting (mE)	Northing (mN)
1	School, Village Badi	GW1	43R	524813.00	2765771.00
2.	School, Village Kawai	GW2	43R	521718.05	2764820.71
3.	School, Village Bardawada	GW3	43R	518628.25	2763257.42

Source: ERM's Site Assessment

The groundwater samples obtained from within the Project AoI were analysed against the IS: 10500:2012 standards and the same have been shown below in ***Table 4.19*** and discussed.

Table 4.19 Groundwater Quality in the Study Area

S.N.	Parameter	Unit	GW1	GW2	GW3	IS: 10500, 2012 Limits, Desirable	IS: 10500, 2012 Limits, Permissible
Physico- Chemical Tests							
1. 1	pH at 25 °C	-	7.04	6.93	7.2	6.5-8.5	No relaxation
2. 2	Temperature	° C	25	25	25	---	---
3.	Electrical Conductivity	ms/cm	1.03	0.96	1.7	---	---
4. 3	Turbidity	NTU	1.1	0.4	0.5	1	5
5. 4	Colour	Hazen	BDL	BDL	BDL	5	15
Chemical Parameters							
6.	Total Alkalinity	mg/L	312	309.6	384	200	600
7.	Total Dissolved Solids	mg/L	566	527	935	500	2000
8.	Salinity	ppt	0.16	0.19	0.43	---	---
9.	DO	mg/L	6.9	6.3	6.2	---	---
10.	Chloride (as Cl)	mg/L	69.43	87.7	218.8	250	1000
11.	Fluorides as F-	mg/L	1.4	0.61	0.34	1.0	1.5

S.N.	Parameter	Unit	GW1	GW2	GW3	IS: 10500, 2012 Limits, Desirable	IS: 10500, 2012 Limits, Permissible
12.	Total hardness (as CaCO3)	mg/L	284.2	399.4	564.5	200	600
13.	Sulphate (as SO4)	mg/L	66.5	16.4	225.2	200	400
14.	Nitrate (as NO3)	mg/L	0.99	3.82	0.64	45	No Relaxation
15.	Phosphate as PO4	mg/L	<3	<3	<3	---	---
16.	COD	mg/L	<10	<10	<10	---	---
17.	BOD	mg/L	<5	<5	<5	---	---
18.	Phenolic Compound (as C6H5OH)	mg/L	BDL	BDL	BDL	0.001	0.002
19.	Iron (as Fe)	mg/L	BDL	BDL	BDL	0.3	No Relaxation
20.	Mercury (as Hg)	mg/L	BDL	BDL	BDL	0.001	No Relaxation
21.	Lead (as Pb)	mg/L	BDL	BDL	BDL	0.01	No Relaxation
22.	Cadmium (as Cd)	mg/L	BDL	BDL	BDL	0.003	No Relaxation
23.	Arsenic (As)	mg/L	BDL	BDL	BDL	0.01	0.05
24.	Nickel as Ni	mg/L	BDL	BDL	BDL	0.02	No Relaxation
25.	Copper (as Cu)	mg/L	BDL	BDL	BDL	0.05	1.5
26.	Zinc (as Zn)	mg/L	2.13	0.35	1.38	5	15
27.	Manganese	mg/L	BDL	BDL	BDL	0.1	0.3
28.	Calcium (as Ca)	mg/L	27.6	129	129	75	200
29.	Magnesium (as Mg)	mg/L	51.6	18.4	58.1	30	100
Microbiological Parameters							
30.	Total Coliform	MPN/100ml	4	2	0	Shall not be detectable in any 100 ml sample	

BDL: Below Detectable Limits

Discussion of Results

- pH of the groundwater samples were found to be in the range of 6.9 – 7.2, which are in compliance to the IS 10500 standard of 6.5 to 8.5.
- Turbidity in the water samples ranges from 0.4 to 1.1 NTU, exceeds the acceptable limit (1 mg/l) in sample collected from village Badi. However it's within the permissible limit.
- TDS in the water samples was found to be between 527 to 935 mg/L and all the samples was found to exceed the acceptable limit of IS 10500 standard (500 mg/l) but is within permissible limit (2000 mg/l).
- Total Hardness values in the groundwater samples were found to be in the range of 284 to 564 mg/L and all the samples was found to exceed the acceptable limit of IS 10500 standard (200 mg/l) but is within permissible limit of (600 mg/l).
- Concentration of fluoride in groundwater sample collected from Village Badi was 1.4 mg/l, within the permissible limit of 1.5 mg/l of IS 10500. For other 2 samples it was observed to be within the desirable limits.
- Value of sulphate in water sample collected from village Bardawada was observed to be 225.2 mg/l, exceeds the acceptable limit (200 mg/l) but is within permissible limits (400 mg/l).
- Concertation of calcium in water samples collected from village Kawai and Bardawada was found to be 129 mg/l, exceeds the acceptable limit of (75 mg/l) IS 10500 but is within the permissible limit of 200 mg/l.
- Concentration of magnesium in water samples collected from village Badi and Bardawada was found to be in the range of 51.6 – 58.1 mg/l and was found to exceed the acceptable limit of IS 10500 standard (30 mg/l) but is within permissible limit (100 mg/l).

- Number of total coliform found in water sample collected from village Badi and Kawai was 4 and 2, respectively exceeds the standards as per IS 10500.
- Concentration of metal analysed in the samples comprising of Iron, Lead, Cadmium, Nickel, Copper, Zinc and Manganese was found to be within the acceptable limits.

Surface Water Quality

To understand the quality of surface water within the project AoI, two (02) surface water samples were collected and analysed against the designated best use classification of Central Pollution Control Board (CPCB) as given in ***Table 4.20*** and the details of water sampling locations are presented in ***Table 4.21.*** Samples were taken from water bodies/lakes in and around the villages in the study area.

Table 4.20 Water Quality Standards by CPCB for Best Designated Usage

Designated-Best-Use	Class of water	Criteria
Drinking Water Source without conventional treatment but after disinfection	A	Total Coliforms Organism MPN/100ml shall be 50 or less
		pH between 6.5 and 8.5
		Dissolved Oxygen 6mg/l or more
		Biochemical Oxygen Demand 5 days 20°C 2mg/l or less
Outdoor bathing (Organised)	B	Total Coliforms Organism MPN/100ml shall be 500 or less
		pH between 6.5 and 8.5
		Dissolved Oxygen 5mg/l or more
		Biochemical Oxygen Demand 5 days 20°C 3mg/l or less
Drinking water source after conventional treatment and disinfection	C	Total Coliforms Organism MPN/100ml shall be 5000 or less
		pH between 6 to 9
		Dissolved Oxygen 4mg/l or more
		Biochemical Oxygen Demand 5 days 20°C 3mg/l or less
Propagation of Wild life and Fisheries	D	pH between 6.5 to 8.5
		Dissolved Oxygen 4mg/l or more
		Free Ammonia (as N) 1.2 mg/l or less
Irrigation, Industrial Cooling, Controlled Waste disposal	E	pH between 6.0 to 8.5
		Electrical Conductivity at 25°C micro mhos/cm Max.2250
		Sodium absorption Ratio Max. 26
		Boron Max. 2mg/l
-	Below-E	Not Meeting A, B, C, D & E Criteria

Table 4.21 Details of Surface Water Sampling Locations

SN.	Location	Sample Code	Zone	Easting (mE)	Northing (mN)
1	Village Badi	SW1	43R	525844.96	2765907.64
2.	Village Kawai	SW2	43R	521891.00	2767454.00

Source: ERM's Site Assessment

The analysis results obtained are shown below:

Table 4.22 Surface Water Sampling Results

S.N.	Parameter	Unit	SW1	SW2
Physico- chemical Tests				
1.	pH at 25 ˚C	-	7.41	7.04
2.	Temperature	° C	25	25
Chemical Parameters				

S.N.	Parameter	Unit	SW1	SW2
3.	Total Alkalinity	mg/L	110.4	69.6
4.	Total Hardness	mg/L	122.9	65.3
5.	DO	mg/L	6.5	6.6
6.	Chloride (as Cl)	mg/L	37.6	5.8
7.	Fluorides as F-	mg/L	0.34	0.56
8.	Sulphate (as SO4)	mg/L	9.67	1.06
9.	Nitrite	mg/L	<0.01	<0.01
10.	Nitrate	mg/L	<0.1	<0.1
11.	Total Nitrogen	mg/L	BDL	2.5
12.	COD	mg/L	<10	<10
13.	BOD	mg/L	<5	<5
14.	Phenol	mg/L	<0.5	<0.5
15.	Salinity	ppt	0.09	0.04
16.	Iron (as Fe)	mg/L	<0.1	<0.1
17.	Silver	mg/L	<0.05	<0.05
18.	Lead (as Pb)	mg/L	<0.01	<0.01
19.	Cadmium (as Cd)	mg/L	<0.003	<0.003
20.	Zinc (as Zn)	mg/L	<0.05	<0.05
21.	Manganese	mg/L	<0.1	<0.1
22.	Sodium (Na)	mg/l	11.4	3.5
23.	Potassium (K)	mg/l	BDL	BDL
24.	Total Phosphorus	mg/l	<1	1.7
25.	Oil and grease	mg/l	<0.2	<0.2
Microbiological Parameters				
26.	Total Coliform	MPN/100ml	210	84

BDL: Below Detectable Limits

Discussion of Results

- Water sample collected from pond at village Badi have 210 MPN/100ml of total coliform, pH value 7.41 i.e. in the range of 6.5 and 8.5. Dissolved Oxygen 6.5 mg/l i.e. more than 5 and BOD value below detection level of 5 mg/l hence meet the criteria for Class B i.e. Outdoor bathing (Organised)
- Water sample collected from water body at village Kawai have 84 MPN/100ml of total coliform, pH value 7.04 i.e. in the range of 6.5 and 8.5. Dissolved Oxygen 6.6 mg/l i.e. more than 5, and BOD value below detection limit of 5 mg/l hence meet the criteria for Class B i.e. Outdoor bathing (Organised).

4.2.11 Soil Quality

As per the groundwater information booklet for Neemuch District by Central Ground Water Board – 2013; the district is generally covered with black cotton soils covering almost three fourths of the area. Remaining area has red-yellow mixed soils and alluvial soils along the river courses.

Soil Quality Monitoring & Analysis

The soil characteristics within the study area, especially the physical quality and fertility of the soil have been characterized by analysing the soil sample collected from 5 locations within the study area. Table below provides details of soil sampling locations. Soil sampling locations are presented in **Figure 4.1**.

Table 4.23 Soil Sampling Locations in the Study Area

Location Code	Location	Co-ordinates	Selection Criteria
SQ1	Project Site - Unit 1	519757.02 m E 2765040.96 m N	Project Site
SQ2	Project Site - Unit 2	522448.99 m E 2765231.03 m N	
SQ3	Forest Area	522141.11 m E 2768576.85 m N	Forest land
SQ4	Village Badi	526507.13 m E 2764879.31 m N	Scrub land
SQ5	Village Lardpura	518018.71 m E 2762850.34 m N	Agricultural land

Source: ERM's Site Assessment

The soil quality analysis results are presented in ***Table 4.24*** and described in the further subsections.

Table 4.24 Results of Soil Analysis

S. No	Parameter	Unit	SQ1	SQ2	SQ3	SQ4	SQ5
1	Particle size distribution						
	Sand	%	88.4	88.9	84.7	78.8	74.3
	Silt	%	4.1	3.3	5.3	8.4	14.3
	Clay	%	7.5	7.8	10.0	12.8	11.4
2	Texture	-	Loamy Sand	Loamy Sand	Loamy Sand	Sandy Loam	Sandy Loam
3	Bulk Density	g/cm^3	1.45	1.82	1.75	1.8	1.61
4	pH	-	6.48	7.23	6.1	7.21	7.78
5	Electrical Conductivity	mmhos/ cm	0.292	0.12	0.086	0.1	0.41
6	Moisture Content	%	9	2.7	0.01	3.2	6.4
7	Cation Exchange Capacity	meq/100gm	35.3	31.9	34.6	31.4	56.3
8	SAR	-	1.21	0.23	0.28	0.24	6.74
9	Water Holding Capacity	%	44.5	36.4	36.7	35.1	42.6
11	Total Nitrogen	mg/kg	153.1	290.6	110.8	126.7	348
12	Sulphate	mg/kg	49	16.4	17.1	BDL	60.3
13	Chloride	mg/kg	67.3	38.4	38.4	75.3	104.6
14	Sodium (Na)	mg/kg	81.5	14	15.2	13.8	415.8
15	Total Potassium (K)	mg/kg	598.4	661.8	877.7	718.2	933.7
16	Calcium (Ca)	mg/kg	4378.5	4587.8	2284.2	3432.2	1906.8
17	Magnesium (Mg)	mg/kg	1313.5	688.2	1370.5	915.2	1144.1
18	Permeability	cc/gm	0.02	0.02	0.02	0.03	0.21

Discussion of Results

pH: Generally, soil pH in the range of 6.50-7.00 is considered to be best suited for growing most crops. The pH level in soil samples was recorded to be within a range of 6.1-7.78 indicating slightly acidic to slightly alkaline pH.

Electrical Conductivity: Electrical Conductivity is used to estimate the soluble salt concentration in soil, and is commonly used as a measure of salinity. The EC value of soil samples were recorded to be within a range of 0.08 micromhos/cm to 0.4 micromhos/cm which can be assessed to be average for germination.

***Sodium Adsorption Ratio (SAR)*:** The sodicity [(1)] hazard of soil, which affects water infiltration in the soil is expressed as the Sodium Adsorption Ratio (SAR). Soil with high level of exchangeable sodium may cause dispersion of soil particles leading to the replacement of major cations (calcium and magnesium) adsorbed on the soil. This could possibly lead to deterioration of soil structures and water infiltration problems. The SAR value in the soil was observed to be 0.23 – 6.74 (agricultural land parcel).

Total Nitrogen: Value of total nitrogen in the soil samples ranges from 110 to 348 (agricultural land).

***Total Potassium*:** Value of total potassium in the samples collected ranges from 598.4 - 933.7 mg/kg.

***Water holding capacity*:** Water Holding Capacity in the samples ranges from 35.1-44.5%.

4.2.12 Traffic Monitoring

Traffic survey was conducted at the access road of the Neemuch Solar Park within the study area to assess the traffic scenario of the area. Detail of traffic survey locations is given in ***Table 4.25*** below.

Table 4.25 Description of Traffic Count Survey Location

Sampling Location	Distance & Direction w.r.t Project Site	Justification for Selection of Location
State Highway (SH)- 9A, Bhilwada – Modak Road	~ 2.5 km, South	Access road to the project site

The summarised results of the traffic survey are given in ***Table 4.26.*** The percentage composition of different vehicle categories is shown in ***Table 4.27*** and ***Figure 4.19.*** Refer ***Appendix D*** for detail results of traffic survey.

Table 4.26 Existing Traffic (Motorised) Volumes in Study Area

Description	Access road
Total Traffic (Vehicle Nos.)/24 Hours (To & fro)	2208
Average Traffic Flow/Hr	184
Max Traffic Flow (Nos)/Hr	213
Min Traffic Flow (Nos)/Hr	16
Max Traffic Flow (Time- hours)	12:00-13:00
Min Traffic Flow (Time-hours)	04:00-06:00

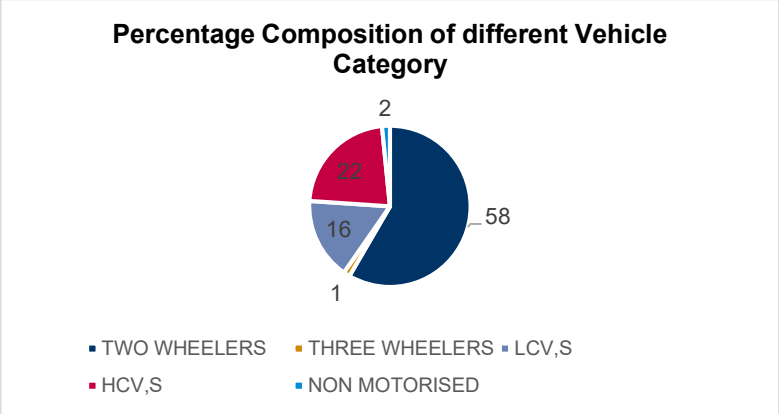
Table 4.27 Percentage Composition of Vehicles in Study Area

Location	(%) Percentage Composition				
	Two Wheeler	Three Wheelers	LMV	HMV	Non-motorised
SH – 9A	58	1	16	22	2

Note: Non-Motorised includes cycles, rickshaws, bullock carts, horse carts; Two wheelers include scooters, motorcycles, Mopeds; Three wheelers include auto; Light motor vehicles (LMVs) include passenger cars, metadors, tractors, tempos, jeeps, van.; Heavy Motor Vehicles (HMVs) include buses, trucks, dumpers, tankers and trailers.

(1) Sodicity is a term given to the amount of sodium held in a soil. Sodium is a cation (positive ion) that is held loosely on clay particles in soil. It is one of many types of cations that are bound to clay particles in soil.

Figure 4.19 Percentage Composition of Different Vehicles Categories



Two wheelers contribute to maximum, 58% of the total traffic on the road followed by heavy motor vehicles (22%) and light motor vehicles (16%). Three wheelers and non-motorised vehicles contribute to 1 and 2% respectively. Saturation capacity (V/C ratio) of the road is presented in ***Table 4.28*** below.

Table 4.28 Saturation Capacity of the access road

S. No	Name of the Road	No. of Lane	Carrying Capacity	Present PCU	V/C ratio
1	SH – 9A	2 lane (two way)	1500 PCU per hour	177	0.12

As shown in table above Saturation capacity (V/C ratio) of the State Highway 9A is 0.12. It indicates that adequate capacity is available and vehicles are not expected to experience significant queues and delays.

4.3 Biological Environment- Flora and Fauna

An ecological survey was undertaken from 19 to 21 December 2019 at the proposed Neemuch Project site. The daytime temperatures varied between 28° C and 30° C. The night-time temperatures varied between 14° C and 16° C. No rain events had occurred leading up to the site assessment.

A rapid ecological survey was conducted to establish an ecological baseline and identify any sensitive ecological receptors within an Area of Influence (AoI) from the Project. The site assessment was undertaken in the month of December, which represents the peak migratory season in India and several bird species travel from North Asia and Europe to the Indian subcontinent. The site assessment therefore also included an assessment of water bodies in the surrounding region to determine extent of migratory bird activity.

4.3.1 Objectives

The ecological surveys were conducted with the following objectives:

Flora

- Identification of sensitive habitats and forest land falling within the Project site and adjoining areas;
- Classification of flora for any endangered, protected or endemic floral species prevailing in the study area based on the field surveys; and

- Identification of areas protected under international conventions, national or local legislation and those recognized nationally and internationally for their ecological, landscape, cultural or other related value.

Fauna

- Identification of fauna (specifically birds, mammals, reptiles and amphibians) based on direct sightings, calls, pugmarks, droppings, nests, etc.;
- Identification and classification of any species recognized as threatened (in accordance with International Union for the Conservation of Nature [IUCN] Red List Version 2019-3) and in accordance to the schedules of the Wildlife (Protection) Act, 1972 and as amended; and
- Identification of areas which are important or sensitive for ecological reasons including their breeding, nesting, foraging, resting, over-wintering areas including wildlife migratory corridors/avian migratory routes.

4.3.2 Approach and Methodology

Study Area

The study area of the ecological surveys has been determined as follows:

- **Project footprint:** fenced Solar Park housing the modules, control room, SCADA building and open space for future expansions with a total area of 1065.7 ha across the three units.
- **Area of Influence:** 5 km radius from the Solar Park that has been identified in past studies[1] as a reasonable estimate for bird and bat movement on a regular basis and therefore representation of species that could be affected by the under-construction and operational Solar Park.
- The study area for the ecological surveys varies from the environmental baseline due to the relatively longer range of biological receptors and to capture movement of the potentially affected species.

Secondary Baseline Data Collection

- The secondary baseline data for the ESIA has been compiled through the following data sources:

Sr. No.	Source	Purpose	Version	Link
1	WII Envis Centre	To identify list of National Parks [NP], Wildlife Sanctuaries [WLS], Conservation Reserves, Biosphere Reserves and Community Reserves in the District/State	-	http://wiienvis.nic.in/
2	Important Bird and Biodiversity Areas (IBAs)	To identify locations and purpose of various IBAs across the country.	-	http://datazone.birdlife.org/home
3	UNESCO World Heritage Site	To identify proximity to any UNESCO World Heritage Sites	-	whc.unesco.org

[1] ERM has carried out extensive bird and bat studies across India and identified that typical bird pathways (migration, foraging and movement) can be understood through a study across the 5 km radius of a wind/solar project. The 5 km radius allows for the determination of sensitive habitat (e.g. forest land or large reservoirs) in the surrounding region and how spillover from those habitats may occur in the solar compound. If there are sensitive habitats immediately outside the 5 km study area, then the same is considered while undertaking the site assessment to determine presence/absence of threatened or protected fauna.

Sr. No.	Source	Purpose	Version	Link
4	Alliance for Zero Extinction Sites	To identify proximity to any declared Alliance for Zero Extinction Sites	-	https://zeroextinction.org/
5	IUCN Red List	To determine the IUCN Red List (threatened) status of various flora and fauna, research more details about the behavior, location and habitat of the species and for spatial distribution maps of the species based on the latest available research information.	2019-3	https://www.iucnredlist.org/
6	Forest Working Plan	To obtain a district-level list of flora and fauna found based on Forest Department surveys.	-	None; hard copy obtained from Neemuch Forest Department.

- Note: all above data sources have been accessed as of 31 May, 2020.

Habitat Surveys

The various habitats within the study area were identified using Google Earth Pro to determine the types and extent of habitats in the 5 km radius of the Project site. These habitats were marked and visited during the site reconnaissance to identify the quality and level of disturbance at these habitat locations.

Floral Analysis

The floral diversity of the study area was recorded by visual observations during the site visit, discussions with local communities/stakeholders and review of scientific publications available in the public domain.

Faunal Analysis

Faunal species were recorded based on direct sightings, indirect evidences (dung, droppings, scat, pugmarks, scratch signs, burrow, nests, etc.) and consultations with local communities. The consultations with local communities was undertaken by displaying pictorial representation of species that are expected in the study are of the Solar Park. The pictorial representation that has been used has been taken from ecology field guides for avifauna [1] and mammals [2]. The species occurring within the study area were surveyed using the following methodologies:

- **Amphibians**: amphibians are often restricted to natural and constructed ponds during the hottest parts of the day [3]. All such water bodies were visited during the late morning-afternoon session to determine presence of amphibians along the shaded ledges of the water body.

[1] Grimmet, R. Inskipp, C. and Inskipp, T. 2013. Birds of the Indian Subcontinent - Second Edition. Published by Christopher Helm, 49-51 Bedford Square, London.
[2] Menon, V. 2014. Indian Mammals: A Field Guide. Hachette, India.
[3] Knutson et. Al. 2005. Agricultural ponds support amphibian populations. Ecological Applications. 14 (3): 669-684.

- **Reptiles**: reptile presence was determined through the use of intensive time constrained search methods [1] [2]. The method was adapted for the terrain by targeting rocks and logs located around water bodies or recently dried streams, hedges and along the trunks of dense vegetation.
- **Avifauna**: An adapted avifaunal survey method for onshore wind farm assessments was utilized for the purpose of the study [3]. The adapted survey method focuses on key habitat features to cover, preferred time of day to ensure maximum bird activity and techniques to determine nocturnal bird activity. Any avifaunal species that was identified by visually sighting or hearing of bird calls was recorded. Birds were identified along motorable roads, around water bodies and in high density vegetation areas during the hottest parts of the day. Binoculars and standard field guides [4] were used for avifaunal identification.
- **Mammals**: Mammal surveys were conducted along motorable roads, near water bodies and in grassy terrain. Individuals were identified through indirect methods such as pellets, tracks, paw marks and scat. Species were then identified using standard literature [5] [6].

4.3.3 Habitat Mapping

The 5 km study area is categorized by a mosaic of agricultural and scrubland but the land parcels for the three units falling within the Neemuch project are largely located on scrubland. The Arnea Block Reserved Forest is located ~ 300m north of the northern boundary of Unit 2 and continued along the northern end of the study at a distance of between 300 m and 1 km from the Neemuch Project site. The breakdown of agricultural land, scrubland and forest land within the 5 km study area has been presented in ***Table 4.3.*** The photo-documentation of the key habitats has been presented in ***Figure 4.20.***

Figure 4.20 Habitats in the study area

Scrubland

Forest Land (in the background)

[1] Welsh, H.H. jr. 1987. Monitoring herpetofauna in woodlands of north-western California and south west Oregon: a comparative strategy. Pp. 203-213. In. Multiple – Use Management of California's hardwood resources. T.R. Plumb, N.H. Pillisbury (eds. Gen. Tech. Regional Environmental Planning. PSW – 100) US Department of Agriculture, Forest Service.
[2] Welsh H.H. Jr. and Lind, A. 1991. The structure of the herpetofaunal assemblage in the Douglas-fir/hardwood forest of norther western California and southwestern Oregon. Pp 395-411. In: Wildlife and vegetation of unmanaged Douglas-fir forests. (Tech. Coords). L.F. Ruggiero, K.B. Aubry, A.B. Carey and M.H. Huff. Ge. Tech. Rep. PNW-GTR-285. Portland, OR: US Department of Agriculture, Forest Service.

[4] Grimmet, R. Inskipp, C. and Inskipp, T. 2013. Birds of the Indian Subcontinent - Second Edition. Published by Christopher Helm, 49-51 Bedford Square, London.
[5] Prater, S.H. 2005. The Book of Indian Animals. Bombay Natural History Society and Oxford University Press – 12th Edition. Pp 316
[6] Menon, V. 2003. A field guide to Indian Mammals. Dorling Kindersley (India) Ltd. New Delhi.

Dried Canal (natural)

Water Body

Agricultural Land

Water Body Surveys

The study area consists of four (04) water bodies with water availability. Each of the water bodies was visited to determine presence of aquatic bird species and understand the migratory bird activity. The list of the water bodies has been presented in ***Table 4.29.***

Table 4.29 Water bodies surveyed near the wind farm

Sr. No.	Water body	Latitude	Longitude	Availability of Water	Distance from Solar Park
1	Water Body near Unit 3	25° 00' 09.57" N	75° 15' 29.14" E	Yes	Adjacent to the southern end of Unit 3.
2	Brahmi River	24° 58' 37.30" N	75° 11' 59.19" E	Yes	1.5 km south of the Unit 1 of the Solar Park at the point closest to the Project site.
3	Kawai Lake	25° 01' 23.90" N	75° 13' 07.29" E	Yes	450m west of the Unit 2 of the Solar Park.
4	Mandol Dam	25° 03' 59.36" N	75° 16' 27.53" E	Yes	4.5 km north of Unit 3 of the Solar Park.

Three of the four water bodies – Water body adjacent to Unit 3, Kawai Lake and Mandol Dam were check dam structures that are used for irrigation during the dry seasons. All four water bodies had received significant rain during the previously concluded monsoon season (i.e. September, 2019) and therefore had high water availability during the survey.

Agricultural Lands

The agricultural land consists of rain-fed agricultural crops including soybean (*Glycine max*), maize (*Zea mays*) and wheat (*Triticum aestivum*). Agricultural land is largely found along the southern end of the 5 km study area along State Highway 9A and abutting villages.

Scrublands

Scrublands are the primary type of vegetation found within the study area and consists of monotypic vegetation composition of dry climate specialists.

4.3.4 Floral Analysis

- The vegetation profile of the region that indicates the type of vegetation has been presented in ***Table 4.30.*** The forest habitat in the area has been classified as tropical dry deciduous forest as per Champion and Seth (1968) Classification[1].

Table 4.30 Vegetation profile of the Project site

Classification Scheme	Classification
Biogeographical Provinces of India[2]	4B: Semi-Arid Punjab Plains
Agro Ecological Sub Region (ICAR)[3]	Hot moist semi-arid ecological sub region (5.2)
Agro-Climatic Zone (Planning Commission)[3]	Western Plateau and Hill region (IX)
Agro-Climatic Zone (NARP)[3]	Malwa plateau zone (M P-10)

The flora found around the 5 km study area has been presented in ***Table 4.31.***

Table 4.31 Flora in the study area

S. No.	Family Name	Scientific Name
1.	Anacardiaceae	*Lannea grandis*
2.	Apocynanceae	*Holarrhena antidysenterica*
3.	Burseraraceae	*Boswellia serrata*
4.	Calastraceae	*Gymnosporia spinosa*
5.	Combretaceae	*Anogeissus latifolia*
6.		*Anogeissus pendula*
7.	Flacourtiaeceae	*Flacourtia indica*
8.	Leguminosae	*Acacia catechu*
9.		*Butea monosperma*
10.		*Cassia fistula*
11.	Malvaceae	*Sterculia urens*
12.	Rutaceae	*Aegle marmelos*
13.	Sterculiaceae	*Helicteres isora*
14.	Verbenaceae	*Lantana camara*

The species identified in the area were largely dry deciduous trees and none of the species had been identified as threatened under the latest IUCN Red List (2020-21).

4.3.5 Faunal Analysis

The above search techniques (***Section 4.3.2***) were used to identify the target fauna – herpetofauna (amphibians + reptiles), avifauna and mammal species. The subsequent sections provide the list of observed and recorded fauna in the study area.

[1] Champion, H.G. and Seth, S.K. 1968. A revised survey of foret types of India. 404 pp.

[2] http://wiienvis.nic.in/Database/HtmlPages/bioprovincemap.htm

[3] http://agricoop.nic.in/agriculturecontingency/neemuch

Herpetofauna

One (01) herpetofauna was observed and three (03) herpetofauna were reported from the study area of the Project. None of the identified species has been threatened under the latest IUCN Red List (Version 2019-3) but one species i.e. Bengal Monitor Lizard (*Varanus bengalensis*) that has been reported in community consultations is protected under Schedule I of the Wildlife Protection Act, 1972.

Table 4.32 Herpetofauna observed/reported in the study area

Sr. No.	Common Name	Scientific Name	IUCN Red List Status (Online Version 2019-2)	Wildlife Protection Act Schedule	Observed/ Reported
1.	Oriental Garden Lizard	*Calotes versicolor*	--	--	Observed
2.	Python	*Python molurus*	--	Schedule I	Reported
3.	Bengal Monitor Lizard	*Varanus bengalensis*	LC	Schedule I	Reported
4.	Common Rat Snake	*Zamenis muscosus*	-	Schedule II	Reported

Note: LC = Least Concern
Reported species have been identified in the Forest Working Plan for Neemuch District. An initial filter has been used for the species identified in the working plan to determine if the habitats found in the Project study are preferred by the species listed.

The photo-documentation of the observed herpetofauna has been provided in ***Appendix A.***

Avifauna

A total of fifty eight (58) bird species were recorded from the study area out of which only ten (10) have been reported and forty eight (48) were observed. Among the observed bird species, two species i.e. Common Pochard (*Aythya ferina*) and Woolly-necked Stork (*Ciconia episcopus*) were classified as Vulnerable in the latest IUCN Red List (Version 2019-3). One species – Black-headed Ibis (*Threskiornis melanocephalus*) has been classified as Near Threatened in the latest IUCN Red List. Nine (09) of the 39 observed species that is 19% of the total species observed during the study are migratory. Raptor activity was minimal within the 5 km study area but several individuals of the commonly found and protected species under the Wildlife Protection Act, 1972 - Black Kite (*Milvus migrans*) and Black-winged Kite (*Elanus caeruleus*) were observed in surrounding villages.

The ten reported species included the protected Shikra (*Accipter badius)*, White-rumped Vulture (*Gyps bengalensis*), Indian Peafowl (*Pavo cristatus*), Egyptian Vulture (*Neophron percnopterus*) and Oriental Honey Buzzard (*Pernis ptilorhynchus*). Among the protected species, White-rumped Vulture is classified as Critically Endangered and Egyptian Vulture as Endangered under the latest IUCN Red List (Version 2020-1). . The above species have been reported from Menal River and within the Arnea Reserve Forest Block and contiguous forest land that is located at the northern end of the study area (~ 1-5 km north of the Neemuch units). The species has been reported across multiple sources – ebird.org, Forest Working Plan for Neemuch District and community consultations.

Over the course of the site visit, several livestock carcasses were observed along the access roads to the Project site but no vulture activity was found along these carcasses. The carcasses were largely being scavenged by the common Jungle Crow (*Corvus splendens*) and street dogs/cats. There are reports of vulture activity in the area[1] but none was observed or reported in consultations with the local community.

[1] Ebird.org, IUCN Red List, India Biodiversity Portal and media articles (e.g. https://indiasendangered.com/more-vultures-in-madhya-pradesh/)

Table 4.33 Avifauna observed/reported in the study area

Sr. No.	Common Name	Scientific Name	Migratory Status	IUCN Red List Status (Online Version 2019-3)	Wildlife Protection Act Schedule	Observed/ Reported
1.	Shikra	*Accipter badius*	R	LC	I	Reported
2.	Common Myna	*Acridotheres tristis*	R	LC	IV	Observed
3.	White-breasted Waterhen	*Amaurornis phoenicurus*	R	LC	IV	Reported
4.	Northern Pintail	*Anas acuta*	M	LC	IV	Observed
5.	Common Teal	*Anas crecca*	M	LC	IV	Observed
6.	Indian Spot-billed Duck	*Anas poecilorhyncha*	R	LC	IV	Observed
7.	Bar-headed Goose	*Anser indicus*	M	LC	IV	Observed
8.	Great Egret	*Ardea alba*	R	LC	IV	Observed
9.	Intermediate Egret	*Ardea intermedia*	R	LC	IV	Observed
10.	Indian Pond Heron	*Ardeola grayii*	R	LC	IV	Observed
11.	Spotted Owlet	*Athene brama*	R	LC	IV	Reported
12.	Common Pochard	*Aythya ferina*	R	VU	IV	Observed
13.	Livestock Egret	*Bubulcus ibis*	R	LC	IV	Observed
14.	Red-rumped Swallow	*Cecropis daurica*	R	LC	IV	Observed
15.	Southern Coucal	*Centropus sinensis*	R	LC	IV	Observed
16.	Woolly-necked Stork	*Ciconia episcopus*	R	VU	IV	Observed
17.	Black Stork	*Ciconia nigra*	M	LC	IV	Observed
18.	Common Pigeon	*Columba livia*	R	LC	-	Observed
19.	Indian Robin	*Copsychus fulicatus*	R	LC	IV	Observed
20.	Indian Roller	*Coracias benghalensis*	R	LC	IV	Observed
21.	Jungle Crow	*Corvus macrorhynchos*	R	LC	V	Observed
22.	Black Drongo	*Dicrurus macrocercus*	R	LC	IV	Observed
23.	Little Egret	*Egretta garzetta*	R	LC	IV	Observed
24.	Black-winged Kite	*Elanus caeruleus*	R	LC	I	Reported
25.	Asian Koel	*Eudynamys scolopaceus*	R	LC	IV	Reported
26.	Grey Francolin	*Francolinus pondicerianus*	R	LC	IV	Observed
27.	Eurasian Coot	*Fulica atra*	R	LC	IV	Observed
28.	Chestnut-shouldered Petronia	*Gymnoris xanthocollis*	R	LC	IV	Observed
29.	White-rumped Vulture	*Gyps bengalensis*	R	CR	I	Reported
30.	White-throated Kingfisher	*Halcyon smyrnensis*	R	LC	IV	Observed
31.	Black-winged Stilt	*Himantopus himantopus*	R	LC	IV	Observed
32.	Long-tailed Shrike	*Lanius scach*	R	LC	IV	Observed
33.	Green Bee-eater	*Merops orientalis*	R	LC	-	Observed
34.	Little Cormorant	*Microcarbo niger*	R	LC	IV	Observed
35.	Black Kite	*Milvus migrans*	R	LC	I	Reported
36.	White Wagtail	*Motacilla alba*	R	LC	IV	Observed
37.	Egyptian Vulture	*Neophron percopterus*	R	EN	I	Reported
38.	House Sparrow	*Passer domesticus*	R	LC	IV	Observed
39.	Indian Peafowl	*Pavo cristatus*	R	LC	I	Reported

Sr. No.	Common Name	Scientific Name	Migratory Status	IUCN Red List Status (Online Version 2019-3)	Wildlife Protection Act Schedule	Observed/ Reported
40.	Oriental Honey Buzzard	*Pernis ptilorhynchus*	R	LC	I	Reported
41.	Great Cormorant	*Phalacrocorax carbo*	R	LC	IV	Observed
42.	Indian Cormorant	*Phalacrocorax fuscicollis*	R	LC	IV	Observed
43.	Baya Weaver	*Ploceus philippinus*	R	LC	IV	Observed
44.	Plain Prinia	*Prinia inornata*	R	LC	IV	Observed
45.	Rose-ringed Parakeet	*Psittacula krameri*	R	LC	IV	Observed
46.	Red-vented Bulbul	*Pycnonotus cafer*	R	LC	IV	Observed
47.	Pied Bushchat	*Saxicola caprata*	R	LC	IV	Observed
48.	Common Stonechat	*Saxicola torquatos*	M	LC	IV	Observed
49.	Spotted Dove	*Spilopelia chinensis*	R	LC	IV	Observed
50.	Little Grebe	*Tachybaptus ruficollis*	R	LC	IV	Observed
51.	Ruddy Shelduck	*Tadorna ferruginea*	M	LC	IV	Observed
52.	Black-headed Ibis	*Threskiornis melanocephalus*	R	NT	IV	Observed
53.	Wood Sandpiper	*Tringa glareola*	M	LC	IV	Observed
54.	Common Greenshank	*Tringa nebularia*	R	LC	IV	Observed
55.	Green Sandpiper	*Tringa ochropus*	M	LC	IV	Observed
56.	Large Grey Babbler	*Turdoides malcolmi*	R	LC	IV	Observed
57.	Common Hoopoe	*Upupa epops*	R	LC	IV	Observed
58.	Red-wattled Lapwing	*Vanellus indicus*	R	LC	IV	Observed

Note: LC = Least Concern, NT = Near Threatened, VU = Vulnerable, CR = Critically Endangered, EN = Endangered, M = Migratory, R = Resident, IV = Schedule IV and I = Schedule I
Reported species have been identified in Forest Working Plan for Neemuch District and ebird.org

The photo-documentation of the observed avifauna has been provided in ***Appendix A.***

As the site assessment was undertaken during the winter migratory season, the presence of flocking behavior among avifaunal species was determined. Several species were observed to be flocking along the northern end of the water body adjacent to Unit 3 and therefore adjacent to the site limits of Unit 3 of the Neemuch Site. The species included the Bar-headed Geese (*Anser indicus*), Common Teal (*Anas* crecca), Black Stork (*Ciconia* nigra), Ruddy Shelduck (*Tadorna ferrigunea)* and Intermediate Egret (*Ardea* intermedia). The same flocking behavior was identified in a small watering hole along the way to water body adjacent to Unit 3. Some pictures of flocking behavior have been provided in ***Figure 4.21.***

Figure 4.21 Flocking behaviour in Water body adjacent to Unit 3 and a small pond along the way

The water body may support small congregations[1] of the Vulnerable Woolly-necked Stork (*Ciconia episcopus*) as observed at the time of the site visit. The species is known to be either individual or breeding in pairs[2] but occasionally displays flocking in areas with large water availability. The presence of several individuals in the study area indicates that the species may be consistently flocking to these water bodies year upon year due to the larger water availability.

Mammals

Twelve (12) species were identified in the study area of the Project, of which, six (06) were directly observed during the site visit. All six species observed in the study area are not threatened under the latest IUCN Red List (Version 2019-3) or protected under the Wildlife Protection Act 1972. The reported species have been identified based on discussions with the local community and review of the Forest Working Plan for Neemuch District. The reported species are more commonly found in the Arnea Reserve Forest block and contiguous habitat that is located >1 km north of the proposed Project site. Villagers residing within the Badi and Kawai Village have indicated that the reported species are rarely found in the daytime but occasionally seen at the outskirts of the forest land during early morning and evening hours.

Table 4.34 Mammals observed/reported in the study area

Sr. No.	Common Name	Scientific Name	IUCN Red List Status (Online Version 2019-2)	Wildlife Protection Act Schedule	Observed/ Reported
1.	Nilgai	*Boselaphus tragocamelus*	LC	III	Observed
2.	Jackal	*Canis aureus*	LC	II	Observed
3.	Sambar	*Cervus unicolor*	VU	III	Reported
4.	Five-striped Palm Squirrel	*Funambulus pennanti*	LC	IV	Observed
5.	Indian Grey Mongoose	*Herpestes edwardsii*	LC	II	Observed
6.	Black-naped Hare	*Lepus nigricollis*	LC	IV	Reported
7.	Sloth Bear	*Melursus ursinus*	VU	II	Reported
8.	Leopard	*Panthera pardus*	VU	I	Reported
9.	Indian Flying Fox	*Pteropus giganteus*	LC	V	Observed
10.	Northern Plains Langur	*Semnopithecus entellus*	LC	II	Observed
11.	Wild Boar	*Sus scrofa*	LC	III	Reported
12.	Bengal Fox	*Vulpes bengalensis*	LC	II	Reported

Note: LC = Least Concern, VU = Vulnerable, I = Schedule I, II = Schedule II, III = Schedule III and IV = Schedule IV
Reported species have been identified in the Neemuch Forest Working Plan.

The photo-documentation of the observed mammals has been provided in ***Appendix A.***

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[1] The congregations have not been reported in public domain or across conservation websites (e.g. Bird Life International) to be nationally or regionally significant.
[2] https://www.iucnredlist.org/species/22727255/110064997

A single bat roosting site in Tharod Village (24° 58' 22" N and 75° 12' 58" E) was identified during the community consultations. The bat roosting site is located within a temple with several Banyan Trees (*Ficus benghalensis*) that is approximately 2.2 km south of Unit 1 of Neemuch Project. Approximately 80 individuals were determined to be found in the bat roosting colony as estimated by direct observation and community consultations.

4.3.6 Proximity to areas of ecological significance

The areas of ecological significance encompasses legally protected areas (national park, wildlife sanctuaries, conservation reserves, community reserves, nationally protected wetlands and biosphere reserves) as well as internationally recognized biodiversity areas (Important Bird and Biodiversity Areas, Alliance for Zero Extinction Sites and UNESCO World Heritage sites). The closest areas of ecological significance have been provided below:

- **Legally Protected Areas**: the closest legally protected area is Gandhi Sagar Wildlife Sanctuary, [IUCN Management Category IV] which is located ~ 50 km southeast of Unit 3. The sanctuary is contiguous with Rana Pratap Sagar Dam, which is located ~32 km southeast of Unit 3. The Gandhi Sagar Wildlife Sanctuary is also declared an Important Bird Area (IBA) and supports significant concentrations of waterbirds (IBA Category A4iii).
- **Internationally Recognized Biodiversity Areas**: The closest internationally recognized biodiversity area is Gandhi Sagar Wildlife Sanctuary and reservoir. Unlike the wildlife sanctuary, the Gandhi Sagar IBA includes the Rana Pratap Sagar Dam and is located ~ 32 km southeast of Unit 3.
- The Rana Pratap and Gandhi Sagar Dams are large water bodies located > 30 km from the Project site and there is no habitat contiguity from the Project site to the dams. Two rivers namely Menal River located 7 km north of the Project site and Brahmi River located 1.8 km south of the Project site do however drain into the Rana Pratap Dam. There appears to be some spillover of bird congregations from the dam reservoirs to the larger water bodies in the study area, as has been observed with the flocking behaviour in water body adjacent to Unit 3 (See ***Figure 4.21***).

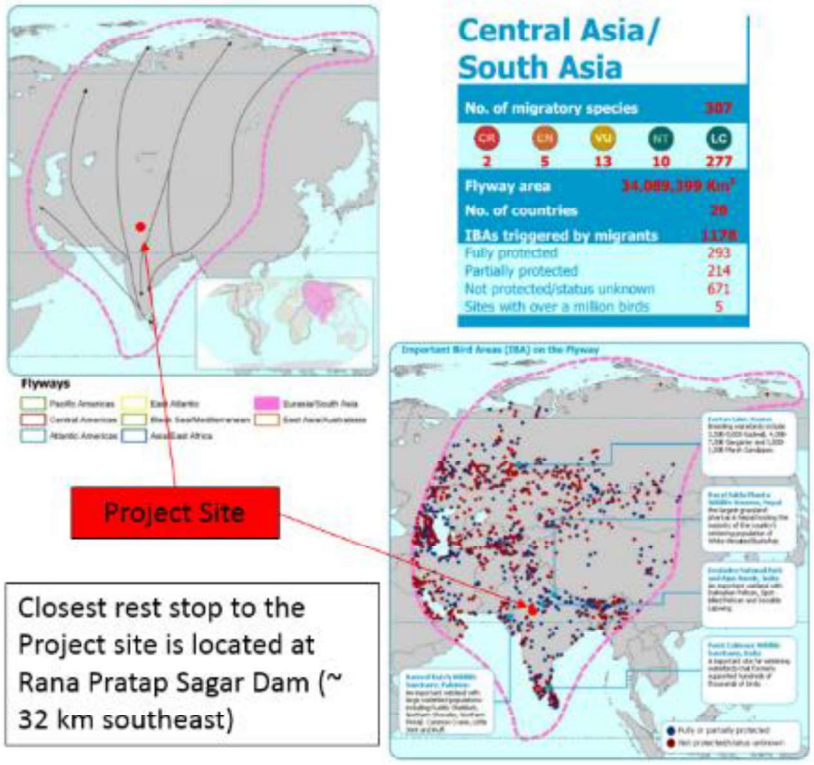
4.3.7 Migratory Pathways

India lies along the Central Asian Flyway, a global migratory pathway that connects the Palearctic (Europe and Northern Asia) to the Indian subcontinent. The birds that utilize this flyway, travel south to the Indian subcontinent between October-early December depending on the end of the monsoon season and remain in the country till February-March. In the year 2019, the seasons were slightly delayed and therefore the country witnessed rains till late September, potentially delaying the winter migrations by 2-3 weeks. The site visit from 19-21 December therefore represented the early to peak migratory season transition period instead of the peak migratory season.)

Bird species travelling along the Central Asian Flyway, utilize several large water bodies across India as congregation sites or rest stops. The number of bird species found during the study had approximately 20% migratory species including congregations of the migratory Bar-headed Geese (*Anser indicus)* and Common Teal (*Anas crecca*).

The details of the Central Asian Flyway and closest rest stop has been provided in ***Figure 4.22.***

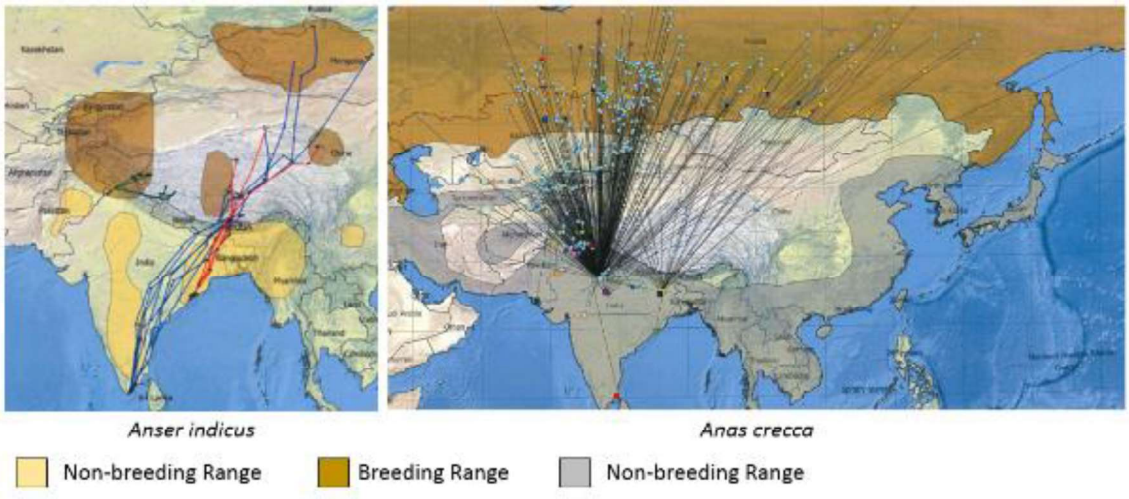
Figure 4.22 Central Asian Flyway



Source: http://datazone.birdlife.org/userfiles/file/sowb/flyways/7_Central_Asia_Factsheet.pdf

The migratory pathways of the two species – Bar-headed Geese and Common Teal that is found to be congregating near the Project site has been provided in ***Figure 4.23.*** The figure indicates that both species have a non-breeding range that seems to overlap with the Project site. The migratory pathways of both species appears to connect to Gandhi Sagar Dam.

Figure 4.23 Migratory pathways of Anser indicus and Anas crecca



Source: Balachandran, S., Katti, T. and Manakadan, R. 2018. Indian Bird Migration Atlas. BNHS India. Oxford University Press. Pp 215.

4.3.8 Applicability of natural, modified and critical habitat

As indicated in ***Table 4.32, Table 4.33*** and ***Table 4.34***, no species of conservation importance (threatened under the latest IUCN Red List) have been observed in the study area with the exception

of the Vulnerable Common Pochard and Vulnerable Woolly-necked Stork. The terrestrial habitat largely consists of agricultural and scrubland, both of which have signs of development and are not supporting species of conservation value. The Project site and 5 km study area is largely modified habitat but no species of significant biodiversity value have been identified and therefore IFC PS 6 provision of conserving modified habitat of significant biodiversity value is not applicable for the Project site. The Project site and 5 km study area has natural habitat only within the Arnea Reserve Forest Block located ~ 300m north of the proposed site. This forest block is not being directly impacted by the siting of Project components and associated facilities. There might be potential for indirect impact such as human-wildlife conflict, which has been specifically discussed in the impact assessment section (**Section 6.3**). As there will be no loss of natural habitat, the provisions of conserving natural habitat under IFC PS 6 is not applicable for the Project. There are no species classified as critically endangered or endangered, no determination of restricted-range species identified and no significant congregations or migration rest stops in the area, the criterion 1, 2 and 3 of critical habitat has not been determined to be applicable for any of the terrestrial habitat in the Project site.

Two exceptions to the above conclusion were further determined – presence of migratory and congregatory species in the water body near Unit 3 and potential critical habitat applicability due to presence of vulture species. These exceptions have been discussed in subsequent paragraphs.

The water body near Unit 3 does support migratory and congregatory bird behaviour. The ESIA was undertaken during peak migratory season (December) where migratory bird activity is supposed to be at its highest. Moreover, the site visit was also fortunately undertaken after a very good rainfall season that ensured there was sufficient water availability and possibly food resources for aquatic bird species. There is a likely chance that the numbers will vary year upon year depending on water and food availability, and it is highly probable that years with wek monsoon will support less birds during winter migratory season.

The site however during peak migratory season, followed by a good monsoon, does not support bird congregations approaching the threshold limits[1] for Critical Habitat criterion 3, as the maximum number of individuals of any one species observed during the site assessment was ~50 (Bar-headed Geese). Further based on discussions with stakeholders there is no indication that the flocking will approach the congregation numbers defined by Bird LIfe International for IBAs or IFC PS 6 definition for critical habitats.

Vulture species including the Endangered Egyptian Vulture, Critically Endangered Red-headed Vulture and Critically Endangered White-rumped Vulture has been identified from the nearby forest patches in Arnea Reserve Forest block. Vultures are wide-ranging species and therefore the critical habitat assessment should consider areas of aggregation, recruitment or specific habitat features important to the species [GN 59, 2019].

The applicability of critical habitat for vultures has been separately assessed for the Project site (covered in this ESIA) and the greater landscape incorporating the Arnea Reserve Forest block and adjacent areas (covered in the transmission line ESIA that is separately commissioned). The reason this has been separated is because there is a change in habitat type from the larger forest block with Menal River to the mosaic of scrub/agricultural land in the Project site and immediate surroundings. The habitat in and around the Project site is also modified due to anthropogenic movement and cultivation and therefore may support a lower diversity of species than the natural habitat found in the Arnea Reserve Forest.

Based on IFC's guidance for vultures in potential critical habitat areas, the Project site and immediate surroundings does not seem to meet the requirements to trigger IFC PS 6 critical habitat criterion 1 as shown below:

- Literature review as well a rapid ESIA does not provide any evidence of breeding colonies, nesting sites or roosting sites within the Project site or immediately adjacent areas;

[1] The threshold limits for migratory and congregatory species is (i) areas known to sustain on a cyclical or regular basis, ≥ 1% of global population of a species and/or (ii) areas that support ≥ 10% of the global population of species during environmental stress.

- As indicated in ***Section 4.3.5***, there is significant availability of food due to the number of livestock carcasses found across the study area but present survey did not record any vulture activity in the study area; and
- The Project site does not fall within close proximity to any vulture 'restaurants' such that regular sightings of the species may be considered.

Due to the absence of known vulture breeding, foraging, nesting and roosting sites in the Project site, the Project site has not been considered as critical habitat. The above analysis has been undertaken for the Solar Park and proposed access roads only. The Arnea Reserve Forest block however, is located only 400m and the forest block is known for occasional sightings of the species. The Project will need to maintain strict vigilance (e.g. livestock carcass disposal or open waste disposal) to ensure that the vultures occasionally visiting the forest block are not travelling further south to the Project site in search of food. The Project site would also need to be vigilant because the forest block in Arnea may see a higher number of vultures if there is recovery of the population of the species in the surrounding areas.

Based on secondary data, it appears that the larger landscape that includes the Arnea Reserve Forest block may meet the requirements of critical habitat defined in IFC PS 6 because of presence of three vulture species – White-rumped Vulture, Red-headed Vulture and Egyptian Vulture. The number of individuals and applicability of critical habitat will be undertaken after a more detailed biodiversity study that is being undertaken for the External Transmission Line as part of a separate ESIA report.

4.4 Social Environment

The purpose of this section is to provide a general socio-economic profile of the area and the issues relevant to the project area. This section provides an understanding of the administrative set up of the district, the demographic profile of the villages in the study area, the social groups present, the land use pattern in the area, the livelihood profile of the community, common property resources and their use, etc. It also highlights the social and physical infrastructure available to support education, health infrastructure, the water supply for irrigation and drinking purposes, sanitation facilities and connectivity.

The social baseline for the project area is based on official data and other secondary information available in the public domain, consultations in the field with key informants and with the communities through focus group discussions. It also includes visual observations made during the site survey. ***Section 1.3*** provides an understanding of the methodology followed for the social baseline data collection.

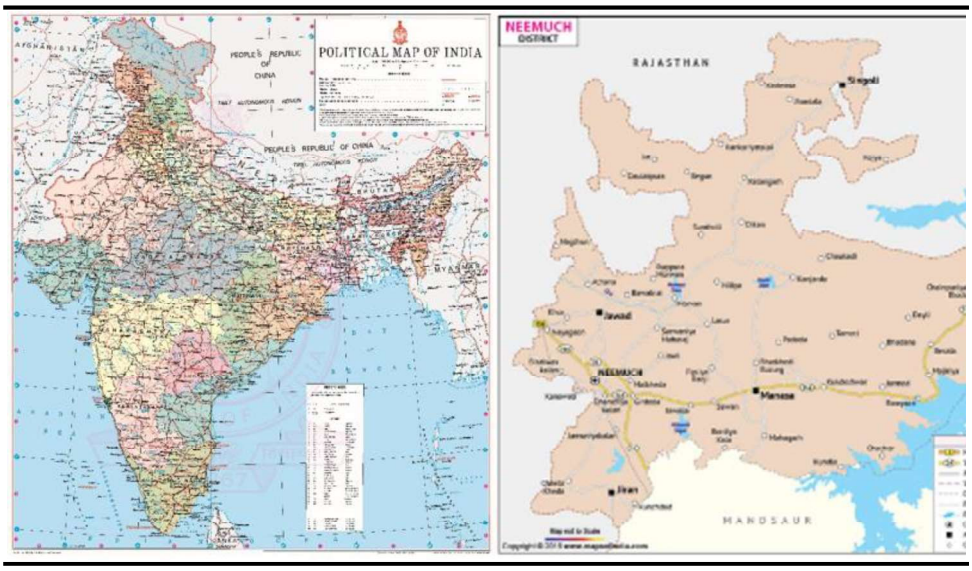
4.4.1 Socio Economic Setting

The project is situated in Singoli tehsil of Neemuch district in Madhya Pradesh. The sections below provide a broad overview and socioeconomic profile of these administrative units.

4.4.1.1 State Profile: Madhya Pradesh

Madhya Pradesh, as the name suggests, is located in the centre of the country and is the second largest state in India (in terms of geographical area). It shares a boundary with Rajasthan in north-west, Gujarat in south-west, Maharashtra in south, Chhattisgarh in south-east and Uttar Pradesh in north east. The state administers 3,08,252 sq. km. of area which is 9.37 percent of the total geographical area of the country and its accounts for 6percent population of India, according to the provisional data of Census 2011. The capital of the state is Bhopal.

Figure 4.24 Madhya Pradesh and Neemuch District



Source: Survey of India

The state of Madhya Pradesh is divided into 51 districts, 367 Tehsils, 313 development Blocks and 52,557 populated villages.

The state comprises of a population of 72,626,809 individuals, who pre-dominantly live in rural areas and make up 72.4 percent of the state's total population. The decadal population growth has reduced from 24.3 percent during the period 1991-2001 to 20.3 percent during 2001 to 2011. The sex ratio in the state is 931, which has increased from 920 in the past decade; however it is still lower than the sex ratio of India, being 940 females per 1000 males. The population density of India is 382 persons/sq. km. while that of Madhya Pradesh is 236 persons/sq. km. The state has the second largest geographical area, of any state in the country.

Table 4.35 Madhya Pradesh Demographic Profile

Attribute	Number
Area (sq. km)	3,08,252 (9.37% of India)
Total population	7,26,26,809 (6% of India)
Males	3,76,12,306 (6.03% of India)
Females	3,50,14,503 (5.97% of India)
Sex ratio	931
Percentage of rural Population	72.4
Percentage of urban population	25.6
Population density	236
Percentage of SC population	15.6
Percentage of ST population	21.1
Total literacy rate	69.3
Male Literacy rate	78.7
Female Literacy Rate	54.5
Rural Literacy	63.9

Source: Census of India, 2011

The literacy rate of Madhya Pradesh is nearly 70percent (of which the rural literacy stands at 63.94percent) which is lower than that of the country, at 74.04percent. The male literacy rate is relatively higher, at 78.73percent while the female literacy rate is 54.49percent, which is quite low when compared to the national female literacy rate of 65.46percent.

Madhya Pradesh ranks 1st amongst all States and Union Territories with regards to Scheduled Tribe (ST) population and 12th in terms of Scheduled Caste (SC) population. The proportion of ST population in the state is 21.1percent and SC population is 15.6percent

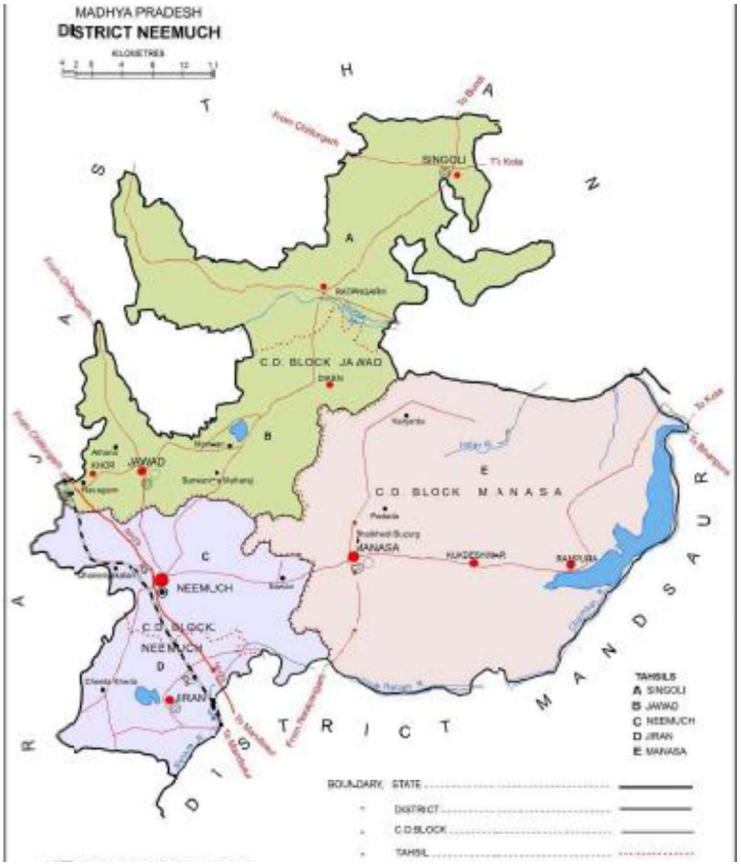
4.4.1.2 District Profile: Neemuch

Neemuch district is located in north- west Madhya Pradesh and lies between 24◦15 to 25◦02 North latitude and 74◦ 43 to 75◦ 37 East longitude. Neemuch district shares a boundary with Mandsaur towards the East and it is bound by the state of Rajasthan towards the North.

The total area of the district is 3,875 km^2 and it is comprised of 804 inhabited villages. There are a total of 12 towns in the district which includes one municipal corporation i.e. Neemuch, 11 Nagar Panchayats i.e. Athaana, Diken, Jawad, Jiran, Kukreswar, Manasa, Nayagaon, Rampura, Ratangarh, Sarwaniya Maharaj and Singoli.[1]

Figure 4.25 helps in understanding the various sub-divisions of the district.

Figure 4.25 Neemuch District Divisions



Source: Neemuch District Census Handbook, 2011

The population density of Neemuch district is relatively lower than that of Madhya Pradesh, as most of the district is rural, with only Neemuch and Khod as urban areas. The Scheduled Caste people form 13.46 percent of the total population in Neemuch, which is marginally lower than the state and the Scheduled Tribe population in Neemuch (8.6 percent) is significantly lower as compared with the state (21.1 percent). The sex ratio of the district (954 females per 1000 males) is slightly higher than the state figure of 931 and the country's sex ratio of 940 females per thousand males. However, the child sex ratio in 2011 has reduced to 927 girls per 1000 boys from 932 girls per 1000 boys as per 2001 census data.

[1] https://neemuch.nic.in/en/about-district/

The status of literacy in the district also reflects a slightly better scenario than that of the state, and the female literacy rate is also marginally better at 57.13 percent against the state figures 54.49 percent respectively. Rural population forms the majority in the district, with 79 percent of the population living in the villages.

4.4.1.3 Tehsil Profile: Singoli, Jiran, Manasa and Jawad

The Project Area of Influence includes villages spanning four tehsils of Neemuch district i.e. Singoli, Jiran, Manasa and Jawad. These four tehsils comprise of nearly 70 percent of the population of Neemuch district. In terms of SC population, Jiran tehsil has the maximum share at 15.6 percent, while Singoli tehsil has the lowest at 11.3 percent; the other two tehsils have nearly equivalent proportions of SC population at around 12.5 percent.

Singoli tehsil has the highest ST population at 18.8%, while Jiran tehsil has the lowest ST population at 6.3 percent. In terms of sex ratio, Jiran tehsil exhibits a relatively higher Sex Ratio at 977, while Jiran tehsil registers the lowest sex ratio at 958. All four tehsils have a higher Sex Ratio than Neemuch district figures.

Table 4.36 Demographic Profile of Tehsils

Attribute	Neemuch District	Singoli Tehsil	Jiran Tehsil	Manasa Tehsil	Jawad Tehsil
Population	8,26,067	1,05,288	72829	267541	1,40,890
% of District Population	N/A	12.7	8.8	32.4	17.1
% SC population	13.46	11.3	15.6	12.5	12.7
% ST population	8.65	18.8	6.3	7.3	11.2
Sex Ratio	954	960	977	972	958
% Total literacy rate	70.8	64.5	70.8	66.2	71.2
% Female literacy rate	57.13	48.8	55.7	51.5	56.6

Source: Census of India, 2011

4.4.2 Study Area

- The Study Area for the current assessment comprises of the area identified for the project as well as villages which might be impacted directly or indirectly by the project. The use of term "Study Area" in the social baseline and impacts sections would comprise consolidated data from Project Villages and Area of Influence. It differs slightly from the manner Study Area is defined for the Environment and Ecology sections.

The key terms used for sub-categorization of the Study Area are:

- Project footprint – Project Footprint comprises of the area within the proposed boundary of Neemuch Solar Park, (this has not been finalised at the time of writing this report);
- Project Villages – The three villages of Badi, Kawai, Bardawada from where the land for the project is being identified are referred to as "Project Villages"
- Area of influence - Area of Influence comprises of the villages falling within the 5 km radius of the project, apart from Project Villages, that may be directly or indirectly affected.

Table 4.37 Land Details for the Solar Park

Land Category	Unit 1 (ha.)		Unit 2-(Ha.)		Unit 3 (Ha.)	Total land (Hectare)
	Bardawada	Kawai	Kawai	Badi	Badi	
Government Land (both NRED allotted & identified)	201.8	89.6	156. 1	163.2	351.7	962. 5
Private Land	5.1	4.2	0	1.7	10.4	21.4
Patta Land	50.7	0	22.4	3.6	5	81.7

Land Category	Unit 1 (ha.)	Unit 2-(Ha.)	Unit 3 (Ha.)	Total land (Hectare)
Sum	**351.5**	**347**	**367**	**1065.7**

Source: Land Data provided by RUMSL, 3rd June 2020

While the project footprint is present only in Singoli tehsil, the Area of Influence spreads across villages spanning four tehsils of Neemuch district i.e. Singoli, Jiran, Manasa and Jawad. In the Study Area, the concentration of villages is higher in Singoli tehsil. It may be noted that the villages Singhpur, Haripur Warla and Nadi that are depicted in the map but could not be located in the Census data of 2011.

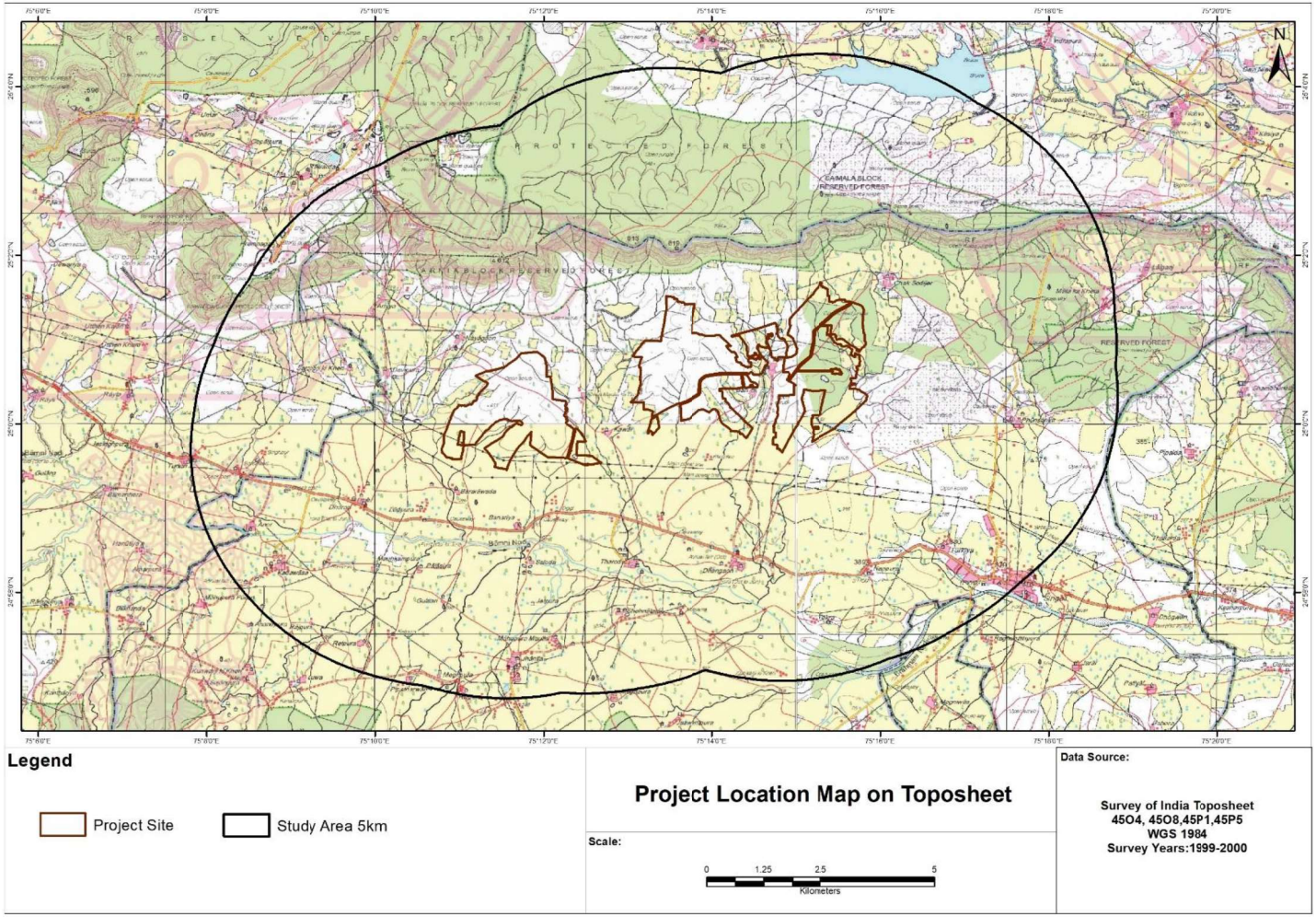
The ***Figure 4.26*** illustrates the Study Area, which shows the villages present within 5 km radius of the project site. The villages lying in the Project Footprint Area and AoI are also listed below in ***Table 4.38.***

Table 4.38 Project Area and Surrounding Area Villages

S. No.	Project villages	S. No.	Area of Influence villages
1.	Badi	1.	Aned
2.	Bardawada	2.	Anoppura
3.	Kawai	3.	Arnya
		4.	Bamni
		5.	Banediya
		6.	Chaksodijhar
		7.	Devipura Abad
		8.	Dhangaon
		9.	Dhardi
		10.	Funsariya
		11.	Gulsari
		12.	Haripura
		13.	Jetpura
		14.	Jhantala
		15.	Kadwasa
		16.	Keri
		17.	Kewalpura
		18.	Ladpura
		19.	Mahupura Molki
		20.	Mendki
		21.	Mokhampura
		22.	Motiyarda
		23.	Nayagaon
		24.	Palasiya
		25.	Rajpura
		26.	Rastpura
		27.	Saloda
		28.	Sawalpura
		29.	Sehnatalai
		30.	Thadod
		31.	Tokra
		32.	Turkiya

Source: Google Earth imagery corroborated with Toposheet

Figure 4.26 Map depicting villages in the Study Area



4.4.3 Demographic Profile of Study Area

The project footprint falls in three villages (known as "Project Villages" while the AoI comprises 32 villages, as depicted in ***Table 4.39.*** The Project Villages comprise of 440 households with a population of 2,047 individuals. The average size of the households is 5 in the Study Area. Kawai village has the highest sex ratio amongst the Project villages. The AoI has a sex ratio of 950 females per 1000 males, which is nearly equivalent to the district figure and better than the state figure of 931.

Table 4.39 Demographic Profile of Study Area

Village	No of HHs	Population	Avg HH size	Sex Ratio	% SC	% ST	% Lit	% F Lit
Project Villages								
Badi	257	1121	4	884	10.8%	22.2%	46.2%	31.9%
Bardawada	77	399	5	928	3.5%	5.5%	70.7%	49.4%
Kawai	106	527	5	974	2.5%	19.9%	58.0%	42.9%
Total	**440**	**2047**	**5**	**915**	**7.2%**	**18.4%**	**54.2%**	**38.5%**
Area of Influence								
AoI Total	**6023**	**28378**	**5**	**950**	**15.0%**	**5.7%**	**68.2%**	**51.1%**
Study Area Total	**6463**	**30425**	**5**	**948**	**14.5%**	**6.5%**	**67.3%**	**50.2%**

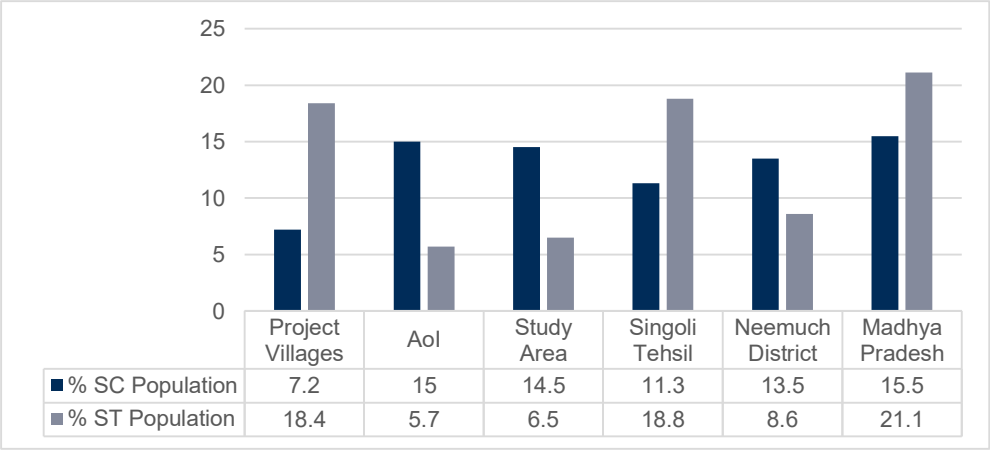
Source: Census of India, 2011

The total literacy in the Study Area is 67.3 percent whereas the female literacy rate by comparison is quite low. Within the Study Area, the female literacy is higher in the AoI than the Project Villages. The proportion of SC population is lower in the Project Villages as compared to the AoI figures, while the proportion of ST population is higher in the Project Villages as compared to the AoI figure, indicating presence of higher numbers of ST households in the Project villages.

4.4.4 Social Stratification

The entire population in the Study Area falls in the rural category. The villages comprise majorly of Dhakad, Gujjar and Rajput communities and households belonging to Bhil (ST), Balai and OBC groups.

Figure 4.27 Proportion of SC/ST Population in the villages of Study Area vis-à-vis Tehsil/ District



Source: Census of India, 2011

4.4.4.1 Scheduled Caste Population

The major sub castes of SC population inhabiting the area are Meghwal, Chamar, Balai, Suthar, Nai, etc. The livelihood pattern of SC population does not significantly differ from the General community; however, they reportedly possess smaller landholdings and their dependence is higher on agriculture labour and wage labour due to lack of access to or limited landholdings. The SC population spread across the Project villages comprise 5-7 households in Kawai and Bardawada villages and about 30 households in Badi villages, based on community consultations held in November 2019.

4.4.4.2 Scheduled Tribe Population

While Madhya Pradesh has a high proportion of ST population, the presence of ST population is relatively low in the district, and the Study Area; however the Project villages, from where the land for the project has been identified, comprises 18.4 percent ST population, based on the 2011 census data. The ST groups largely consists of people from the Bhil tribe, comprising 5-6 households in Bardawada village, approximately 20 households in Kawai and approximately 45 households in Badi village, as reported during community consultations held in November 2019.

There are two prominent groups of Bhil community present in the area - one resident group (living within villages) and one group of Bhil that migrated to the area and live in a hamlet known as Mama Basti. Mama Basti is a settlement on the boundary of three villages (Dhangoan, Badi and Funsariya) near the Dhandgoan ka Talab. The community has migrated from Jhabua District, around 35 to 40 years back.

There are in total 30 houses with 30 to 35 families living in Mama Basti. The Bhils have relatively smaller land holdings, approximately 2-4 *Bigha* each (approximately 0.4- 0.5 hectare) and there are some landless Bhil households as well; however, there might be encroachments done by some families on government land- this will be confirmed during the RAP survey. The migrant community group has reportedly received houses under the Indira Awas Yojana.

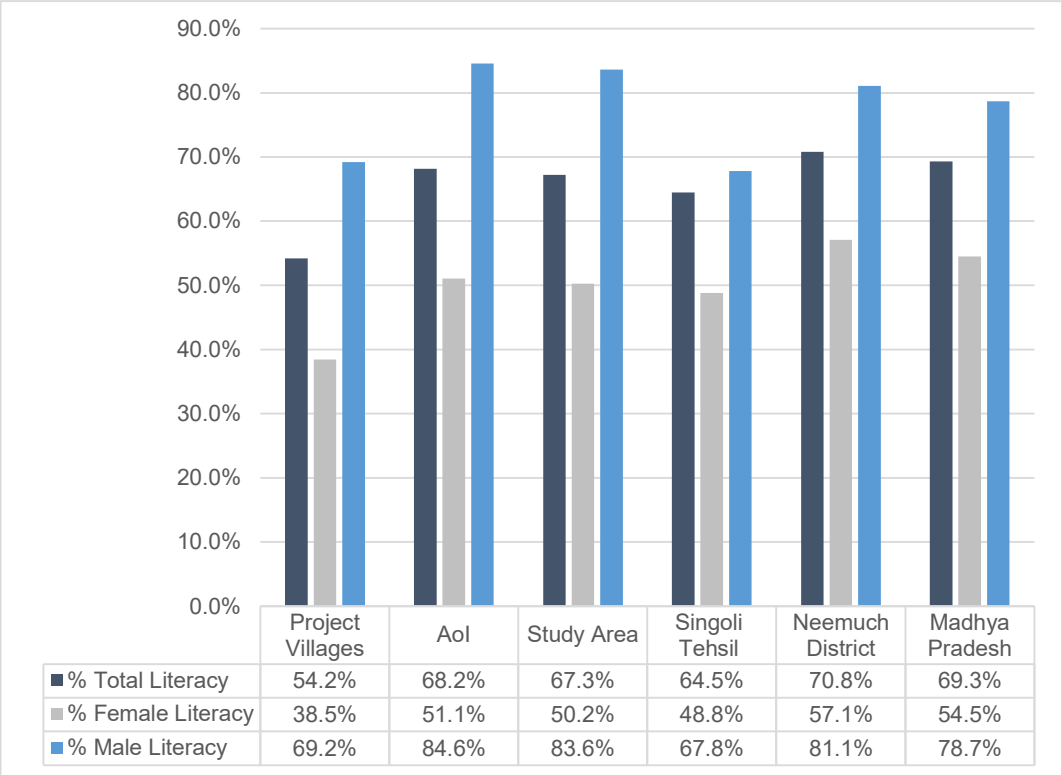
Box 4.1 Bhil Tribe

The main occupation of the Bhil tribe is agriculture; however, the land holdings amongst the community were reported to be slightly lower (2-3 Bigha average) than that of the general community. The tribe has access to the mainstream education, health and justice system, participates in religious festivals such as Diwali, Holi and Raksha Bandhan and is part of the Gram Panchayat of the village. Nevertheless, the tribe has their own traditional leadership in the form of group elders, who play an important role in decision making and conflict resolution

4.4.5 Literacy and Education

The total literacy rate and female literacy rate in the Project villages is the lowest as compared to the AoI, Study Area, Tehsil and district figures. The female literacy rates in the AoI are relatively higher and are comparable to the district and state figures, while in the Project villages, the female literacy rates are quite low.

Figure 4.28 Comparative Overview of the Literacy Rate across Study Area, District and State



	Project Villages	AoI	Study Area	Singoli Tehsil	Neemuch District	Madhya Pradesh
% Total Literacy	54.2%	68.2%	67.3%	64.5%	70.8%	69.3%
% Female Literacy	38.5%	51.1%	50.2%	48.8%	57.1%	54.5%
% Male Literacy	69.2%	84.6%	83.6%	67.8%	81.1%	78.7%

Source: Census of India, 2011

In recent years a key change is that reportedly all girls in the Project villages attend schools; however, dropouts take place after primary or middle school level, if the girls have to travel to other villages for continuing education, due to safety concerns and lack of commutation facilities. Additionally, some communities are averse to sending adolescent girls to co-educational schools and prefer all-girls schools.

The boys usually complete school education and those belonging to financially secure families go on to complete graduate courses in colleges or join technical courses, while others are pulled into farm based work to support their respective families economically. The proportion of boys, compared to girls, completing education beyond 10th and 12th standards is lesser as the people reportedly do not get gainful employment after attaining higher education. The cost of higher studies, with additional costs of commuting (in several cases), is perceived as a cost with inadequate returns, rather than an investment. Thus, the youth eventually join their family in agriculture and related work. There are reportedly no ITIs in and around Singoli tehsil and those opting for technical courses have to move to other towns/ cities with training options like Neemuch and Mandsaur.

4.4.6 Land ownership and use

This section presents an overview of the ownership and use of land in the project area, based on the Census 2011; however it does not include recent aerial imagery based updates, which are underway but not completed at the time of writing this. The area has an agrarian economy and hence the dependence on land, as a resource, is high. The table for land utilization reiterates the heavy dependence of people on agriculture, making it one of the primary sources of their livelihood.

4.4.6.1 Land Category Breakup

Table 4.40 Land Use Break Up in the Study Area

Villages	Total Area (in ha)	Net Area Sown[1]	Forest Area	Area under Non-Agricultural Uses	Barren & Un-cultivable Land	Permanent Pastures & Other Grazing Land[2]	Land Under Miscellaneous Tree Crops etc. Area	Culturable Waste Land[3]	Current Fallows[4]	FallowLand other than Current Fallows Area[5]
Project Villages										
Badi	1300.4	294.6	111.0	34.9	651.6	74.7	92.3	41.3	0.0	0.0
Bardawada	565.1	181.1	0.0	14.9	295.8	8.7	0.0	19.7	41.6	3.3
Kawai	826.5	145.9	100.2	38.0	415.0	41.2	31.2	52.2	0.0	2.8
Total	**2692.0**	**621.5**	**211.3**	**87.9**	**1362.4**	**124.6**	**123.5**	**113.2**	**41.6**	**6.1**
AoI Total	**13959.0**	**6953.8**	**1635.9**	**1144.1**	**2196.4**	**516.7**	**501.1**	**771.4**	**105.0**	**81.5**
Study Area Total	**16,650.95**	**7,575.34**	**1847.2**	**1232.0**	**3,558.81**	**641.36**	**624.6**	**884.6**	**146.6**	**87.6**

Source: Census of India, 2011

*The definitions for various categories of land are used from *http://mospi.nic.in/45-nine-fold-classification-land-use.*

The ***Table 4.40*** denotes that approximately 50.6 percent of the land area in the Project Villages is categorised barren and uncultivable land, 23.1 percent is net sown area, out of which 63 percent is unirrigated land and 37 percent is irrigated land. The Project villages have 7.8 percent of the total land area as forest land, 3.3 percent area under non-agricultural use and 4.2 percent as culturable waste land. Additionally, 4.6 percent is land comprising of miscellaneous tree crops, and 4.6% are permanent pastures and other grazing land. Current fallows area and fallow lands other than current fallows comprise of only 1.52 percent and 0.2 percent respectively. This data is a decade old and more recent estimates are currently not available. It is understood from consultations with local communities that with the availability of reliable electricity in recent years, more people have invested in installing bore wells and have brought more land into agricultural use. This includes privately owned land, patta land, and even government land (by squatting or encroachment). This land that is now

[1] Net sown area is the total area sown with crops and orchards, counting area sown more than once in the same year, only once.

[2] All grazing lands whether they are permanent pastures and meadows

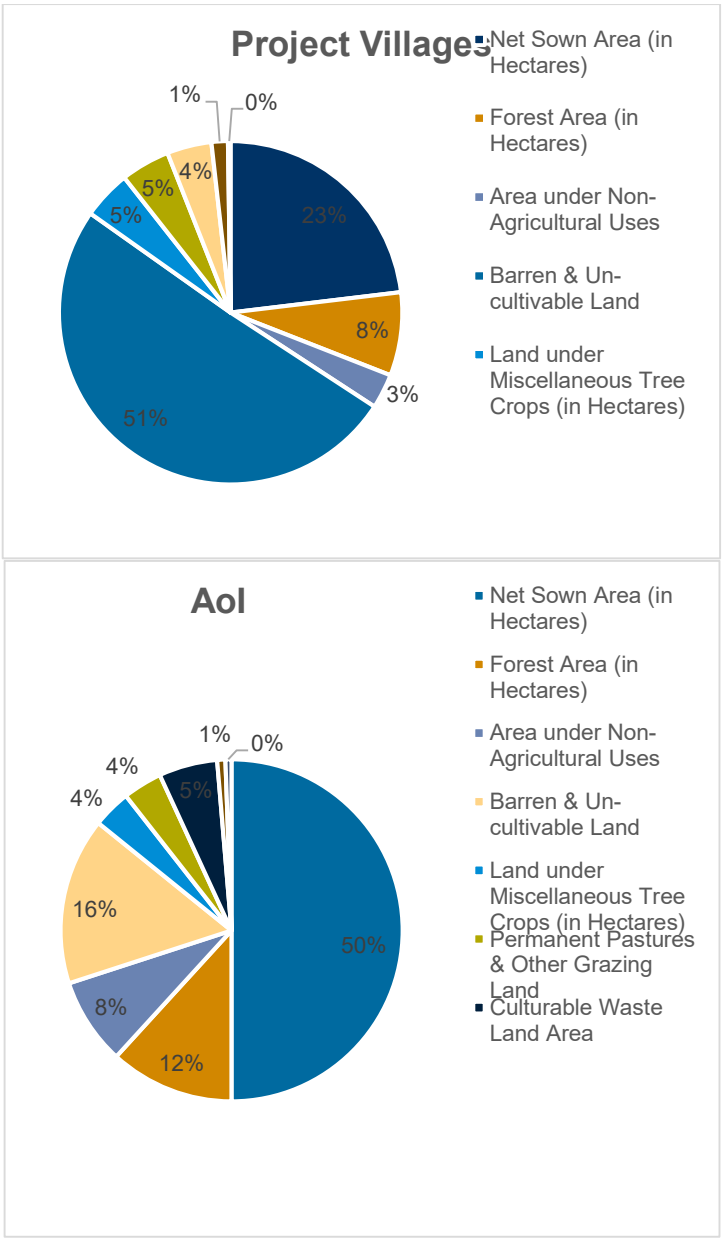
[3] All lands available for cultivation whether not taken up for cultivation or taken up for cultivation once but not cultivated during the current year and the last five years or more in succession for one reason or the other. Such lands may be either wholly or partly covered with shrubs and jungles, which are not put to any use. Land once cultivated but not cultivated for five years in succession would also be included in this category

[4] Current fallow area is the Cropped area which are kept fallow during the current year but was cultivated in the previous year. For example with any seeding area is not cropped in the same year, it may be treated as current fallow.

[5] Fallow land other than current fallow land are lands, which are taken up for cultivation but are temporarily out of cultivation for a period of not less than one year and not more than five years , i.e., equal or greater than one year but less than or equal to five years. The reasons for keeping such lands fallow may be one or more of the following:
i) Poverty of the cultivator
ii) Inadequate supply of water
iii) Malarial climate
iv) Silting of canals and rivers and
v) Un - remunerative nature of farming

being used for agriculture, may be drawn from the land use previously categorised barren, uncultivable and culturable waste as noted below.

Figure 4.29 Proportion of Land Use in Study Area



Source: Census of India, 2011

In the AoI, approximately 50 percent of the land is categorised as net sown area, out of which 48 percent is unirrigated land that is rain fed and 52 percent is irrigated land, with some form of irrigation arrangements. Approximately 15.8 percent of total land area is barren and uncultivable land, 11.8 percent is forest area, 8.2 percent land is under non-agricultural uses, 5.5 percent is culturable wasteland, 3.6 percent is land comprising of miscellaneous tree crops, and 3.7 percent comprise of permanent pastures and other grazing land. Fallow lands other than current fallows comprise of 0.8 percent and 0.6 percent respectively in the AoI.

4.4.6.2 Land Ownership and Occupation (Squatting/Encroachment)

Community consultations suggest that grazing, agriculture and firewood collection are undertaken as year round activities, growing more intense in certain months Firewood collection is done after monsoon in the months of July to January. Agriculture is usually done in the Kharif season (to utilise the monsoon rain) and open grazing is year round.

According to discussions with the local community, most households own agricultural land; in the form of private land parcels or government allotted patta land (these land types are defined in ***Section 2.5.1***). As per the 2011 Census data, all households have at least 0.1-0.2 ha (1-2 bigha) of agricultural land and majority of households in the project villages fall in the category of Marginal Farmers. The household belonging to Dhakad community largely fall in the category of Small to Semi-Medium farmers as per Census definition[1], having landholdings ranging from 10-25 Bigha (1 Ha – 2.5 Ha). Those households who were landless, especially belonging to SC and ST categories, were, over the past decades, allotted patta land parcels (typically of 1 ha each) by the government. The last patta land allotment was done in 2001. Most of the patta land parcels have been with the patta landholders for more than 20 years. There are however, a few households which remain landless. This is mainly due to the reasons stated below:

- The households have split since the last allocation without dividing the existing land holdings and thus there are certain new households who do not own land;
- There were landless households who were not present in the village at the time of the patta allocation and thus did not receive any pattas from the government;
- Some households that were allotted Patta land have sold them, without the official paperwork, as the sale of Patta land is not allowed as per legal provisions. So, the land remains in the name of original patta holders on papers, but they in reality have no or much smaller portion of land.
- The patta land in the project footprint is used for agricultural purposes and grazing (in non-agricultural season). Several patta holders are reported to be SC and ST category. According to the discussion with the community, at the time of patta allotment, the land was barren, with poor top soil and was thus was not usable for cultivation. However, the patta holders undertook significant land improvements, including clearing the land of stones and bringing, or purchasing and adding top soil from outside. Some have even installed bore wells for irrigation while others made small improvements like installing stone slab fencing to keep animals out. These stone slabs are quarried and available locally and purchased for boundary demarcation. Water is generally available at 400-500 ft depth and Borewell construction takes up to INR 60,000 even if there is no water availability. In case water is found in the borewell, the cost of construction goes up to INR 1.5 lacs, which includes the cost of installing the motorised pump. There are instances

[1] Agriculture Census 2010-11: Schedules and Instructions for Land Record

S. No	Size Class (ha.)	Farmer Category
1	Below 0.50 ha. 01	Marginal Farmers
2	0.50 ha. – 0.99 ha. 02	
3	1.00 ha. – 1.99 ha. 03	Small Farmers
4	2.00 ha. – 2.99 ha. 04	Semi Medium
5	3.00 ha. – 3.99 ha. 05	
6	4.00 ha. – 4.99 ha. 06	Medium
7	5.00 ha. – 7.49 ha. 07	
8	7.50 ha. – 9.99 ha. 08	
9	10.00 ha. – 19.99 ha. 09	Large Farmers

of borewells running dry during some summer months however, the water availability is restored to varying extents in the area after the monsoon.

- The private land in the project footprint is used for agricultural and grazing purposes (in non-agricultural season, as with patta land. The trend of using bore wells and irrigation channels for improving agricultural productivity of the land has also been noted on private land.

Use of Government Land: Grazing

- The Government land in the Project Footprint is used for livestock grazing, fire wood collection and stone quarrying (very few licenced quarries remain currently, as per November 2019 consultations). Livestock ownership in the Project villages is higher among the Gurjar community (cows and buffaloes), while Bhil community is reported to possess a higher number of goats. The livestock census data from 2019 is presented in the table below.

Table 4.41 Livestock Census data for project villages

Villages in the Unit	Livestock	Buffalo	Sheep	Goat	Total
Bardawada	262	237	0	197	696
Kawai	501	150	0	232	883
Badi	1433	343	0	825	2601
Project villages Total	**2196**	**730**	**0**	**1254**	**4180**

Source: Livestock Census 2019

- In Badi village, the number of livestock owned by the residents is about 2600, while the livestock holdings in Bardawada and Kawai villages are relatively lower. During consultations, the residents of Badi explained that the Gurjar community (present in higher numbers in this village) are proficient in livestock rearing and invest their surpluses in buying more milch cows. Livestock grazing takes place as open grazing on government land and the men of the household are responsible for livestock grazing while the women are responsible for domestic caretaking responsibilities of the livestock, comprising stall feeding, cleaning of livestock and their sheds, making dung cakes, milking, etc. The men transport the milk for sale.
- The availability of grazing land near the project villages is reported to be limited, as reported during the community consultations, since the number of livestock is more and the available area for grazing has reduced in recent years due to squatting/ encroachment and agricultural activities, also on government land. Government land occupied for agriculture has tended to be in areas that were also good grazing areas and are now unavailable. It was reported that there land encroachments have been done by a social group that is known to be good at agriculture (Dhakar community).
- As a result, a few private fodder lots have been constructed, also on encroached government land by village residents, who ensure that the area within the fodder lot (bounded by stone slab boundary walls) has good year-round availability of better quality fodder. For this, they charge INR 1000 per cow/buffalo per year, for open grazing within the fodder lot. These needs are driven by the reduction in grazing area and the need for improved fodder for milch livestock and buffalos as families also draw better incomes from dairying activities. Given these circumstances, people were concerned about further reductions to grazing lands, especially for the livestock owning communities who have further invested in procuring more livestock to benefit from dairying work.

Use of Government Land: Agriculture

Areas within the 968.8 ha Government land within the project footprint is currently used for agriculture (squatted upon or encroached land by villagers). There are significant encroachments/squatting for

agriculture, on the government land; however the details on the extent were neither available on record at the Tehsil office, nor with the Patwari.

An assessment will be made during RAP surveys planned later in the month September/October 2020 and this information will be included in the RAP document.

The patta holders and private land holders from the adjoining plots have extended their boundaries to include larger land parcels for cultivation. In addition to this, the local community has also done boundary marking on government land, to demarcate grazing areas for an individual household or a group of households, by creating 'fodder lots'. Some of these encroachments or squatters are reported to be at least 20-30 years old, or as reported going back two generations. The local community stated that they deposit fines for encroachment/squatting and cultivation on Government lands; however, the fines are paid only for a small fraction of the actual encroachment, and are not paid every year. The payment of fines for a fraction of encroached land helps the households get their names in the Government records while avoiding the payment of actual sum of fines, which would be much higher in most cases. Usually the penalty amount and the method for calculating the fine varies from one village to another. In some places it is reported to be calculated based on the reference year's yield. There is no fixed frequency of these checks across farms in the villages as understood through consultations. People see benefit in remaining on this list (of squatters/encroachers), even if they have to pay a small fine, as they think that this makes them eligible for future 'patta' allotments or regularisation of their claims on government land. This understanding was not confirmed by relevant government officials. However, this seems to act as an extra-legal, proxy, claims establishment system, where families and generations continue to cultivate, year after year, and appears to be locally accepted/respected, in terms of 'claim'.

Other uses on Government Land

Quarrying activities usually occur on Government land present near the Project Footprint area, during the months of October- November. It has been reported by the village residents that the mining activity is conducted on a reduced scale than the earlier activity level with very few licenses still active. Quarrying (for construction material), requires a local permit from the panchayat, and is usually conducted immediately after the monsoon season, due to collection of water in the pits (July to September). The villagers use these stones to make the boundaries around their owned as well as squatted/encroached land. These stones are in high demand and wall making is a source of livelihood for some people.

4.4.7 Occupational Profile

The Study Area is categorized by nearly 53.4 percent working population, where majority of the working population comes under "Main Workers"[1], i.e. being employed for more than 6 months in a year. The Project Villages have nearly 56percent Main workers of the total working population. The employment of both men and women in the project villages is in agriculture, where men mostly work as cultivators[2] while women take up paid or unpaid work as agricultural labourers[3]. The details of the types of paid employment are presented in ***4.4.7.1*** and ***4.4.7.2***. The table below depicts that women are equal contributors to the Main Working Population as men in Kawai and Bardawada village, whereas the women participation as Marginal Workers[4] is higher in these two villages.

[1] Main Workers are those workers who had worked for the major part of the reference period (i.e. 6 months or more);

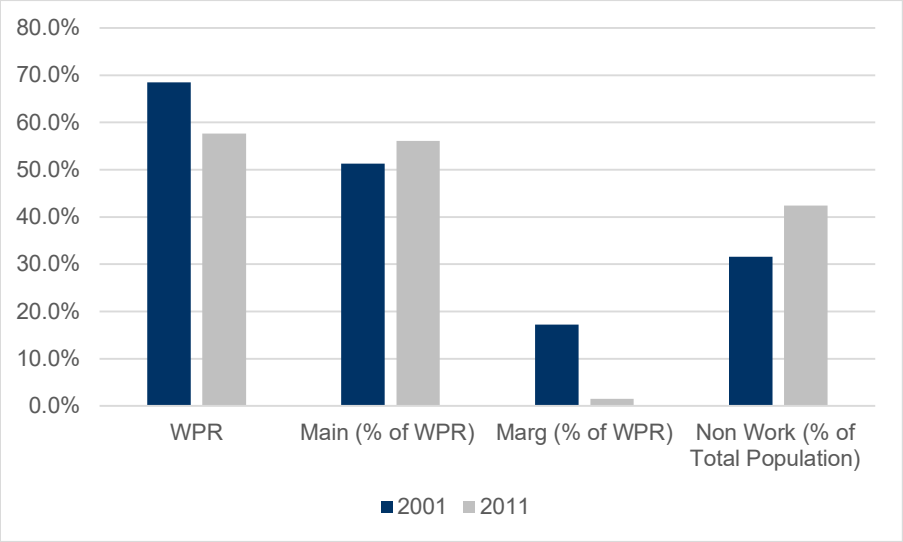
[2] A person is classified as cultivator if he or she is engaged in cultivation of land owned or held from Government or held from private persons or institutions for payment in money, kind or share. Cultivation includes effective supervision or direction in cultivation

[3] A person who works on another person's land for wages in money, or kind or share is regarded as agriculture labourer. He or she has no risk in the cultivation, but merely works on another person's land for wages. An agriculture labourer has no right of lease or contract on which she or he works

[4] Marginal Workers are those workers who have not worked for major portion of reference period (i.e. less than 6 months)

The ***Table 4.42*** and ***Figure 4.30*** below presents the worker participation in the Project Villages, during the previous decade, obtained from the 2001 Census of India. It is observed that the overall worker work participation has decreased from 2001 Census to 2011 Census, thereby bringing about an increase in the proportion of Non-Working population, especially in the female category. This change may be a result of number of factors, some of them being increasing landlessness or sub-optimal land holdings, women dropping out of the workforce to take on household work (for economic and cultural reasons), increasing unemployment over the decade as more youths spend longer time studying in adulthood, and waiting to join jobs rather than join the agricultural workforce, etc.

Figure 4.30 Decadal comparison of Working trends in the Project villages



Source: Census 2001 and 2011 data

A similar trend is also observed for the proportion of marginal workers' participation, which has decreased over the decade whereas the proportion of Main Workers has remained nearly the same. It is also observed that there is a decrease of proportion of Female workers, both Main and Marginal from 2001 to 2011, indicating that either the engagement levels of females has decreased over the decade due to socio-cultural reasons or the growth in employment opportunities for females is not at par with the female population growth over the decade.

Table 4.42 Working Population in the Study Area as per Census 2011

Villages	WPR	Main [1] (% of WPR)	Main M (% of WPR)	Main F (% of WPR)	Marg[2] (% of WPR)	Marg M (% of WPR)	Marg F (% of WPR)	Non Work (% of Total Population)
Project Villages								
Badi	56.3%	54.5%	57.0%	43.0%	1.8%	60%	40%	43.7%
Bardawada	62.2%	61.7%	49.6%	50.4%	0.5%	0%	100%	37.8%
Kawai	56.9%	55.2%	50.9%	49.1%	1.7%	44%	56%	43.1%
Project Villages Total	**57.6%**	**56.1%**	**53.8%**	**46.2%**	**1.5%**	**52%**	**48%**	**42.4%**
AoI Total	**53.1%**	**45.7%**	**59.6%**	**40.4%**	**7.4%**	**38%**	**62%**	**46.9%**
Study Area Total	**53.4%**	**46.4%**	**59.2%**	**40.8%**	**7.0%**	**38%**	**62%**	**46.6%**

Source: Census of India, 2011

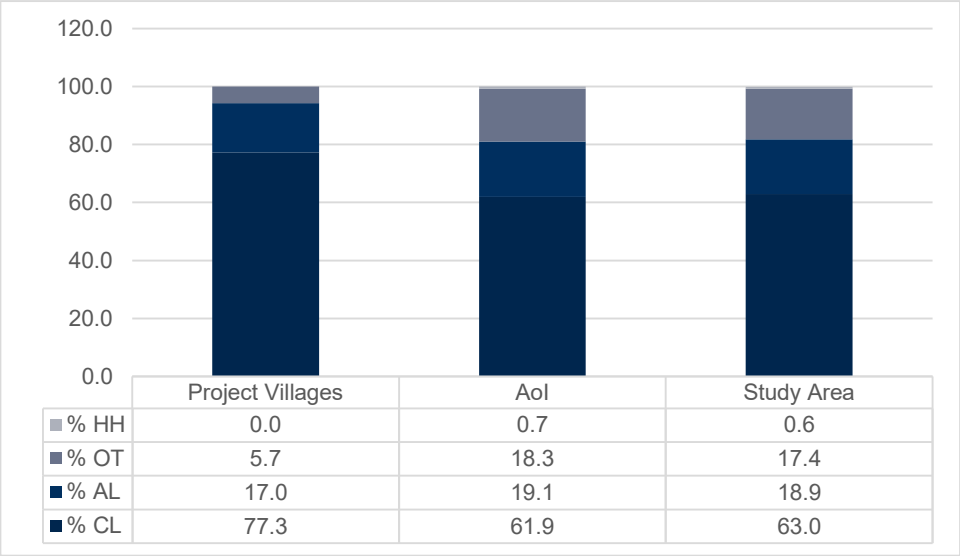
Table 4.43 Proportion and Break-up of Working Population in the Study Area (as per Census 2001)

Villages	WPR	Main (% of WPR)	Main M (% of WPR)	Main F (% of WPR)	Marg (% of WPR)	Marg M (% of WPR)	Marg F (% of WPR)	Non Work (% of Total Population)
Project Villages								
Badi	69.6%	48.4%	67.6%	32.4%	21.1%	28%	72%	30.4%
Bardawada	57.2%	56.6%	47.8%	52.2%	0.6%	100%	0%	42.8%
Kawai	74.7%	52.3%	51.7%	48.3%	22.4%	46%	54%	25.3%
Project villages Total	**68.5%**	**51.3%**	**58.3%**	**41.7%**	**17.2%**	**35%**	**65%**	**31.5%**

Source: Census of India, 2001

Out of the Main Working Population, majority of the population can be categorized as Cultivators[1] or Agricultural Labourers[2], endorsing the fact that the region has an agrarian economy. As per Census data, nearly 5.7% population in Project Villages and 18.3% population in the AoI report being engaged in other work[3], like construction labourers, working in the stone quarries in Rajasthan, in shops near Singoli, etc. The proportion of Household workers[4] is negligible across the Study, as depicted in ***Figure 4.31*** below. It can be observed as per Census 2011 data, that men account for majority of the main workers in the Study Area, at 59.2 percent while women account for majority of the marginal workers at 62% of the total working population.

Figure 4.31 Distribution of Main Working Population in the Study Area



	Project Villages	AoI	Study Area
% HH	0.0	0.7	0.6
% OT	5.7	18.3	17.4
% AL	17.0	19.1	18.9
% CL	77.3	61.9	63.0

Source: Census of India, 2011

The following categories comprise the main occupational activities within the Study Area:

- Farm Based Activities (cultivators, agricultural labourers and livestock rearing);
- Non-farm based activities (contractual labour for construction, stone quarries, etc.)

4.4.7.1 Farm Based Livelihoods

As can be seen from ***Figure 4.31*** approximately 94.3% of the main working population in the Project Villages and 81% of the main working population in the AoI is dependent upon farm-based activities for their livelihood. The farm based activities comprise of agriculture, agricultural labour and livestock rearing. The area has a lower water table with varying water availability of 400-800 ft at the farm lands and most of them are reported to have seasonal water availability, which is influenced by rainfall. There are a few tubewells located in the proximity of surface water bodies, which are reported to provide water to the community throughout the year. Wells, tube-wells as well the supply of electricity for a period of 6-10 hours per day for irrigation, form the major sources of irrigation across villages

3All workers i.e. those who have engaged in some economic activity during the last one year, but are not cultivators or agriculture labourers or in household industry are 'Other Workers'
4 Household industry is defined as an industry being run by one or more member of a household at home or within village in rural areas and only within the precincts of the house where the household lives in urban areas. The larger proportion of workers in the household industry consists of members of household. The industry is not run on the scale of a registered factory which would qualify or has to be registered under the Indian Factories Act.

apart from rainfall. The project villages experience low to medium' annual rainfall during the months of June to September, which is indicative of low replenishment of water in surface and groundwater reservoirs. The risk of water availability is estimated to be '***High***', as detailed in ***Section 4.2.10.1***. The current dependence on land and livestock rearing in the area is higher in absence of less rainfall leading to sub-optimal agricultural activity in the area.

Dependence on Agriculture in the Project Villages

Villagers cultivate on their own (private) land parcels, Patta land parcels and there is understood to be Government land being encroached/squatted upon by the villagers which, they reported, has been made productive by putting in some investment and effort and there is potential for converting more such land, for agricultural usage, though this is not permitted. The extent of encroachment and squatting on Government land could not be determined because of the reluctance of the community in providing these details. The extent of encroachment and squatting would emerge during the RAP surveys and be detailed in the RAP report.

Before starting cultivation on any land, the land improvement work like removing stones and other levelling work has to be done, for which the average cost comes out to be about INR 23,000 to 25,500 per bigha (0.11 Hectare). The villagers say that they have known about the upcoming Solar Park project and that is why some of them have not made further investment in encroached/squatted upon land parcels for cultivation. This may be contradictory to reports of recent investments in all types of agricultural land, to increase productivity through bore well irrigation.

The land holdings in the villagers are relatively higher amongst Dhakad community, who fall in the category of Small to Semi Medium farmers (land holdings ranging from 1 ha to 2.5 ha), which is reported to be relatively better off and with traditional skills in bringing barren land into cultivation. It is also anecdotally reported that this community may have a greater share of encroached/squatted upon land, given their skills with agriculture. Most of the encroachment in the villages is reportedly done in the last 20 years. Approximately 10-15 percent households in the Project Villages are reported to be landless or with sub-optimal/marginal land holdings, falling in the category of Marginal farmers.
An increase in government land occupied for agriculture is also a reduction in grazing area, thus creating further stress for livestock owning households, largely from a different community from the agriculturalists.

Crops and cropping pattern in the Study Area

The primary crops in the region comprise of Maize, Pulses (Urad, Moong), Gram, Groundnut, Cotton and Soybean amongst Kharif crops and Wheat, Mustard, Coriander, Isabgol, Fenugreek, Garlic and Opium (licensed) being the Rabi crops. In addition, some households also cultivate vegetables for self-consumption. The dependence on monsoons for agriculture is high, especially during the summer months of May and June.

Table 4.44 Productivity and related costing of major crops in AoI

Crop	Agricultural Season	Costing per Hectare (INR)	Production	Price per quintal
Soybean	June-October	40,000-50,000	20 quintals	3000 approx.
Wheat	November-April	50,000 – 60,000	50-60 quintals	1600-1700
Maize	June-October	65000	50 quintals	1500-1600
Pulses	June-October	50,000	20-25 quintals	8,000- 9,000
Gram	October- April	25,000	5 Quintals	4500
Isabgol	November-April	40,000	15 Quintals	8000- 9000
Mustard	October- April	30,000	20-25 Quintals	3500-4000
Groundnut	March – July	25000	20 Quintals	4500
Cotton	March – July	20,000	6-8 Quintals	4500

Crop	Agricultural Season	Costing per Hectare (INR)	Production	Price per quintal
Opium	October- April	5 lacs	10 Quintals Poppy seeds; 55 kg opium	450000/ Q for poppy seeds 150000/ Q for opium

Source: Community Consultations undertaken by ERM India in November 2019

The community consultations revealed that Wheat cultivation in the area has been good in the last year due to good rainfall. The vegetables like tomatoes, chillies, etc., have higher cost of labour and maintenance while the productivity dwindles, as there is higher probability of infection. *Jow* is a less water intensive crop and is grown in areas receiving scanty rainfall. Some of the villagers have diversified their farming and have started cultivating Oranges, Guava, Pomegranate, etc. Opium crop needs Government license for cultivation and fetches proceeds from sale of Poppy seeds, the flower and the case; thus leading to more profits.

The people retain a part of the crop produce for self-consumption while the excess is sold in Singoli Mandi to local traders. The farmers sell their agricultural produce to individual traders and not in the Government Mandis due to flexibility in terms of time of sale, lack of documentation required, preference for getting cash payments, against the less preferred practice of receiving cheques for sale in Mandis. People from Kawai village reportedly sell through Mandi as they are affluent. The government Minimum Support Price (MSP) for Maize is INR 1700 to 1800 per Quintal while the private selling price is reported to be around INR 2,100 per Quintal. Additionally, farmers don't get MSP, if the crops are cultivated on Encroached land parcels, which is verified by visits of Patwaris to individual land parcels and records of encroachment maintained by them.

Box 4.2 Process of determination of Minimum Support Price as per APMC consultations

The process for deciding the MSP in the Government Mandis is described below.

- Farmers have to make the registration on government list for selling their crops on the government portal;
- Declaration of crops have to be done by the farmers at the beginning of cultivation period;
- As per the crop and the total land on the name of the farmers, the government estimate the total production of the crop;
- Rates are determined on the basis of quality of crops, the crops with higher water content are sold at relatively lower prices;
- The rates of crops in the area are published in newspapers as well as an online portal –Agmanet;
- The government only will buy the estimated crop on MSP, not above the limit decided by the government.

The rainfall in this year has been good and that's why engagement in agriculture is gainful, otherwise agriculture is not solely sufficient for sustenance and is supplemented by other activities like livestock rearing, migration of youth to nearby cities during agriculturally leans periods, etc. There has also been damage to crops due to excess rainfall in the last year in certain areas and compensation has been paid by the Government for the damage, approx. INR 20,000-25,000 per hectare. Compensation for damage to the crops due to excess rainfall was decided based on Section 6, sub-section 4 of RBC (Revenue Board Circular).

Consultations with women's groups, farmers, and general community in the Project villages highlight that the role of women in agriculture comprises activities such as sowing, weeding, cutting and watering and during harvesting season. In terms of remuneration, women are paid INR 100 - 200 /day while men are paid INR 200 - 300 /day. However, women of the household undertake agricultural work for the agricultural fields owned by their family, which is not accounted for as economic work. Their primary responsibilities are household work, caretaking of children and the elderly, tending to

livestock, cleaning their sheds, collection of fodder, and fuelwood in addition to agriculture work in the fields.

Livestock rearing

In addition to agriculture, livestock holdings play an important part in the livelihoods of the community, in terms of supplementing household income from agriculture and other sources. The livestock also plays a key role in meeting the nutritional intake of the household as well as the animal by-products also serve as a steady source of fuel for the domestic needs like cooking, in addition to the LPG. The main livestock holdings in the area comprise of Cows, Buffaloes, Goats and Sheep. While there are no reported household maintaining livestock holdings for solely commercial purposes, most of the household are reported to be engaged in the sale of surplus milk to the neighbouring villages and Singoli. Singoli has a private and a Government dairy and milk from the project villages is also sold door to door in colonies (in Singoli town) by the residents of the Project Villages.

The Bhil community largely has Goats and Sheep while the Gurjars and Dhakads have cows and buffaloes, where Gurjar households has the maximum livestock ownership, going as high as 15-20 buffaloes per household. There are reported to be grazing areas (fodder lots) set up on the encroached land parcels where livestock are allowed to graze against a payment of INR 1000 per livestock head per year.

In terms of gender roles, women take care of stall feeding of livestock, cleaning of livestock and their sheds, preparation of dung cakes, milking, etc.; but are not responsible for grazing of livestock outside the household premises. Male members of the household are responsible for livestock grazing near the villages, sale and purchase of livestock, livestock feed and by products.

4.4.7.2 Non- Farm Based Livelihoods

As can be seen in ***Figure 4.31***, the non-farm based livelihoods act as a supplementary source of income to the families in the area. The non-farm based livelihoods in the area primarily comprise of male casual labour involved in construction of houses in nearby villages and Singoli, working as labourers in stone quarries in nearby villages of Rajasthan, working in shops and enterprises in and around Singoli, etc. The stakeholder consultations also suggested migration of males, either alone or with family, to the nearby cities of Bhilwada, Chittorgarh, etc. The migration is both seasonal as well as long term depending on the area of employment and skill set of the individual. The migrated workforce is largely engaged as daily wage labourers in the construction projects in nearby towns and cities or are engaged in manufacturing sector. In cases where only males migrate, females of the family stay in the villages and take part in cultivation of agricultural fields of the family.

Seasonal and long term migrant workers may have returned to their villages as part of the overall flows induced by lock-downs related to the COVID 19 pandemic. Given that this is a developing situation, these aspects will need to be assessed during the RAP survey, and also later, periodically.

4.4.8 Physical Infrastructure

4.4.8.1 Water Supply and Sanitation

The household level supply of water is also done through the bore wells (400-500ft deep), by an infrastructure set up by Panchayat that has piped connections to some common water access points in the village as well as to some households as well.

None of these sources was reported in the Project Villages, as a community source of drinking water. Only private sources for irrigation were reported in the project villages. Drinking water is reported to be easily available in the Project villages, with some water scarcity problems reported during summer seasons. Women have the responsibility to carry water from the community water points to their

respective households while some families depend on other families for water through bore wells, against payment for the same. As discussed in 4.2.10.1, the Project villages fall in the region of extremely high baseline water stress and high risk of baseline water depletion. The quality of drinking water available at lower depth is reported to be good while higher salt concentration is found in water from deeper levels. There are issues of drying of borewells reported in the summer months. The DPR has identified the ground water as project water source, which will further cause stress on ground water resources of the area (Refer Section 4.2.10 and 6.2.3 for details).

Open Drains are present in the Project villages, as observed during community consultations in November 2019. In Kawai village the provision of drains was missing in certain parts with water logging and flowing on the road. In terms of toilets, construction has been completed for a lot of toilets at household level in the Project villages; however, a good proportion of the population, especially the older folks still practice open defecation.

4.4.9 Social Infrastructure

4.4.9.1 Education Infrastructure

According to Census of India, Primary Schools provide education from class 1st to 5th, Middle Schools cater to children studying from classes 6th to 8th, Secondary School provides education to students of classes 9th and 10th and similarly, senior secondary school teaches children studying in classes 11th and 12th. One interesting fact here is that, a composite school with classes 1st to 12th, will be treated as four separate units and will be counted separately as a Primary, Middle, Secondary and Senior Secondary school.

The AoI is characterised by the presence of co-educational primary schools across all the villages lying in the AoI, with the exception of Anooppura and Mokhampura village. However, as pointed out during community consultations, all-girls schools are preferred by the community for adolescent girls. There is a dearth of Middle, Secondary and Senior Secondary schools in the Study Area, with 2 Middle schools, no Secondary or Senior Secondary Schools in the Project Villages (comprising of three villages) and 14 Middle Schools, 5 Secondary Schools and 3 Senior Secondary Schools in the AoI (comprising 32 villages).

Table 4.45 Availability of Schools in the Study Area

Villages	Government Primary school (P)	Government Middle school (M)	Government Secondary School (S)	Government Senior Secondary school (SS)
Project Villages				
Badi	1	1	0	0
Bardawada	1	0		
Kawai	1	1	0	0
PFA Total	**3**	**2**	**0**	**0**
AoI Total	**34**	**14**	**5**	**3**
Study Area Total	**37**	**16**	**5**	**3**

Source: Census of India, 2011

The lack of village level facilities at the middle and higher levels of education forms one of the primary reasons of children dropping out of schools.

4.4.9.2 Health Facilities and Health Seeking Behaviour

The health facilities in the Study Area follow a three-tier health infrastructure system, as also applies to the state of MP. The health facilities available at the village level comprise of Primary Health Sub Centres and Public Health Centres (PHC). While the sub centres cater to a population of 5,000

individuals, the PHCs are for a population of 10,000-30,000 individuals. While the PHCs are mostly for OPD (Out Patient Department) and basic IPD (Indoor Patient Department) cases, sub centres usually have a delivery room and two resident nurses (one male and one female). Each PHC has 5-6 sub centres under them. In turn, a cluster of 6-10 PHCs come under a CHC (Community Health Centre), which caters to a population exceeding 1 lakh, and also provides emergency services. The CHCs in turn report to the public hospitals at the district level.

The villages of the Study Area have access to 2 Primary Health Centres, one each in Nayagaon and Jhantala villages. Four AoI villages of Dhangaon, Dhardi, Funsariya and Kadwasa, have a Primary Health Sub Centre in their village.

4.4.10 Energy Use

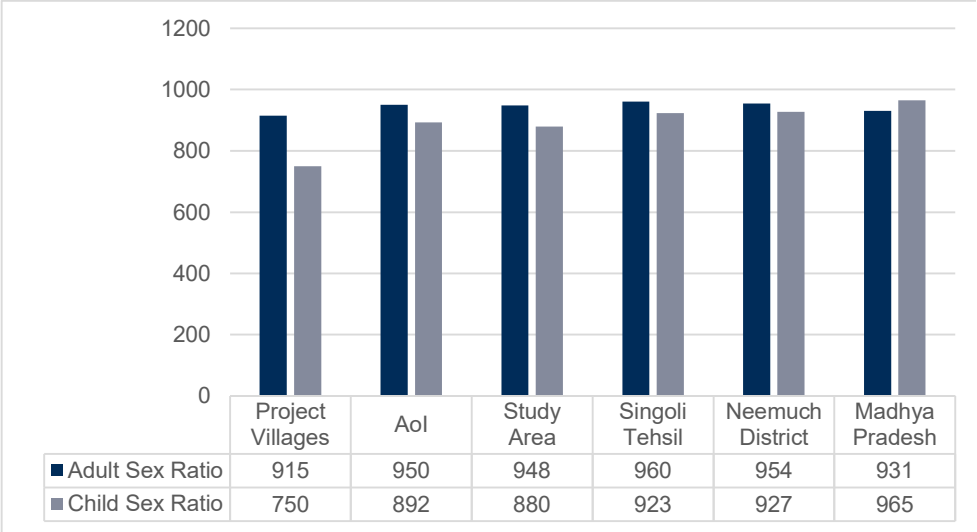
The population in the Study Area is understood to use both LPG as well as dung cakes (as fuel source) to meet their daily domestic energy requirements. While LPG adoption and availability across the villages has improved over the past few years because of Pradhan Mantri Ujjwala Yojana; firewood and burning dung cakes as fuel continues to be the main domestic fuel for cooking requirements. This usage/dependence also goes up to form the overall economics of livestock rearing in the area.

4.4.11 Gender: Role in Society

The Project Villages exhibit lower adult sex ratio and child sex ratio as compared to the AoI, tehsil, district and the state figures of sex ratio (both adult and child). The probable reason for the trend can be attributed to higher infant mortality rates among girls or cultural preference of male children, possibly leading to sex selective abortions, which causes an imbalance in the gender composition in the region. The practice of differential treatment of boys and girls could not be gauged through the consultations conducted in the project area villages.

The consultations suggest that in particular social and caste groups in the villages, there is lower participation of women in agricultural activities or any activities outside the house, there is also lower participation in household or economic decision making and women possess fewer independent economic means.

Figure 4.32 Comparison of Adult and Child Sex Ratios across Study Area, Tehsil and District



	Project Villages	AoI	Study Area	Singoli Tehsil	Neemuch District	Madhya Pradesh
Adult Sex Ratio	915	950	948	960	954	931
Child Sex Ratio	750	892	880	923	927	965

Source: Census of India, 2011

4.4.11.1 Gender Roles in a household

The consultations suggest that in a household, women from most social and caste groups, take equal ownership and responsibilities of working on agricultural fields owned by their household, taking care of domestic chores of cooking, cleaning, fetching water from community water points to their respective houses, caretaking of children and elderly as well as tending to livestock owned by the family. Men are largely responsible for management of financial resources, sale and purchase of goods, agriculture related work in the fields, including sale of produce, etc. and their contribution to domestic chores of cleaning, cooking, caretaking is limited.

The occupational profile of the community is detailed in ***Section 4.4.7***, where men's employment options primarily comprise working as cultivators, agricultural labours, construction labours,. There have not been any cases reported for women working as construction labourers or in any enterprise outside their respective villages.

4.4.11.2 Gender Roles in Livestock management and Agriculture

Women take care of stall feeding of livestock, cleaning of livestock and their sheds, preparation of dung cakes, milking, etc.; but are not responsible for grazing of livestock outside the household premises. Male members of the household are responsible for livestock grazing near the villages, sale and purchase of livestock, livestock feed and by products. The women from Rajput community are a little different from the rest, as they are only responsible for household chores and have restrictions on their movement outside the house, therefore, do not do any agricultural work in the fields.

On the agricultural fields, women are involved in cutting, sowing, threshing, watering, and collecting fuel wood. The women engaged as agricultural labourers are paid an amount of INR 100-200 per day where as men are paid INR 200-300. The tasks that are taken care of by men include sale and purchase of agricultural inputs, sale of crops in markets and Mandis and other farm based activities.

4.4.11.3 Gender profile in Asset ownership

The exposure of women outside the realms of their villages was observed to be limited as few travel outside other than for functions or religious events. There are no Self Help Groups reported to be active in the project villages, in the village consultations. The ownership of land and assets by women is also understood to be minimal and in cases where women own land legally, the management of the same in terms of sale, purchase or usage is decided by the men in the family, with limited or no consultations with women. The proceeds from sale of land and its usage is also usually discussed within households but the final decision on usage of money is taken by male members of the household.

The men have more social exposure and access to cash and linkage to banking services, understanding of financial and legal instruments, etc. which makes them the natural decision making authority in a household. Women are restricted in their movement outside villages due to socio-cultural practices and safety issues and in spite of being equal contributors to the household (which forms unpaid work); have less access to cash and resources for discretionary spending.

Women Headed Household

There are some women headed households in the project villages; however in most cases these Women Headed families are provided financial support and security by other members of their extended family, as part of the prevalent joint family and living systems. However, women headed households that are living independently from their extended families, have to fend for themselves, by working as labourers on agricultural fields.

These Women headed households (both joint as well as independent) face additional risks of not being included in negotiations, or other key meetings due to prevailing cultural norms and may not

therefore receive the benefits and advantages compared to those who do participate. Thus they become a little more vulnerable in cases of sale of land for the project, where there is a chance that the proceeds from sale of land do not reach them.

4.4.11.4 Gender Roles as community leaders

There are biases present with respect to women's role as community leaders along with inhibitions of women in interacting with the general public due to cultural practices. One (of the many) such case observed in Badi village is presented below.

Box 4.3 Role of Women as Elected Representatives

In Badi village, a woman was elected as the Sarpanch of the Badi Panchayat on a seat reserved for women. However, during community consultations – it was her husband (or "*Sarpanch-pati*") who was solely participating in discussions and reporting on village statistics. The female Sarpanch did not participate in the discussions in the presence of men of the village. During a separate women's consultation, the female Sarpanch spoke about general issues, but was not aware of a lot of details as reportedly she did not visit any of the villages in her constituency and those responsibilities were carried out by her husband solely. While reservation of seats has ensured that more women are elected, functional participation and leadership still transfer by proxy to their husbands.

Source: ERM Site visit in November 2019

Section 5 discusses the various categories of stakeholders that are present in the Study area for this assessment and presents their profiles, expectations from and influence on the project.

5. STAKEHOLDER IDENTIFICATION, INFORMATION DISCLOSURE, CONSULTATION AND PARTICIPATION

5.1 Stakeholder Identification and Categorization

A stakeholder is defined as "any identifiable group or individual who can affect the achievement of an organization's objectives or who is affected by the achievement of an organization's objectives". Stakeholders thus vary in terms of degree of interest, influence and control they have over the project. While those stakeholders who have a direct impact on or are directly impacted by the project are known as **Primary Stakeholders,** those who have an indirect impact or are indirectly impacted are known as **Secondary Stakeholders**.

During the ESIA process, a stakeholder identification and prioritization was conducted for identifying the key stakeholders of the project, while keeping in mind the nature of the project and its setting. Furthermore, consultations were conducted with these identified stakeholders through a participatory approach. The table below presents the key stakeholders of the project.

Table 5.1 Stakeholder Group Categorisation

Stakeholder Groups	Primary Stakeholders	Secondary Stakeholders
Community	■ Private Land Owners from Bardawada, Kawai, Badi villages ■ Patta Holders from Bardawada, Kawai, Badi villages ■ Squatters and Encroachers ■ Agricultural Labourers ■ Graziers ■ Vulnerable Social Groups in other villages in the vicinity ■ Contractors ■ Potential unskilled labourers to be engaged for the construction phase of the project ■ Owners of land required for temporary occupation or use ■ Local Community from Project villages.	■ Fence Line Communities from other villages in the vicinity ■ Non-recognised 'patta owners' who have procured the patta based on a verbal agreement with the original (and registered) patta holder;
Institutional Stakeholders	■ Gram Panchayats of Dhardi (for Bardawada village) and Badi (for Kawai and Badi villages); ■ Singoli Tehsil officials	■ Local Political Groups ■ Civil Society/ Local NGOs
Government Bodies/Regulatory Authorities	■ Regulatory Authorities comprising the following: – MP Pollution Control Board; – Central Pollution Control Board (CPCB) – Ministry of Environment Forest and Climate Change (MoEFCC) – Local Fire Authority; – Ministry of Road Transport and Highways – State Transport Authority; – District Collector and Revenue Department; – Central Electrical Authority through C.E(P&D) Jabalpur; – Department of Telegraph – Communication, Govt. of Madhya Pradesh; – Department of Panchayati Raj, Madhya Pradesh; – Labour Department;	

Stakeholder Groups	Primary Stakeholders	Secondary Stakeholders
	– Wildlife Warden, State Forest Department; – District and State Forest Department, MoEFCC. ■ District Administration	

5.2 Stakeholder Analysis

The significance of a stakeholder group is categorized considering the magnitude of impact (type, extent, duration, scale and frequency) or degree of influence (power and proximity) of stakeholder group and urgency/likelihood of the impact associated with the particular stakeholder group in the project context.

The magnitude of stakeholder impact/influence is assessed taking the power/responsibility and proximity of the stakeholder group and the group is consequently categorized as negligible, small, medium or large. The urgency or likelihood of the impact on/influence by the stakeholder is assessed on a scale of low, medium and high. The overall significance of the stakeholder group is assessed as per the matrix provided in table below.

Table 5.2 Stakeholder Significance and Engagement Requirement

		Likelihood of Influence on/ by Stakeholder		
		Low	Medium	High
Magnitude of Influence/ Impact	Negligible	Negligible	Negligible	Negligible
	Small	Negligible	Minor	Moderate
	Medium	Minor	Moderate	Urgent
	Large	Moderate	Urgent	Urgent

The influence and priority have both been primarily rated as:

- High Influence: This implies a high degree of influence of the stakeholder on the project in terms of participation and decision making or high priority to engage with the stakeholder;
- Medium Influence: Which implies a moderate level of influence and participation of the stakeholder in the project as well as a priority level to engage the stakeholder which is neither highly critical nor are insignificant in terms of influence; and
- Low Influence: This implies a low degree of influence of the stakeholder on the project in terms of participation and decision making or low priority to engage that stakeholder.

The intermediary categories of low to medium or medium to high primarily imply that their influence and importance could vary in that particular range subject to context specific conditions or also based on the responses of the project towards the community

The coverage of stakeholders as stated above includes any person, group, institution or organization that is likely to be impacted (directly or indirectly) or may have interest/influence over project. Keeping this wide scope of inclusion in stakeholder category and the long life of project, it is difficult to identify all potential stakeholders and gauge their level of influence over project at the outset of the project. Therefore the project proponent is advised to consider this stakeholder mapping as a live document which should be revised in a timely manner so as to make it comprehensive for any given period of time.

Table 5.3 Stakeholder Analysis

Relevant Stakeholders	Profile/ Status	Impact/Influence of the project on this Stakeholder Group	Impact/Influence of the Stakeholder Group on the project	Expectations, Opinions Key Concerns of Stakeholders	Overall Rating of Stakeholder Influence
Primary Stakeholder					
Private Land Owners and Patta Holders from Bardawada, Kawai, Badi villages	■ Private Land Owners comprise of those households, whose land parcels are falling within land footprint of the Solar Park. ■ Patta holders comprises of households that were assigned land (Patta), by dint of their landlessness (or other vulnerabilities), in 1950s- 60s to 80s, under various schemes. ■ The criteria and terms for allotting Patta land were different as this was done at different times, for different purposes. The Tehsil office reported that these documents were lost over time and are not available; ■ This group is dependent on their land parcels for their livelihood needs; ■ This includes the land owners in the RoW of the Transmission Line routes for the project. ■ The exact number of land owners for the project is not currently known.	■ The project will be set up on 35.488 ha. of private land and 87.734 ha Patta land parcels across the three villages; ■ The dependence on land for agriculture and livestock in the area is high, as depicted in the Census data and reported during consultation; ■ The purchase of land for the project development activities will affect this stakeholder group leading to reduced land holdings; ■ Additionally, if this stakeholder group is provided with an alternate land parcel, the quality of alternate land parcels and the effort and investment required to make it fit for cultivation, is also of key concern, as there are certain rocky patches of land existing in and around the project area.	■ The stakeholder groups' influence on the project is pertinent to smooth land availability and its support is key for the smooth functioning of the project related activities in the area.	■ Concerns regarding land being procured by the Project, because there has been significant cost and effort expended in the preparation of the land for making it cultivable; ■ Adequate payment for the land being procured for the project activities, including for those without any formal recognized ownership documents, who may have 'bought' patta land based on a verbal agreement; ■ Minimal disturbance to the community with regards to access issues, pollution, health and safety risks and influx of migrant workers ■ This Stakeholder group may expect income generating activities or employment as construction labourers, masons, drivers, etc. during the construction phase of the Project.	High

Relevant Stakeholders	Profile/ Status	Impact/Influence of the project on this Stakeholder Group	Impact/Influence of the Stakeholder Group on the project	Expectations, Opinions Key Concerns of Stakeholders	Overall Rating of Stakeholder Influence
Encroachers/ occupiers/ squatters (for agriculture)	■ This stakeholder group comprises of households that have illegally encroached/occupied Government Landin the project area and around. ■ Encroachment of Government land is a general practice in the area, where certain households start using Government land for agriculture, without any legal ownership of the land parcel. ■ In Neemuch, it has been reported that the practice of encroachment is usually undertaken in the project area by the relatively well-off households, that already own land; ■ When the encroachment related practices are identified by the Government officials, this group is willing to pay small fines against the use of Government land; however, in such scenario, the Encroachers do not disclose the exact encroachment and only declare a fraction of the actual encroached land to, in their understanding, get some sort of sanction to continue to informally occupy and use the land.	■ This stakeholder group has been using the land for livelihood activities; though does not have legitimate claims or ownership of the land. In fact, they are well aware of their illegal status; ■ The project would be set up on the encroached land and would lead to disruption of economic activities and incomes to these households, and those employed by them on these lands (usually seasonally).	The influence of this stakeholder group present in project villages on the project is moderate, considering they do not have legal rights on the land; however, they have influence in the village by virtue of their economic power (they are all land owners and employers of agricultural labour). They have previously held agitations and protests (in 2019) as they do not want to part with their encroached land parcels, given that they have made several improvements to it and made this land productive. There have been some media reports recently that have highlighted community protests for land take in Solar parks.	■ The key concern of this stakeholder group is of losing the land parcels which they have been using for agriculture; ■ This group reports that they have spent considerable amount of effort and money to make the land cultivable and all this effort will be wasted after the project comes on this land; ■ Additionally, their concern is for the proportion of land parcels under their possession which are undeclared; ■ The Revenue inspector and his team, which undertook the land mapping exercise did not note the encroached land parcels (as this was not his mandate) and thus this stakeholder group is concerned that they may not receive any compensation or benefits; ■ This Stakeholder group may expect income generating activities or employment as construction labourers, masons, drivers, etc. during the construction phase of the Project.	Medium

Relevant Stakeholders	Profile/ Status	Impact/Influence of the project on this Stakeholder Group	Impact/Influence of the Stakeholder Group on the project	Expectations, Opinions Key Concerns of Stakeholders	Overall Rating of Stakeholder Influence
	■ This practice helps them to make official records of their dependence on the land, simultaneously saving the fines for the actually encroached land, which would be significantly higher. ■ To make it productive, most occupiers have made improvements to the land, including installing bore wells and improving the soil quality through use of manure and repeated cultivation and tilling.				
Agricultural Labourers	■ This stakeholder group comprises of those households that have marginal or limited land holdings and members of their families work as Agricultural labourers in the land parcels falling in the area identified for project across all three categories- private land, patta land (that is being cultivated), and encroached land under agriculture	■ The land procurement for the project will be impacting their income sources, thereby leading to a deterioration of the household income.	■ The influence of this group on the project is limited, given that they do not have any legal claims on the land; ■ This group can be used during the construction phase of the project as unskilled labour with priority hiring and may additionally be included in Livelihood Restoration initiatives;	■ This Stakeholder group may expect employment as construction labourers, masons, drivers, etc. during the construction phase of the Project.	Low
Graziers – people from the Project villages	■ The Government land in the Project Footprint is reported to be used by the community	■ The procurement of Government land that is being used shall reduce	■ The influence of this group (including those who have	■ The key expectations of this stakeholder group is to allow for provision of adequate	Low

Relevant Stakeholders	Profile/ Status	Impact/Influence of the project on this Stakeholder Group	Impact/Influence of the Stakeholder Group on the project	Expectations, Opinions Key Concerns of Stakeholders	Overall Rating of Stakeholder Influence
who use the government land as open grazing area for their livestock	for grazing of livestock of nearby villages. There are approx. 4000 heads of livestock (comprising Cows, Buffaloes, and Goats) in the three project villages. ■ The livestock ownership in the Project villages is higher amongst Gurjar community (Cows and Buffaloes), while Bhil community is reported to possess a higher number of Goats. ■ The local community has also done boundary marking on government land, to demarcate grazing areas for an individual household or a group of households, by creating 'fodder lots', where livestock from the village is fed commercially, by charging INR 1000 per livestock per year.	the amount of land available for grazing near the project villages; ■ This land procurement may also lead to impact on easement or access to other areas available for livestock grazing.	created and use private fodder lots on occupied government land,) on the project is limited, given that they do not have any legal claims on the land; ■ Livestock forms an important part of the villages' nutritional and energy source and may impact availability of food (milk, meat, etc.) during construction phase, to some extent is affected badly.	grazing land in the project area for livestock grazing-ensuring quality and access; ■ Easements shall be provided through project design elements to have minimal impact on this stakeholder groups' ease of activities.	
Vulnerable social groups such as women headed households, BPL and Landless households	■ This stakeholder group is comprised of groups/households that are considered to be vulnerable due to their social, political or economic status in the society. ■ For the project, the vulnerable groups are identified as women & women headed households, elderly, physically	■ The influence of project on this group is similar in nature as the entire fence line community, as it is a subset of the same.	■ The involvement of this stakeholder group is expected to be as part of the larger local community; ■ This stakeholder group should be specifically consulted to ensure adequate provisions in the RAP and LRP	■ Priority in economic benefits and development opportunities created by the project; ■ Minimal disturbance to the community in regards to access issues, grazing land, pollution and influx of migrant workers.	Medium

Relevant Stakeholders	Profile/ Status	Impact/Influence of the project on this Stakeholder Group	Impact/Influence of the Stakeholder Group on the project	Expectations, Opinions Key Concerns of Stakeholders	Overall Rating of Stakeholder Influence
	handicapped, landless and those with less than 1 ha of land and families in the Below the Poverty Line Category.		for the differential impacts expected on this group		
Indigenous People	■ While the project is not located in a scheduled V area, the local community is comprised of ST population. ■ The largest proportion of ST population is in the Project Villages of the Neemuch Solar Park. ■ The utilization of Government land and loss of Common Property resources in the area, that are used by STs is critical and triggers FPIC	■ The influence of project on this group is similar in nature as the entire fence line community, as it is a subset of the same.	■ The involvement of this stakeholder group is expected to be as part of the larger local community; ■ In keeping with the requirements of the IFC PS 7, the project will require to obtain Free Prior Informed Consent from this stakeholder group prior to the initiation of project activities.	■ Priority in economic benefits and development opportunities created by the project; ■ Minimal disturbance to the community in regards to access issues, grazing land, pollution and influx of migrant workers.	High
EPC/ Construction Contractors, sub-contractors	■ This stakeholder group comprises of the EPC contractors and other contractors/ sub-contractors involved in the Project for various tasks, like access roads construction, laying down of Transmission Line towers, civil and electric works for the Solar Park, etc.	■ The project provides this group contractor-ship opportunities and steady flow of income.	■ This stakeholder group is critical for the smooth functioning and timely implementation of the Project; ■ This group may also play an important role in the formation of public opinion towards the project	■ Continued economic opportunities and work generation; ■ Clarity in terms of scope of work, expectations, key performance indicators, responsibilities and timelines for the project; ■ Timely and adequate disclosure of information to allow the project activities to be carried out;	High

Relevant Stakeholders	Profile/ Status	Impact/Influence of the project on this Stakeholder Group	Impact/Influence of the Stakeholder Group on the project	Expectations, Opinions Key Concerns of Stakeholders	Overall Rating of Stakeholder Influence
				■ Fair business opportunities and contract closure; ■ Undertake project activities in keeping with the contractual agreements and applicable regulations in place.	
Unskilled labourers to be engaged for the construction phase of the project	■ This group is comprised of skilled and semi-skilled workers, who will be involved in the project on a contractual basis. ■ Labour may be local, regional or migrant (from other regions) and is likely to be comprised of skilled worker and any number of semi-skilled or unskilled workers This decision will be the contractors', depending on their requirements.	■ If local labour is used, it will help create goodwill locally and the project related opportunities would be shared with the local population.	■ This stakeholder group will be critical for the smooth functioning and timely implementation of the project; ■ This group may also play an important role in the formation of public opinion towards the project.	■ Concerns pertaining to wages, benefits, working hours and working conditions, etc.; ■ Health and safety involved with the construction phase ■ Working hours at the construction site ■ Timely disbursement of wages; ■ Access to the GRM established for the project	Low
Owners of land required for temporary occupation or use	■ Some of the project components would require short term leasing of land available, largely from Private and/ or Patta land owners; ■ This requirement would be better understood during the time of initiation of construction activity.	■ The short term leasing of land by the project may bring in additional income from lease, if the land is not being used for any other commercial purposes; ■ The project related activities on these land parcels may be for purposes of storage, set up of labour camps, etc. and may result in change in	■ This stakeholder group is critical for availability of land parcels that are conveniently located from the project footprint (based on the needs) and are available without disturbances or issues during the lease period.	■ The expectations of this stakeholder group is clear communication of lease terms and amount and timely payments, as necessary; ■ Restoration of land to its original state, or better, at the time of handing it back to the owners.	Medium

Relevant Stakeholders	Profile/ Status	Impact/Influence of the project on this Stakeholder Group	Impact/Influence of the Stakeholder Group on the project	Expectations, Opinions Key Concerns of Stakeholders	Overall Rating of Stakeholder Influence
		land use due to construction or storage activities, contamination issues, etc.			
Gram Panchayats (GPs) of Dhardi (for Bardawada village) and Badi (for Kawai and Badi villages)	■ This stakeholder group is comprised of Sarpanch, ward member and Gram Sewak of Panchayats of Dhardi (for Bardawada village) and Badi (for Kawai and Badi villages).	■ The influence of project on this stakeholder group is minimal due to limited control that the project can exert on the functioning of this group. There may be higher influence of this group just before the local elections	■ This group has the ability to influence the perception of the community in regards to the Project and its activities	■ Involvement of this group in decision making process for the project, especially related to the land taking process ■ Involvement in the formulation and implementation of the community development activities for the project; ■ Adequate communication of project information, in terms of timelines of key activities and their potential impacts.	Low
Singoli Tehsil/ Neemuch district officials (District Collector's office)	■ This group is comprised of the regulatory authorities at the tehsil and district level that are responsible for land demarcation, allotment of patta land, for the project and for various permits and licenses pertaining to the project. ■ The decisions regarding whether to provide alternate patta land, register 'verbal transactions' of patta land sale, and how other matters pertaining to patta land may be resolved also require	■ The project should be in compliance with the requirements stated and the processes governed by this stakeholder group. ■ Their involvement for resolution of patta land related issues will be essential ■ They will be required to provide support for law and order for the smooth and peaceable functioning, of construction activities, and to resolve grievance that may be escalated to them.	■ This stakeholder group is high in priority as this group provides the land demarcation and permits and licenses essential for the functioning of the project; ■ Noncompliance to conditions laid down in permits issued by this group stakeholders group can result in penalties and fines	■ Developmental activities in the project area; ■ Smooth operations of the project related activities by causing minimal impacts on the community; ■ Adherence to regulations and maintenance of law and order	High

Relevant Stakeholders	Profile/ Status	Impact/Influence of the project on this Stakeholder Group	Impact/Influence of the Stakeholder Group on the project	Expectations, Opinions Key Concerns of Stakeholders	Overall Rating of Stakeholder Influence
	their participation and final decision.		being levied on the Project.		
Regulatory Authorities at state and central levels	■ This stakeholder group is comprised of the central, state and district level regulatory authorities; ■ These authorities influence the project in terms of establishing policy, granting permits and approvals for the project, monitoring and enforcing compliance with the applicable rules and regulations.	■ The main concerns of the Regulatory Authorities from the Project Proponents is abidance to all applicable guidelines, policies and laws.	■ The ability of the project to comply with the various applicable rules and regulations may play a role in the timely implementation of the project.	■ Project's compliance to the regulatory requirements; ■ Timely disclosure of information and provisioning of updated through the life of the project ■ This stakeholder group is also critical for various permits/clearances required for the commissioning of the project	
Secondary Stakeholders					
Fence Line Community	■ This stakeholder group is comprised of the local population in the three villages, coming under the project boundaries that are not directly impacted by the Project activities as well as population residing in other villages in the Study area of the project;	■ The project will use land which is currently being used by this stakeholder group in accessing their farms, lakes and other common areas, grazing their livestock, etc.; ■ Some of the community members also use this land for cultivation (through encroachments) or work on the farm lands as agricultural labourers, etc. These activities will be disrupted after the project related activities commence on the identified land	■ This stakeholder group shall play a critical role in the smooth functioning of the Project.	■ Adequate provisions of easements while designing various project features in order to ensure minimal access restriction for this group; ■ Minimal disturbance to this group due to various activities of construction, operation and decommissioning phases, including plying of vehicles for transportation purposes, using the roads near these villages.	High

Relevant Stakeholders	Profile/ Status	Impact/Influence of the project on this Stakeholder Group	Impact/Influence of the Stakeholder Group on the project	Expectations, Opinions Key Concerns of Stakeholders	Overall Rating of Stakeholder Influence
Local Political Groups	■ This stakeholder group is comprised of the political parties and local politicians active in the region; ■ This group might be active in the area and may play an important role in the polarisation of public opinion towards the Project.	■ The project will have minimal or no influence on this stakeholder group	■ This stakeholder group is expected to play a critical role in the development of the public opinion towards the project, especially in light of the current political environment in the country.	■ The main expectation and concern of the stakeholder group from the project includes the project's role in the development of the area in keeping with the broader agenda of the projects and keeping the constituents and loyalists of the parties at the forefront.	Low
Civil Society/Local NGOs	This stakeholder group comprises of NGOs and Civil Society Organizations of a national, state and local level who may be active in the area. Most of the NGOs and CSOs working in the region are state level NGOs, involved in literacy, water management, WASH and gender equality some of the key NGOs and CSOs working in the region include the following: ■ Water Aid ■ Neemuch Gabli Educational & Social Welfare Society ■ Seema Mahila Mandal, Neemuch ■ Gramya Evam Bal Utthan Samiti ■ Grask Gramin Rojgar Evam Samaj Kalyan Samiti Samiti Dewas ■ Guru Shaheb Public Education Society	The level of influence of project on this stakeholder group is limited as it does not affect the functioning of this group.	■ The stakeholder group may play an important role in the development of public opinion for the project; ■ This stakeholder group may also be involved in the implementation of the community development plans	■ The main expectations and concerns of the stakeholder group from the project is likely to include the development of the project, in keeping with the applicable regulations and with minimal impacts on the local population, while contributing towards the overall development of the area ■ The interest of this stakeholder group primarily pertains to the roles of the project in implementing community development activities in the area; ■ Involvement in the formulation and implementation of the community development activities for the project; and ■ Timely disclosure of information pertaining to the project.	Medium

Relevant Stakeholders	Profile/ Status	Impact/Influence of the project on this Stakeholder Group	Impact/Influence of the Stakeholder Group on the project	Expectations, Opinions Key Concerns of Stakeholders	Overall Rating of Stakeholder Influence
	■ Gurudev Samaj Kalyan Samiti Ashoknagar ■ Gyanmanu Mahila Mandal				

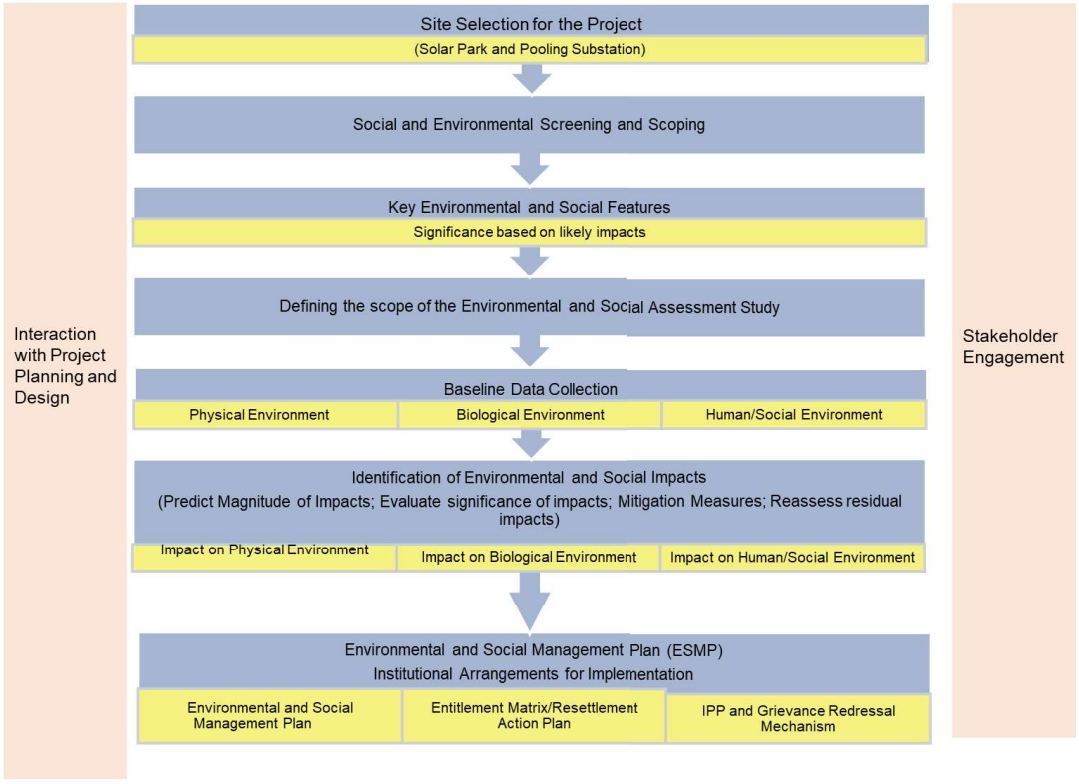
6. ENVIRONMENTAL AND SOCIAL IMPACTS

This section assesses the manner in which the Project will interact with elements of the physical, ecological or social environment to produce impacts to resources/ receptors. It has been organized as per the phases of the project i.e. pre-construction, construction and operational phases of the project life cycle to understand the risks and impacts associated with each phase.

6.1 Impact Assessment Methodology

The ESMF for Solar Park (Feb 2017) states that sub-projects shall be appraised based on a step-by-step process beginning with screening stage. The overall process as depicted in the ESMF is reproduced here and followed in the study.

Figure 6.1 Impact Assessment Process



Source: Developed based on ESMF process as per ESMF for Solar Park, Feb 2017, page-27 and ERM IA Standards

This section describes the impact assessment steps and methodology followed in this report which complies to the impact identification process and methodology (Section-4) of the ESMF for Solar Park.

6.1.1 Screening and Scoping

An Environmental and Social Scoping Study for the entire 1500 MW Project had been previously undertaken during September 2018- March 2019. The earlier identified impacts has been revisited during the ESIA study to confirm/validate the scoping study outcome. The screening checklist provided in ESMF for Solar Park (page 29) is used to identify relevant components to be investigated in detail during this study. The results of this screening are provided in table below.

Table 6.1 Screening for Impacts

Environmental and Social features	Status/Availability in and around site (study area)	Justification for Expectation of Potentially Significant Impacts
■ **Physical Environment**		
Land use and Land cover	■ The current land use of the proposed project site is agricultural land, grazing land, and scrub land with some trees ■ Some are is under water features like natural drains, ponds	■ In the construction phase, temporary land use changes will occur at contractor facilities and labour camps, material storage areas; ■ During construction phase, there will be permanent change of the land use within the land parcels where the Solar Park and pooling substation will be established.
Topography and Slope percentage	■ The Project site area is fairly flat land; ■ The high gradient area, i.e. area > 7° is nil.	■ Impact on topography of the Project site due to site levelling activities.
Soil Environment	■ Soil in the area is black cotton soil; ■ No major anthropogenic activities are carried out in the area which may lead to soil contamination. There are stone quarrying activities occurring on the site, mainly in Unit 3 area.	■ Changes in soil quality: ■ Any use of controlled explosives in rocky strata that leave trace amounts of chemicals; ■ Use of drilling fluids (natural, oil-based or synthetic) that can leave trace amounts of chemicals; ■ Improper waste disposal; ■ Discharge from contractor facilities, labour camps and site office; ■ Soil contamination due to accidental leaks and spills of oil, lubricants, or fuel from construction equipment. ■ Compaction of soil during excavation, transportation of construction material & tower components, foundation work, backfilling, tower erection and stringing; ■ During operation phase, soil environment will mainly be impacted due to disposal of municipal solid waste, improper storage and disposal of broken solar panels, , accidental spill of transformer oil (Fresh and used oil) and waste water from site office. ■ Generation of hazardous waste during operation of Solar Park.
Ambient Air Quality	■ As per baseline monitoring conducted for the Project, ambient air quality parameters (PM_{10}, $PM_{2.5}$, SO_2, NO_X) were within the prescribed CPCB limits.	■ Dust emissions due to movement of machinery and vehicles; ■ Fugitive dust emissions due to site clearance activities, excavation and back filling activities etc.; ■ Air emissions due to operations of D.G. sets.
Ambient Noise Quality	■ As per baseline monitoring conducted for the Project, the noise levels during day and night time were observed within the CPCB prescribed limits. However, at two locations day time noise levels are	■ Noise generation due to construction activities, operation of equipment's, machineries, D.G. sets, movement of vehicles and heavy earth moving machineries. ;

Environmental and Social features	Status/Availability in and around site (study area)	Justification for Expectation of Potentially Significant Impacts
	at the edge of prescribed limit of 55 dB for daytime.	■ Local communities may get disturb due to higher than anticipated noise.
Water Resources and Quality	■ The Project site is located a 'Critical' block (Jawad Block) as per CGWB; ■ Water bodies present in the study are mostly rainfed and are used for domestic purposes as washing of clothes and for domestic animals.	■ Stress on local water resources due to water requirement for the foundation activities, establishment of substation, labour camp during construction phase and domestic water use , module cleaning during operations; ■ Surface water and ground water contamination due to improper disposal of sewage at site and labour camp; ■ Impact on surface water quality due to runoff from storage area during monsoon; ■ Soil erosion and sediment transport to nearby water bodies.
Drainage	■ Project site have water bodies and 3rd or 4th order dendritic drainage channels within the site area.	■ Any changes to topography in the area will advertently impact the drainage channels and might result in water logging in adjoining areas of the Project site.
■ **Biological Environment**		
Ecology	■ Habitats in the study area include agricultural land, open scrub, water bodies and open forest areas (no forest area within Project footprint); ■ The closest legally protected area is Gandhi Sagar Wildlife Sanctuary, [IUCN Management Category IV] which is located ~ 50 km southeast of Unit 3; ■ The closest internationally recognized biodiversity area is Gandhi Sagar Wildlife Sanctuary and reservoir which is located ~32 km southeast of Unit III3. This is also declared an Important Bird and Biodiversity Area (IBA) and supports significant concentrations of water birds (IBA Category A4iii); ■ Four species of herpetofauna, 58 species of avifauna and 12 species of mammals were recorded/reported from the study area during site visit.	■ The Project site is located on scrub land and clearance of vegetation may affect the local ecology through the loss of shelter, foraging resources, shade and roosting sites; ■ A water body is adjacent to the south of Unit 3. This water body supports migratory bird activity and flocking behaviour among 2-3 winter migrants; and ■ The Project is located close to Arnea Reserve Forest and its contiguous forest land leading into Rajasthan. The forest land supports some high conservation species including leopard, sloth bear and vulture species (some sightings).
Occupational health and safety		■ Occupational health hazards; ■ Safety risk due to wrong handling of construction machinery, working at height, etc.; ■ Exposure of workers to Electromagnetic Field (EMF) while working in proximity to charged electric power lines during

Environmental and Social features	Status/Availability in and around site (study area)	Justification for Expectation of Potentially Significant Impacts
		construction and operation and maintenance.
■ **Social Environment**		
Demographics	■ The project footprint falls in three Project villages, while the AoI comprises 32 villages. The Project villages comprise of 440 households with a population of 2,047 individuals (as per 2011 Census data while the current figure is expected to have increased significantly). ■ The average size of the households is 5 in the Study Area	■ The EPC contractor or its sub-contractors will bring in skilled migrant labour during construction phase of the project that is expected to last for about 21 months; while for most of unskilled and semi-skilled works, preference will be given to local people. Displacement of local people is not envisaged for the proposed Solar Park however there are chances of migration of members of land selling households to cities in search of wage labour jobs, in light of lesser or limited land holdings available in the village.
Economy and Employment	■ The population is currently engaged in agriculture, animal husbandry and jobs as agricultural labourers	■ Solar Park will generate employment opportunity for local people mostly during construction phase as well as for select activities (and in smaller numbers) like module cleaning, grass cutting and security related jobs during operation phase.
Land based Impacts	■ The population is currently engaged in agriculture, animal husbandry and jobs as agricultural labourers	■ Land based livelihood may be hampered due to procurement of Private, Patta and Government land for the project. The residents of the project villages are engaged in cultivation in and around the land identified for the project footprint; ■ There are understood to be more than 600 Project affected people due to land procurement related impacts. ■ The setting up of project would lead to loss or reduction of agricultural income for Private land owners, patta land holders, squatters and encroachers on Government land, agricultural labourers, Graziers, etc.
Community health and safety	■ Proposed Project site have settlements in proximity	■ Setting up of labour camps in the proximity of the communities and use of village roads for transportation of material and labour is likely to induce negative impacts such as road accidents, air pollution, noise pollution, potential conflict between the local community and labourers, increased risk of gender based violence, etc. ■ Transportation of construction materials and increased vehicular movement will lead to traffic hazards for community residing close to the access roads.
Indigenous People	■ There is presence of Bhil (ST) households across the three villages of the project; however, extent of impact by the project needs to be	■ This group is present and is understood to be working as agricultural laborers in private and patta land parcels (perhaps also on encroached Government land

Environmental and Social features	Status/Availability in and around site (study area)	Justification for Expectation of Potentially Significant Impacts
	determined through focused consultations	parcels) and thus will be economically displaced due to project related land procurement

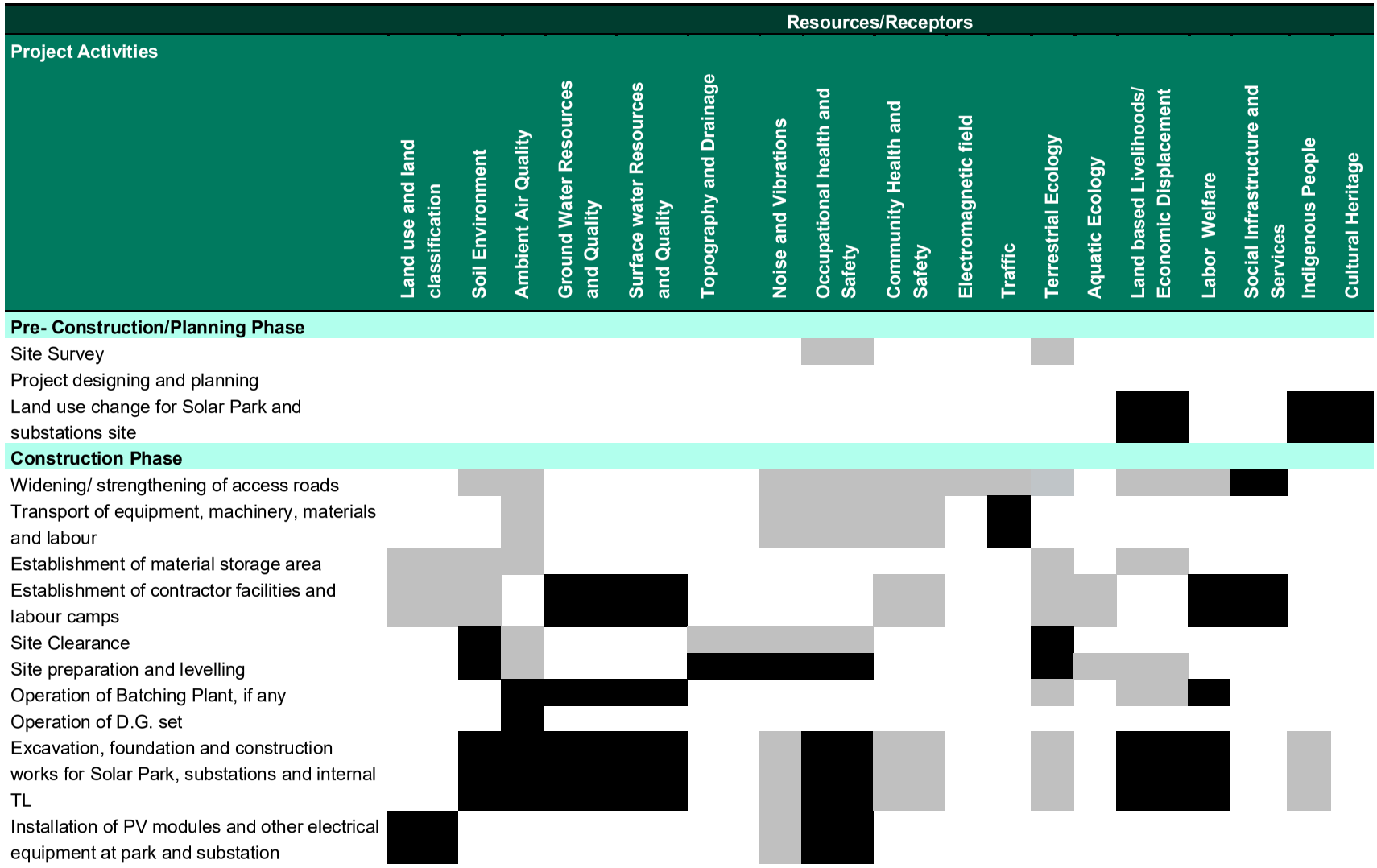
6.1.2 Impact Matrix

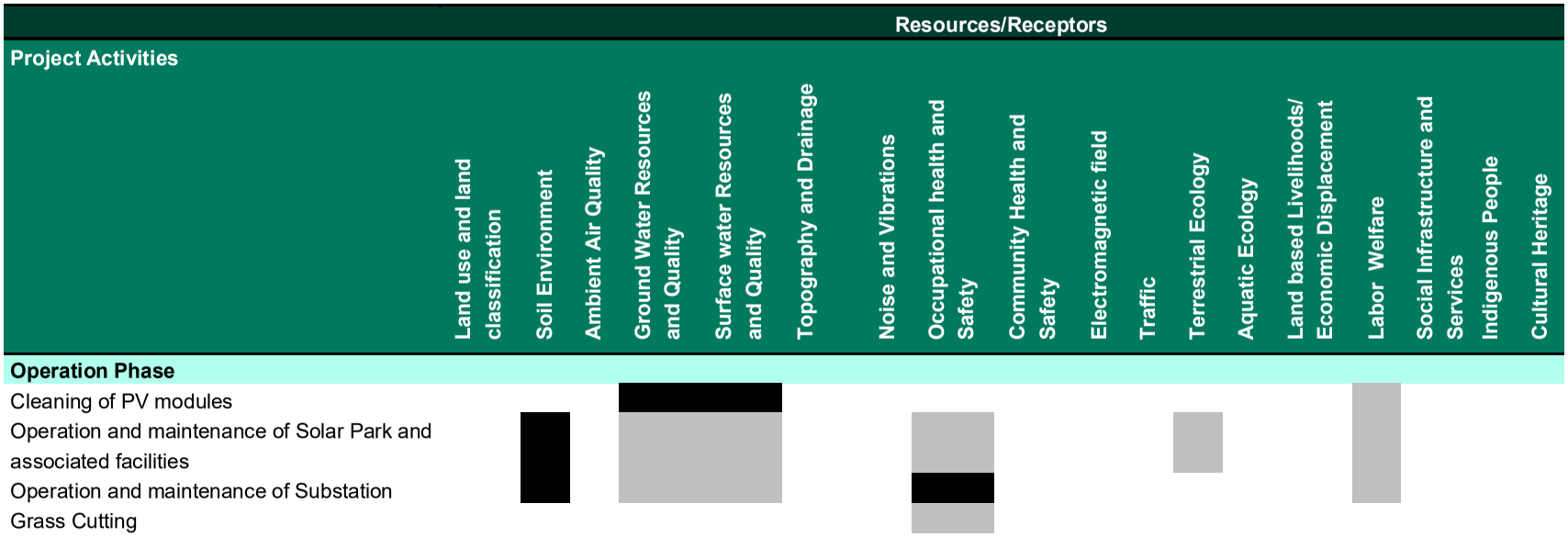
In addition to the screening checklist, various project features and activities that could reasonably act as a source of impact were identified, and these have been listed down the vertical axis of a potential interactions matrix. The resources/receptors in the environment have been listed across the horizontal axis of the matrix. The interaction matrix enables a methodical identification of the potential interactions each Project activity may have on the range of resources/receptors within the Area of Influence i.e. the study area for the Project.

The completed Potential Interactions Matrix for Project activities and likely impacted resources/ receptors is presented in ***Table 6.2***. The matrix consists of a list of resources/receptors that could be affected against a list of activities for the proposed Solar Park. Entries in the matrix cells are colored to indicate whether:

- An interaction is not reasonably expected (white);
- An interaction is reasonably possible and the resulting impacts are likely to lead to low effects (grey); or
- The interaction is reasonably possible and at least one of the resulting impacts is likely to lead to medium or high effect (black).

Table 6.2 Activity Receptor Interaction Matrix





= Represents "no" interactions is reasonably expected,

= Represents interactions reasonably possible but none of the outcome will lead to significant impacts

= Represents interactions reasonably possible with one of the outcomes leading to potential significant impact

6.1.3 Prediction of Impacts

Prediction of impacts is carried out with an objective to determine what is likely to happen to the environment as a consequence of the Project and its associated activities. From the potentially significant interactions identified in scoping, the impacts to the various resources/receptors were elaborated and evaluated. The list of impacts which were identified from this for detailed assessment for different stages of the project is as follows:

Phase	Impact/Potential Impact Title
Planning Phase	Impact due to Private Land Purchase
	Impacts due to Patta land Purchase
	Impacts due to LUPA of Government land
Planning and Construction Phase	Land use and Land cover
	Soil environment
	Topography and Drainage
	Water resources and quality
	Ambient air quality
	Ambient noise quality
	Occupational health and safety
	Habitat Modification and Loss
	Impacts due to construction Activities
	Ecosystem Services
	Impacts due to temporary occupation of land for construction activities
	Impact on Community Health and Safety
	Stress on community resources
	Impact on Employment and Entrepreneurship opportunities
	Impact on women
Operation Phase	Soil Environment
	Water resources and quality
	Health and safety
	Collision and Electrocution risks
	Community health and safety
	Impact on employment
	Impact on Indigenous Communities/Vulnerable groups
	Impact on women

6.1.4 Evaluation of Impacts- Impact Significance

Each impact was described in terms of its various relevant characteristics (e.g., type, scale, duration, frequency, extent). The terminology used to describe impact characteristics is as shown in ***Table 6.3***.

Table 6.3 Impact Characteristic Terminology

Characteristic	Definition	Designation
Type	A descriptor indicating the relationship of the impact to the project (in terms of cause and effect)	Direct Indirect Induced
Extent	The “reach” of the impact (e.g., confined to a small area around the Project Footprint, projected for several kilometres, etc.)	Local National Global

Characteristic	Definition	Designation
Duration	The time period over which a resource/ receptor is affected.	Temporary Short-term Long-term Permanent
Scale	The size of the impact (e.g., the size of the area damaged or impacted, the fraction of a resource that is lost or affected, etc.)	[no fixed designations; intended to be a numerical value or a qualitative description of "intensity"]
Frequency	A measure of the constancy or periodicity of the impact.	[no fixed designations; intended to be a numerical value or a qualitative description]

The definitions for the type designations are given in ***Table 6.4***. Definitions for the other designations are resource/receptor-specific.

Table 6.4 Impact Type Definitions

Type	Definition
Direct	Impacts that result from a direct interaction between the Project and a resource/ receptor
Indirect	Impacts that follow on from the direct interactions between the Project and its environment as a result of subsequent interactions within the environment
Induced	Impacts that result from other activities (which are not part of the Project) that happen as a consequence of the Project.

The above characteristics and definitions apply to planned and unplanned events. An additional characteristic that pertains only to unplanned events is likelihood. The likelihood of an unplanned event occurring was designated using a qualitative scale, as described in ***Table 6.5***.

Table 6.5 Definitions of Likelihood Designations

Likelihood	Definition
Unlikely	The event is unlikely but may occur at some time during normal operating conditions (probability less than 20%)
Possible	The event is likely to occur at some time during normal operating conditions (probability greater than 20% and less than 50%)
Likely	The event will occur during normal operating conditions (probability greater than 50%

Once an impact's characteristics were defined, each impact was assigned a 'magnitude'. Magnitude is typically a function of a combination (depending on the resource/receptor in question) of the following impact characteristics:

- Extent
- Duration
- Scale
- Frequency

In case of unplanned events only, magnitude incorporates the 'likelihood' factor discussed above.

Magnitude essentially describes the intensity of the change that was predicted to occur in the resource/receptor as a result of the impact. As discussed above, the magnitude designations themselves are universally consistent, but the descriptions for these designations vary on a resource/receptor-by-resource/receptor basis. The universal magnitude designations are:

- Positive
- Negligible
- Small
- Medium
- Large

In the case of a positive impact, no magnitude designation (aside from 'positive') was assigned. It was considered sufficient for the purpose of the IA to indicate that the Project was expected to result in a positive impact, without characterising the exact degree of positive change likely to occur.

In the case of impacts resulting from unplanned events, the same resource/ receptor-specific approach to concluding a magnitude designation was followed, but the 'likelihood' factor was considered, together with the other impact characteristics, when assigning a magnitude designation.

In addition to characterising the magnitude of impact, the other principal impact evaluation step was definition of the sensitivity/ vulnerability/ importance of the impacted resource/receptor. There are a range of factors that was taken into account when defining the sensitivity/ vulnerability/ importance of the resource/receptor, which may be physical, biological, cultural or human. Other factors were also considered when characterising sensitivity/ vulnerability/importance, such as legal protection, government policy, stakeholder views and economic value. The sensitivity/ vulnerability/importance designations used herein for all resources/receptors are:

- Low
- Medium
- High

Once magnitude of impact and sensitivity/ vulnerability/ importance of resource/ receptor have been characterised, the significance was assigned for each impact as below:

- **Negligible**: An impact of negligible significance is one where a resource/ receptor (including people) will essentially not be affected in any way by a particular activity or the predicted effect is deemed to be 'imperceptible' or is indistinguishable from natural background variations.
- **Minor**: An impact of minor significance is one where a resource/ receptor will experience a noticeable effect, but the impact magnitude is sufficiently small and/or the resource/receptor is of low sensitivity/ vulnerability/ importance. In either case, the magnitude should be well within applicable standards/ guidelines.
- **Moderate**: An impact of moderate significance has an impact magnitude that is within applicable standards/guidelines, but falls somewhere in the range from a threshold below which the impact is minor, up to a level that might be just short of breaching a legal limit. Clearly, to design an activity so that its effects only just avoid breaking a law and/or cause a major impact is not best practice. The emphasis for moderate impacts is therefore on demonstrating that the impact has been reduced to a level that is as low as reasonably practicable (ALARP). This does not necessarily mean that impacts of moderate significance have to be reduced to minor, but that moderate impacts are being managed effectively and efficiently.
- **Major**: An impact of major significance is one where an accepted limit or standard may be exceeded, or large magnitude impacts occur to medium valued/sensitive resource/receptors or

medium magnitude impacts occurs to highly valued/sensitive resource/receptors. An aim of IA is to get to a position where the Project does not have any major residual impacts, certainly not ones that would endure into the long-term or extend over a large area. However, for some aspects there may be major residual impacts after all practicable mitigation options have been exhausted (i.e. ALARP has been applied). An example might be the visual impact of a facility. It is then the function of regulators and stakeholders to weigh such negative factors against the positive ones, such as employment, in coming to a decision on the Project.

- **Critical**: An impact of critical significance is one where an accepted limit or standard may be exceeded, or large magnitude impacts occur to highly valued/sensitive resource/receptors. However, for some aspects there may be critical residual impacts after all practicable mitigation options have been exhausted (i.e. ALARP has been applied), which needs to be offset.

Figure 6.2 Impact Significance Matrix

Receptor Sensitivity	Impact Magnitude			
	Negligible	Small	Medium	Large
Low	Negligible	Negligible	Minor	Moderate
Medium	Negligible	Minor	Moderate	Major
High	Negligible	Moderate	Major	Critical

It is important to note that impact prediction and evaluation takes into account any embedded controls (i.e., physical or procedural controls that are already planned as part of the Project design, regardless of the results of the IA Process).

6.1.5 Identification of Mitigation and Enhancement Measures

Once the significance of an impact has been characterised, the next step was to evaluate what mitigation and enhancement measures are warranted. For the purposes of this IA, ERM adopted the following Mitigation Hierarchy:

- **Avoid at Source, Reduce at Source:** avoiding or reducing at source through the design of the Project.
- **Abate on Site:** add something to the design to abate the impact.
- **Abate at Receptor:** if an impact cannot be abated on-site then control measures can be implemented off-site.
- **Repair or Remedy:** some impacts involve unavoidable damage to a resource (e.g. agricultural land and forestry due to creating access, work camps or materials storage areas) and these impacts can be addressed through repair, restoration or reinstatement measures.
- **Compensate in Kind, Compensate Through Other Means:** where other mitigation approaches are not possible or fully effective, then compensation for loss, damage and disturbance might be appropriate (e.g., planting to replace damaged vegetation, financial compensation for damaged crops or providing community facilities for loss of fisheries, access, recreation and amenity space).

The priority in mitigation was to first apply mitigation measures to the source of the impact (i.e., to avoid or reduce the magnitude of the impact from the associated Project activity), and then to address the resultant effect to the resource/receptor via abatement or compensatory measures or offsets (i.e., to reduce the significance of the effect once all reasonably practicable mitigations have been applied to reduce the impact magnitude).

6.1.6 Preparation of Environmental and Social Management Plan

The final stage in the IA Process is the definition of the basic management and monitoring measures that are needed to identify whether: a) impacts or their associated Project components remain in conformance with applicable standards/ guidelines; and b) mitigation measures are effectively addressing impacts and compensatory measures and offsets are reducing effects to the extent predicted. The mitigation measures recommended in individual impact assessments were compiled for project construction and operation phases. The ESMP prepared has also taken organization structure of RUMS and context of the project (sectoral, regional, and socio-cultural external environment) to determine practical and effective mitigation measures.

6.2 Impacts on Physical Environment

The proposed Project site is located in a rural setup with no major industrial/ anthropogenic activities. This section outlines the potential impacts on the physical environment due to project activities planned during different phases of the Project lifecycle.

6.2.1 Assessment Criteria

ERM has defined impact assessment standards based on internal parameters that identifies the significance value of the impacts as a matrix between resource/receptor sensitivity or vulnerability and impact magnitude. The internal impact assessment standards for impacts on physical environment has been provided in ***Table 6.6*** and ***Table 6.7*** below.

Once magnitude of impact and sensitivity/ vulnerability/ importance of resource/ receptor have been characterised, the significance was assigned for each impact. Impact significance is designated using the matrix shown in ***Figure 6.2.***

Table 6.6 Criteria for Resource/ Receptor Sensitivity or Vulnerability

Environmental Attributes	Sub criteria	Low	Medium	High
Land use and Land cover		Land use not of relevant use by Community Negligible visual change.	Land use of local use by communities e.g. grazing, agriculture, but no major dependence Visual Change but common feature	Land use of regional importance. Change would impact Land use classification of the area. Land use of major dependence of local people for agriculture, livestock grazing, settlement etc. Visual Change aesthetically affecting locals.
Soil Environment	*Environment* The extent to which the soil and its quality plays an ecosystem role in terms of supporting biodiversity. This includes its role as in supporting a lifecycle stage	The soil quality does not support diverse habitat or populations and/or supports habitat or population of low quality	The soil quality supports diverse habitat or population of flora and fauna and supports habitats commonly available in the study area	The soil quality supports economically important or biologically unique species or provides essential habitat for such species
	Social The extent to which the soil and its quality provides a use (agricultural use) to the local communities and businesses, or is important in terms of national resource protection objectives, targets and legislation	The soil quality has little or no role in provisioning of services as agricultural uses for the local community.	The soil has local importance in terms of provisioning services as agricultural services but there is ample capacity and / or adequate opportunity for alternative sources of comparable quality i.e. ready availability across the study area.	The soil is wholly relied upon locally, with no suitable technically or economically feasible alternatives, or is important at a regional level for provisioning services.
Topography		Flat topography	Undulating topography	Hilly area
Water Resources - Surface water and ground water (quality/quantity)	*Environment* The extent to which the water resource plays an ecosystem or amenity role in terms of supporting biodiversity either directly or indirectly, particularly with respect to dependent ecosystems.	The water resource does not support diverse aquatic habitat or populations, or supports aquatic habitat or population that is of low quality.	The water resource supports diverse populations of flora and / or fauna but available in the surface water bodies in the region	The water resource supports economically important or biologically unique aquatic species or provides essential habitat for such species

Environmental Attributes	Sub criteria	Low	Medium	High
	Social The extent to which the water resource provides or could provide a use (drinking water, agricultural uses, washing and other domestic or industrial, use as waterways) to the local communities and businesses, or is important in terms of national resource protection objectives, targets and legislation	■ The water resource has little or no role in terms of provisioning services as agricultural water source, other domestic uses as washing, bathing, industrial use and waterways for the local community. ■ The groundwater resource is not currently abstracted and used in the vicinity of the Project, but is of sufficient quality and yield to be used for that purpose in the future (and there is a reasonable potential for future use). ■ The ground water block is categorized as 'safe' by CGWB	■ The surface water resources have local importance in terms of provisioning services but there is ample capacity and / or adequate opportunity for alternative sources of comparable quality. ■ The groundwater resource is an important water supply, and is currently used, but there is capacity and / or adequate opportunity for alternative sources of comparable quality. ■ The ground water block is categorized as 'safe' by CGWB.	■ The surface water resources are wholly relied upon locally, with no suitable technically or economically feasible alternatives, or is important at a regional or transboundary watershed level for provisioning services. ■ The groundwater resource is wholly relied upon locally, with no suitable technically or economically feasible alternatives, or is important at a regional or national level for water supply or contribution to groundwater dependent ecosystems (e.g. transboundary rivers). ■ The ground water block is categorized as 'semi critical', 'critical' or 'over exploited' by CGWB.
Ambient Air Quality	Human Receptor	Locations where human exposure is transient.[1]	Few Receptors (settlements) within 500 m of the Project site	Densely populated receptors(settlements) within 500 m of Project site
	Ecological Receptor	Locally designated sites; and/or areas of specific ecological interest, not subject to statutory protection.	Nationally designated sites.	Internationally designated sites.
Ambient Noise Quality	Human Receptor	Industrial area	Residential and Recreational place	Educational/ Religious/ Medical Facilities

[1] As per the NAAQS and World Bank/IFC guidelines, there are no standards that apply to short –term exposure, e.g., one or two hours, but there is still a risk of health impacts, albeit less certain.

Environmental Attributes	Sub criteria	Low	Medium	High
	Ecological Receptor	Locally designated sites; and/or areas of specific ecological interest, not subject to statutory protection (for example, as defined by the Project ecology team).	Nationally designated sites.	Internationally designated sites.

Table 6.7 Criteria for Impact Magnitude

Magnitude Criteria	Negligible	Small	Medium	Large
Land use and Land cover	■ An imperceptible, barely or rarely perceptible change in land use characteristics. The change may be short term.	■ Subtle changes in land use character over a wide area of a more noticeable change either over a restricted area or infrequently perceived. The change may be short term to long term and is reversible.	■ A noticeable change in land use character, frequently perceived or continuous and over a wide area; or a clearly evident change over a restricted area that may be infrequently perceived. The change may be medium to long term and may not be reversible	■ A clearly evident, frequently perceived and continuous change in land use characteristics affecting an extensive area. The change may be long term and would not be reversible
Soil compaction and erosion	■ Qualitative-No perceptible or readily measurable change from baseline conditions ■ Scale-Localized area as Particular activity areas ■ Time-Short duration (few days) or one time as temporary	■ Perceptible change from baseline conditions but likely to easily revert back to earlier stage with mitigation ■ Scale- -Project site, activity areas and immediate vicinity not impacting any sensitive receptor ■ Short term-Only during particular activities or phase of the Project lifecycle as civil works or construction phase (few months)	■ Clearly evident (e.g. perceptible and readily measurable) change from baseline conditions and/or likely take time to revert back to earlier stage with mitigation ■ Scale- Project site, activity areas and immediate vicinity impacting sensitive receptor/s ■ Long term-Spread across several phases of the Project lifecycle (few years)	■ Major (e.g. order of magnitude) change in comparison to baseline conditions and/or likely difficult or may not to revert back to earlier stage with mitigation ■ Scale- Regional or international; ■ Permanent change

Magnitude Criteria	Negligible	Small	Medium	Large
Soil contamination	■ Well within Dutch standard[1]	■ Well within Dutch standard	■ Exceeds Target Value but well within Interventional Value	■ Exceeds Interventional Value and needs intervention.
Topography	■ An imperceptible, barely or rarely perceptible change in topographical characteristics. The change may be short term	■ A subtle change in topography character over a wide area or a more noticeable change either over a restricted area or infrequently perceived. ■ The change may be short term to long term and is reversible.	■ A noticeable change in topographic character, frequently perceived or continuous and over a wide area; or a clearly evident change over a restricted area that may be infrequently perceived. The change may be medium to long term and may not be reversible.	■ A clearly evident, frequently perceived and continuous change in topographic characteristics affecting an extensive area. The change may be long term and would not be reversible.
Water Resources - Surface water and ground water (quantity/availability)	■ There is likely to be negligible (less than 1% of lean season flow) or no consumption of surface water by the Project at any time. ■ There is likely to be negligible or no abstraction, use of or discharge to the groundwater by the Project at any time. ■	■ The Project will consume surface water, but the amounts abstracted are likely to be relatively small in comparison to the resource available at the time of use (i.e. taking into account seasonal fluctuation) ■ The Project will consume groundwater or deliver discharge to groundwater, but the amounts abstracted / discharged are likely to be relatively small in comparison to the resource available at the time of use	■ The Project will consume surface water, and the amounts abstracted are likely to be significant in comparison to the resource available at the time of use (i.e. taking into account seasonal fluctuation) ■ The Project will consume groundwater or discharge to groundwater, and the amounts abstracted / discharged are likely to be significant in comparison to the resource available at the time of use (i.e. taking into account seasonal fluctuation).	■ The Project will consume surface water, and the amounts abstracted are likely to be very significant in comparison to the resource available at the time of use (i.e. taking into account seasonal fluctuation) ■ The Project will consume groundwater or discharge to groundwater, and the amounts abstracted / discharged are likely to be very significant in comparison to the resource available at the time of use (i.e. taking into account seasonal fluctuation).

[1] Dutch Target and Intervention Values (Soil remediation Circular 2009-2012 Revision), https://zoek.officielebekendmakingen.nl/stcrt-2012-6563.pdf.

The assessment of potential impacts to soil and sediment has been considered as per the Dutch Standard as Bangladesh does not have any local standards for soil or sediment quality.

Magnitude Criteria	Negligible	Small	Medium	Large
		(i.e. taking into account seasonal fluctuation).		
Water Quality	■ Discharges are expected to be well within statutory limits ■ Abstractions from or discharge to aquifer(s) are unlikely to cause water quality issues	■ Discharges are expected to be within statutory limits. ■ Groundwater quality be within ambient levels or allowable criteria or may exceed for 1-2 parameters which is common occurrence due to geological regime of the area. ■ Abstraction or discharge to aquifer(s) may cause small but local changes in water quality in the aquifer system. These can be considered potential short-term localized effects on groundwater quality which is likely to return to equilibrium conditions within a short (months) timeframe.	■ Occasional breach(es) of statutory discharge limits (limited periods) expected. ■ Groundwater quality exceeds ambient levels or allowable criteria for key parameters. ■ Abstraction or discharge to aquifer(s) are expected to cause potential localized effects on groundwater quality which are likely to be fairly long lasting and / or give rise to indirect ecological and / or socio-economic impacts	■ Repeated breaches of statutory discharge limits (over extended periods) expected. ■ Groundwater quality exceeds ambient levels or allowable criteria. ■ Abstractions or discharge to aquifer(s) are expected to cause potentially severe effects on groundwater quality which are likely to be long-lasting (e.g. years or permanent) and / or give rise to indirect ecological and / or socio-economic impacts.
Ambient Air Quality	■ Soil type with large grain size (e.g. sand); and/or No emissions/dust generation due to Project across all phases. ■ Existing ambient air quality of the area is well below the Prescribed NAAQ limits	■ Soil type with large grain size (e.g. sand); and/or ■ Limited emissions/dust generations for short duration ■ Existing ambient air quality of the area is well below the Prescribed NAAQ limits.	■ Moderately dusty soil type (e.g. silt); and/or ■ Dust generation and emissions from Projects for long duration ■ Existing ambient air quality of the area is within the Prescribed NAAQ limits but with only deferential of 10- 20 microgm/m3	■ Potentially dusty soil type (e.g. clay, which will be prone to suspension when dry due to small particle size); and ■ Significant process emissions from Project for the entire Project cycle.

Magnitude Criteria	Negligible	Small	Medium	Large
				■ Existing ambient air quality of the area is exceeding the Prescribed NAAQ limits.
Ambient Noise Quality	■ Predicted noise levels are at or less than 3 dB (A) above the relevant limits / thresholds. ■ Short term exposure (Few hours in a day and not continuous)	■ Predicted noise levels are 3 to less than 5 dB (A) above the relevant limits / thresholds	■ Predicted noise levels are between 5 and 10 dB (A) above the relevant limits / thresholds. ■ Medium Term Exposure (1 to 6 months)	■ Predicted noise levels are more than 10 dB (A) above the relevant limits / thresholds. ■ Long term exposure (> 6 months)

6.2.2 Planning and Construction Phase

6.2.2.1 Impact on land use and land cover

For the purpose of assessment of impacts on land use of the area, following Project activities leading to an alteration in land use of the area during construction phase were considered:

- Construction/ upgradation of access roads (internal);
- Establishment and operation of temporary structures such as temporary site office (portable cabin) and store yard;
- Vehicular movement;
- Establishment of PV modules and associated transformer yard; and
- Construction of Central Monitoring Station, Switching Yard.

Context and Receptor Sensitivity

The proposed Project site is located in a rural setup with no major industrial/ anthropogenic activities. The current land use of the proposed project is mostly scrub land, used for grazing with parcels of agricultural land, some of which are a result of encroachment. In the pre-construction phase, permanent change will occur to the land use (grazing and agriculture) where the project boundary will be established, to prepare for the next phases (construction and operations). In the construction phase, temporary land use changes will occur at contractor facilities and labour camps, material storage areas and there will be a long term change of the land use within the land parcels where the Solar Park and pooling substation will be located. Receptor sensitivity is envisaged to be ***medium*** considering the land use will change to industrial. It is understood that some avoidance of agricultural areas will be achieved but other areas will need the land use to be changed. All remaining scrub, currently available for grazing will be converted within the project boundary, affecting the dependence of the community on this area, though, it is understood, that some land for grazing will be set aside. .

Embedded/In-built Controls

Construction activities will be restricted to within the acquired land and immediate surroundings only. Post construction activities, any land taken for a temporary basis for storage of material would be restored to their extent possible as acceptable to land owners to minimise impacts to land use. Existing roads will be used to the extent possible.

Impact Magnitude

The establishment of the Solar Park will convert scrub land and agricultural land to industrial use for the long term (at least 25 years). The total land area of 1065.7 ha will undergo land use change, out of which 968.838 Ha is government land. Short term changes in land use are also envisaged from the establishment of the associated facilities such as storage yard, site offices, labour camp and switch yard. However, the impact on land use will only be within the Project boundary and will not affect any of the neighbouring areas. Furthermore, the changes to land use will be reversible. Thus, magnitude of the impact has been assessed to be ***medium***. Impacts on land use during construction phase due to establishment of temporary facilities like labour camp, storage area, will be for a shorter period of time.

Impact Significance

As per the impact significant assessment matrix (refer ***Figure 6.2)*** a combination of medium impact magnitude with medium receptor sensitivity results in impact significance as **moderate**.

Additional Mitigation Measures

- Construction activities should be restricted to designated area;
- On completion of construction activities, land used for temporary facilities such as Contractor office, batching plant (if any), stockyard, labour camp should be restored to the extent possible;
- The land use around permanent Project facilities should not be disturbed; and
- The land should be restored back to the original state to the extent possible after completion of life cycle of the Project and in case there are plans not to continue further at the site.

Residual Impact Significance

The residual impact significance is envisaged to remain **moderate** as changes in land use will be for long term for majority of the Project component (installation of PV modules, access roads, central monitoring station, and switching yard).

Impact	Changes in Land use and land cover				
Impact Nature	Negative	Positive	Neutral		
Impact Type	Direct	Indirect	Induced		
Impact Duration	Temporary	Short-term	Long-term	Permanent	
Impact Extent	Local	Regional	International		
Impact Scale	Limited to Project site and associated facilities				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Resource /Receptor Sensitivity	Low	Medium	High		
Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **moderate**				
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Large
Residual Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **moderate**				

6.2.2.2 Soil Environment

Following Project activities during construction phase are envisaged that may impact the soil environment:

- Construction/strengthening of access roads;
- Vegetation clearance and top soil removal;
- Storage of oil and lubricants onsite;
- Storage of construction materials; and
- Disposal of different type of waste generated during construction activities, from the temporary site office and labour camp.

The Project site has agricultural land, scrub land and barren land. The uncultivated land parcels with rocky strata were also observed during site visit. As reported during consultation with local

community, it takes huge cost, time and efforts to undertake agriculture activity on the land parcels with rocky strata.

In addition, there are agricultural land parcels in the surroundings of the Project site. Village Bardawada towards south-west, Banediya towards south and agricultural land towards east adjacent to Unit 1. Unit 2 also has few agricultural fields just adjacent to the boundary towards west and south-east. Unit 3 has agricultural fields just adjacent to the boundary towards north. Village Badi is present adjacent to Unit 2 towards west.

The site clearance activities, excavation and levelling of ground will cause disturbance of the soil strata and impact on soil quality. The Project will also undertakes the soil compaction activity to ensure soil stability during the site levelling at site. Hence, the receptor sensitivity has been assessed as ***medium.***

Soil Erosion and Compaction

The project will undertake the soil compaction activity to ensure soil stability during the establishment of storage areas, labour camp, access road, installation of batching plant, establishment of substation, SCADA building etc. During construction activities, there would be compaction of soil in the Project area during movement of vehicles/ construction machinery and work force movement. In addition, laying of electrical wires in the agricultural field during erection of internal electrical lines will also lead to the compaction of agricultural soil to certain extent.

Embedded/In-built Controls

- Vehicles will utilize existing roads to access the site. Existing roads will be widened/ strengthened to have the width and turning radius to accommodate the necessary vehicles for the Project.

Impact Magnitude

The site clearance, excavation, drilling for foundation and access road construction will largely affect the top layers of the soil. Compaction of soil during excavation, transportation of construction material & project components, foundation work, backfilling, erection of structures will lead to temporary effects on natural infiltration of rainwater, but these impacts were temporary and for short term. Further, site clearance will be restricted only in the Project site. Land close to the Project site will not be disturbed.

Vehicles will be encouraged to utilize the existing roads with minor strengthening. The usage of existing roads by vehicles and minimal access road construction will reduce the impact from soil compaction in the area.

Based on the above, the Impact Magnitude has been assessed to be **small.**

Impact Significance

As per the impact significant assessment matrix (refer ***Figure 6.2***) a combination of small impact magnitude with medium receptor sensitivity results in impact significance as **minor**.

Additional Mitigation Measures

- The topsoil present in the construction shall be removed and stock pilled in separate area;
- The stock pile should be protected from natural elements to prevent from erosion and also degradation;
- Topsoil to be reused on site for landscaping purpose;
- Defined routes for transportation and construction vehicles, workers etc. to minimize soil compaction;

- Good drainage as per the natural slope condition should be provided to reduce surface runoff and associated erosion;
- Back filling and revegetation of the area disturbed will be undertaken phase wise immediately after the completion; and
- Site clearance, piling, excavation and access road construction will not be carried out during the monsoon season to minimize erosion and run-off.

Residual Impact Significance

The significance of residual impacts will lower down to **negligible** taking into account the recommended mitigation measures.

Impact	Soil Erosion and Compaction				
Impact Nature	Negative	Positive	Neutral		
Impact Type	Direct	Indirect	Induced		
Impact Duration	Temporary	Short-term	Long-term	Permanent	
Impact Extent	Local	Regional	International		
Impact Scale	Limited to Project areas				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Resource/ Receptor Sensitivity	Low	Medium	High		
Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **Minor.**				
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Large
Residual Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **Negligible.**				

Waste Generation and Soil Contamination due to leaks and Spills

General construction waste generated onsite will comprise of concrete, steel cuttings/filings, packaging materials or plastic. Municipal solid wastes consisting of food waste, plastic, glass and waste paper will also be generated by the construction workforce at canteen facility/ labour camp. A small proportion of the waste generated during construction phase will be hazardous and will include waste fuel, grease, broken modules, paints, chemicals and waste oil containing rags. If improperly managed, solid waste could create impacts on soil quality.

Embedded/In-built Control

- Spill control measures such as the storage and handling of chemicals and fuel in concrete areas with secondary containment will be implemented to minimize impacts in the event of a spill;
- The EPC contractors will have control over the amount and types of waste (hazardous and non-hazardous) produced at the site;
- The hazardous wastes to be stored onsite temporarily at separate designated covered area provided with impervious flooring and secondary containment and to be disposed in accordance with Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016; and

- Workers will be strictly instructed/ trained about random disposal of any waste generated from the construction activity.

Impact Magnitude

The construction contractors will have control over the amount and types of waste (hazardous and non- hazardous) produced at the site. The municipal waste from the labour camp will only be routed through proper collection and handover to local municipal body for further disposal. The hazardous wastes will be temporarily stored in labelled drums on impervious surface at designated area onsite and will be disposed off through approved vendors in accordance to Hazardous Wastes Rules, 2016The impact magnitude has therefore been assessed as **small**.

Impact Significance

As per the impact significant assessment matrix (refer ***Figure 6.2***) a combination of small impact magnitude with medium receptor sensitivity results in impact significance as **minor**.

Additional Mitigation Measures

- Construction and Demolition Waste should be stored separately and disposed through approved facility/landfill;
- All waste should be stored in a shed that is protected from the elements (wind, rain, storms, etc.) and away from natural drainage channels;
- A log book should be maintained for quantity and type of hazardous waste generated;
- Designated areas should be provided for Solid Municipal Waste and daily collection and period disposal should be ensured;
- EPC Contractor should ensure that no unauthorized dumping of used oil and other hazardous waste is undertaken at the site;
- Hazardous waste to be disposed through MPPCB authorised vendors;
- In case of accidental/unintended spillage, the contaminated soil should be immediately collected and stored as hazardous waste;
- The guidelines and procedures shall be prepared and followed for immediate clean-up actions following any spillages;
- Damaged/ discarded solar panels to be disposed with the help of authorised recycling vendors/ module installation contractors/ supplier; and
- Other wastes such as e-waste, used discarded batteries shall be disposed off in accordance to E-waste rules and batteries management and handling rules.

Residual Impact Significance

The significance of impacts due to waste generation after implementation of mitigation measures has been considered as **minor.**

Impact	Impact on soil environment due to waste generation (hazardous and non-hazardous)			
Impact Nature	Negative	Positive	Neutral	
Impact Type	Direct	Indirect	Induced	
Impact Duration	Temporary	Short-term	Long-term	Permanent
Impact Extent	Local	Regional	International	
Impact Scale	Limited to Project area			

Frequency	Occasionally				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Resource/Receptor Sensitivity	Low		Medium		High
Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **minor.**				
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Major
Residual Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **minor.**				

6.2.2.3 Impact on Topography and Drainage

Context and Receptor Sensitivity

The proposed Project site mainly exhibits flat topography. The topographic elevation at the Site was observed in the range of 396- 440 m amsl. The gradient at the Site's micro watershed was observed to be~ 25 m/km. Slope in general, was observed to be ranging from very gentle to gentle category and there is no high gradient area (slope >7°) within the Project area.

The study area have small seasonal water streams which finally discharge into Brahmani River running in the South of the Project site. A natural seasonal water channel delineates the border between Kawai and Badi Villages. The canal was dry during the site visit despite the assessment being immediately after the monsoon season. The water channel may pass through Unit 2 and/or Unit 3 after the Solar Park is constructed. The study area also have two large water bodies- water body near Unit 3 in East and Bardawada pond in South of Unit 1 which receives runoff from site. Any changes to topography in the area will advertently impact the drainage channels and might result in water logging in adjoining areas of the project site. Being a fairly flat land with gentle slope on site and water channels passing between Units, the receptor sensitivity has been assessed to be **medium**.

Embedded/In-built Control

- Design of the Solar Park will follow the natural topography, efforts will be taken to make limited change the topography.
- Project designing shall be done in a way to utilize existing topography to maximum;

Impact Magnitude

There will be a very limited change in the topographic character of the area within the project footprint. This change will long term and may not be reversible. The alteration in surface drainage pattern of the area due to construction activities will be limited to smaller areas located in project footprint. The natural flow of storm water will not be altered on contiguous larger area. Further, care will be taken to maintain the natural drainage in the area so that rain water can take its path without any restriction by the constructions at site. Hence impact magnitude is assessed to be **small.**

Impact Significance

As per the impact significant assessment matrix (refer ***Figure 6.2***) a combination of small impact magnitude with low receptor sensitivity results in impact significance as **minor**.

Additional Mitigation Measures

- Project shall ensure to avoid any unnecessary changes in the topography especially during the preconstruction and construction phase;
- Micro drainage channel should be particularly avoided when constructing access roads or planning the Transmission Line pathway in order to ensure no change to the topography of the area;
- Storm water drains must be designed in line with the natural topography and eventually drain into the natural seasonal streams in the Site area

.Significance of Residual Impacts

The residual impact significance will be **minor** after implementing above mentioned mitigation measures.

Impact	Change in topography and drainage				
Impact Nature	Negative	Positive	Neutral		
Impact Type	Direct	Indirect	Induced		
Impact Duration	Temporary	Short-term	Long-term	Permanent	
Impact Extent	Local	Regional	International		
Impact Scale	Limited to Project site and access road				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Resource/ Receptor Sensitivity	Low	Medium	High		
Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **Minor.**				
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Large
Residual Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **Minor**				

6.2.2.4 Water Resources and Availability

Context and Resource Sensitivity

During construction phase, water will be primarily required for foundation works for installing solar panels, electrical installations at PSS at Solar Park. Besides this, civil construction activities such as construction of control room, security guard room, utilities, labour camp will also have water requirement.

As detailed in the baseline section (***Section 4.2.10***), the overall water resource sensitivity was evaluated as **High** based groundwater and surface water risk. Groundwater risk was estimated based on Block Categorization and Hydrogeology while surface water risk was estimated based on Inter Annual Variability, Seasonal Variability, Availability Index and Total Annual Rainfall. Baseline Water Stress and Baseline Water Depletion were evaluated as risk factors common to both groundwater and surface water risk. For the site, total water risk was evaluated based BWS and BWD while groundwater and surface water risks were evaluated based on the aforementioned individual factors.

- Groundwater resource sensitivity was estimated to be '***High***' due to high risk of availability of resources, high risk from BC and high risk based on stakeholder consultations.

- Surface Water resource sensitivity was estimated to be '***High***' due to high risk from AI, SV, IAV and TAR.

Embedded/in-built control

- Nil

Impact Magnitude

- Approximate 250 - 300 KLD of water would be required for civil works and 80- 100 KLD domestic water will be required during peak construction stage. The water requirement will be met through tanker water supply. The construction phase will be of duration of 21 months with peak construction period of 6-8 months. Hence, the magnitude of impact is assessed as **medium.**

Impact Significance

As per the impact significant assessment matrix (refer ***Figure 6.2***) a combination of small impact magnitude with high receptor sensitivity results in impact significance as **major.**

Additional Mitigation Measures

Following mitigation measures are proposed for conservation of water resources of the area:

- No ground water abstraction for construction phase;
- Tanker water supply shall be only through authorized sources;
- Construction labour deputed onsite to be sensitised about water conservation and encouraged for optimal use of water;
- Regular inspection for identification of water leakages and preventing wastage of is necessary for efficient utilisation of water;
- As part of project designing, SPD shall consider the rainwater harvesting ponds in the open area depending on the topography, slope, natural drainage etc. Accordingly infrastructure such as drains/ piping system/ size of pond etc. shall be designed.
- Similarly, in case water is sourced from surface water bodies, infrastructure requirements shall be identified and planned in project design.

  (Refer ***Appendix F*** for Water Management Plan and section 6.2.3.2 for details)

Residual Impact Significance

After implementation of mitigation measures, the significance of residual impacts for construction activities will be **major to moderate**

Impact	Water resources				
Impact Nature	Negative	Positive	Neutral		
Impact Type	Direct	Indirect	Induced		
Impact Duration	Temporary	Short-term	Long-term	Permanent	
Impact Extent	Local	Regional	International		
Impact Scale	Limited to Project areas				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Resource/Receptor Sensitivity	Low	Medium	High		
Impact Significance	Negligible	Minor	Moderate	Major	

	Significance of impact is considered **major.**				
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Major
Residual Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **major to moderate**				

6.2.2.5 Water Quality

Context and Receptor Sensitivity

Major source of wastewater generation during construction phase is labour camp, site office to be established for Solar Park. Approximately 54 KLD of sewage will be generated during construction activities. There is a potential for contamination of surface and groundwater resources resulting from improper management of sewage.

The Project footprint does not have any water body, whereas, Area of Influence has few large water bodies receiving storm water in the area. Kawai Lake and Arnya Lake are present at a distance of ~ 700 m from unit 2 (west), and ~ 3 km (north-west of Unit 1) respectively. There is a water body near Unit 3 in the East- South East and Bardawada pond is present in the South of Unit 1. The quality of water in the nearby water bodies could be affected due to surface runoff from contaminated soil (soil contamination due to oil/ fuel spillage and leakages) especially during monsoon season. The surface runoff carrying the loose top soil will lead to increased sedimentation in the receiving water bodies. Based on the topographical conditions, the general surface water flow direction in the Project area is anticipated from North to South. Hence, Bardawada pond and water body near Unit 3 may receive surface runoff from the site. The water of these water bodies is used by local villagers for washing, cleaning and irrigation purposes. Hence, receptor sensitivity is assessed as **medium**.

Embedded/ in-built control

- Provision of septic tank and soak pits onsite and in labour camps and at site office for treatment and disposal of sewage, thereby minimizing the impacts of wastewater discharge.

Impact Magnitude

There is no surface water body located within the project foot print area which could get direct impact due to construction activities. As part of the site preparation stage, a drainage and sewerage system will be constructed for the site office and labour camp. The sewerage system will consist of soak pits for the collection of wastewater from the kitchen and washing areas and Office facility. Sewage from the toilets will be discharged into lined septic tanks.

Further, there is no direct discharge of wastewater in the ground water aquifer of the area. However, ground water quality of the area may get indirectly impacted due to soil contamination.

Hence magnitude of impact is assessed as **small**.

Impact Significance

As per the impact significant assessment matrix (refer ***Figure 6.2***) a combination of small impact magnitude with medium receptor sensitivity results in impact significance as **minor.**

Additional Mitigation Measures

- Ensure proper cover and stacking of loose construction material at site to prevent surface runoff and contamination of receiving water body;

- Open defecation and random disposal of sewage will be strictly restricted;
- Planning of toilets, soak pits and septic tanks, waste collection areas away from natural drainage channels;
- Provision of number of toilets across with easily accessible location as the project site is spread across large area of 3 units;
- Use of licensed contractors for management and disposal of waste and sludge;
- Labourers will be given training towards proactive use of designated areas/bins for waste disposal and encouraged for use of toilets;
- Provision for impervious storage area, especially for fuel & lubricant, hazardous waste, etc. will be made onsite; and
- Spill/ leakage clearance plan to be adopted for immediate cleaning of spills and leakages.

Residual Impact Significance

Residual significance of impacts during construction phase will be **minor.**

Impact	Water Quality				
Impact Nature	Negative	Positive	Neutral		
Impact Type	Direct	Indirect	Induced		
Impact Duration	Temporary	Short-term	Long-term	Permanent	
Impact Extent	Local	Regional	International		
Impact Scale	Limited to Project area				
Frequency	Both Construction and Operation Phase				
Likelihood	Likely				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Resource Sensitivity	Low	Medium	High		
Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **minor**				
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Large
Residual Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **minor**				

6.2.2.6 Ambient Air Quality

Context and Receptor Sensitivity

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

- Fugitive dust emissions from site clearance, piling work, handling of construction materials, emission due to movement of vehicles on unpaved roads, plying of vehicles, etc.
- Vehicular emissions due to increased traffic movement on site and on the approach roads;
- Exhaust emissions from construction machinery and other equipment such as batching plant, if any; and
- Emissions from diesel generators required to be run for construction power purposes

The proposed Project site is located in a rural setup. The human receptors for dust emissions are located between Unit 2 and 3, i.e. Badi village and ~ 450 m towards East from Unit 1 (Kawai village). There are no ecologically protected areas in vicinity of the site. The receptor sensitivity is assessed as **medium.**

Embedded/in-built control

- Suppression of fugitive dust emissions by spraying water, wetting of the stockpile;
- Pre-identified proper locations of material stockpiles, especially sand; and
- Screening or providing wind breaks for stockpiles, covering of trucks with tarpaulin sheets during transportation of material.

Impact Magnitude

The major source of emissions in the construction phase is the fugitive dust emissions from construction activities. In addition, operation of DG sets will also cause gaseous emissions. There will be some impacts due to plying of vehicles on the access roads which runs across settlement area.

The ambient air quality analysis reveals that the air shed is unpolluted and the air pollutants- PM (PM_{10} and $PM_{2.5}$), SO_2, NO_x and CO are well below the prescribed CPCB and WHO guidelines.

The construction activities will occur for a period of time (~21 months) whereas dust emitting activities such as site clearing, civil construction etc. will be of short duration. The impact magnitude has been categorized as ***small*** because the soil type is loamy sand and dust emission will be limited to construction phase only for shorter duration.

Impact Significance

As per the impact significant assessment matrix (refer ***Figure 6.2***) a combination of small impact magnitude with medium receptor sensitivity results in impact significance as **minor.**

Additional Mitigation Measures

- The construction site shall be barricaded;
- Keeping areas of open excavation to a minimum;
- Minimising stockpiling by coordinating excavations, spreading, re-grading, compaction activities;
- Cease or phase down work if excess fugitive dust is observed, investigate source and take suppression measures;
- Speed of vehicles on site to be limited to 10-15 km/hr;
- The emissions from diesel generator shall be by optimised operations, orientation at the site and providing adequate stack height for wider dispersion of gaseous emissions
- Switch off machinery and equipment when not in use;
- Prevent idling of vehicles and equipment; and
- Vehicle engines will be properly maintained and will have a valid Pollution under Control (PUC) to ensure minimization in vehicular emissions.

Residual Impact Significance

The significance of residual impact will be **minor to negligible** after implementing mitigation measures.

Impact	Ambient Air quality – Construction phase

Impact Nature	Negative	Positive	Neutral		
Impact Type	Direct	Indirect	Induced		
Impact Duration	Temporary	Short-term	Long-term	Permanent	
Impact Extent	Local	Regional	International		
Impact Scale	Project area and vicinity				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Resource Sensitivity	Low	Medium	High		
Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **Minor.**				
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Major
Residual Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **Minor to Negligible.**				

6.2.2.7 Ambient Noise Quality

Context and Receptor Sensitivity

The sources of noise in the construction phase include construction activities, operation of equipment's, machineries, drilling, D.G. sets and movement of vehicles. The construction machinery used for the construction activities could be the major sources of noise at site whereas increased noise levels are also envisaged as a result of increased material movement in the area.

It is to be noted that the proposed project site has habitats in close proximity. Village within 500 m of the project site and access road includes Badi, Kawai and Bardawada which may get impacted due to high noise levels during construction activities and project related vehicular movement through village roads, especially fence line community. Therefore receptor sensitivity is considered as **medium**.

Embedded/in-built control

- Normal working hours of the contractor will be defined (preferable 8 am to 6pm). If work needs to be undertaken outside these hours, it would be limited to activities which do not generate noise; and
- Avoid unnecessary honking.

Impact Magnitude

The operation of construction machinery, DG set will generate noise. Construction works are expected to last for 21 months and construction activities will be limited to daytime only. The increase in traffic volumes during construction activities will also increase noise levels in the area.

The baseline noise monitoring results reveals that the equivalent ambient noise level for day time (Leq day) and night time (Leq night) at Badi and Kawai villages was within the corresponding prescribed limits of CPCB and WHO for residential area.

Hence, the magnitude of impact on ambient noise levels is assessed as **medium** considering the construction period of the project to last for approximately 21 months and proximity to the villages and the construction activities may lead to exceedance of prescribed noise day time limits at receptors.

Impact Significance

The impact significance has therefore been assessed as **moderate.**

Additional Mitigation Measures

- Ensure safe distance of project related activities from schools, hospitals, etc.;
- Only well-maintained equipment to be operated on-site;
- If it is noticed that any particular equipment is generating too much noise then lubricating moving parts, tightening loose parts and replacing worn out components to be carried out to bring down the noise. It is to be ensured that such machinery are kept far away from the households;
- Machinery and construction equipment that may be in intermittent use to be shut down or throttled down during non-work periods;
- Low noise equipment shall be used as far as practicable;
- The number of equipment operating simultaneously shall be reduced as far as practicable;
- Install enclosures around construction area, in order to reduce the extent of noise emanating due to project related activities;
- DG set with acoustic enclosures shall be used;
- Vehicular movement through village roads should be planned to avoid traffic jam and inconvenience to local residents;
- Equipment noise should be 85 dB (A) at 1 m from the source in line with WB/IFC EHS guidelines;
- Minimal use of vehicle horns needs to be encouraged;
- Limit construction related activities to day time in order to restrict the noise related nuisance in the evenings, where permissible noise threshold is lesser;
- Provision of Grievance Redressal Mechanism to all the key stakeholders in order to raise and register their grievances pertinent to noise and dust related issues.

Residual Impact Significance

Significance of residual impact is assessed to be **minor** taking into consideration above mentioned mitigation measures.

Impact	Ambient Noise Quality				
Impact Nature	Negative	Positive	Neutral		
Impact Type	Direct	Indirect	Induced		
Impact Duration	Temporary	Short-term	Long-term	Permanent	
Impact Extent	Local	Regional	International		
Impact Scale	Project area and vicinity				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Resource Sensitivity	Low	Medium	High		
Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered to be **Moderate**.				
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Major
Residual Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **Minor**				

6.2.2.8 Occupational Health and Safety

Context and Receptor Sensitivity

The proposed Project will involve several higher risk activities as shown below:

- Construction of support structure for PV module would require operation of pile drivers.
- The installation of solar module will involve operation of cranes and other mechanical lifting equipment.
- Laying of interconnecting cable with require digging.
- The commissioning of the inverter rooms and Transmission Line will also involve live power lines.
- Working on live wires carrying power has dangers of electric shock and electrocution.
- Construction and commissioning of PSS and associated structures will involve multiple hazards i.e., working at height, use of cranes and mechanical lifting equipment, working with high voltage power;
- Besides this, there could be slip and trip hazards especially during monsoon season; and
- The area experiences extreme winter and summer condition. Working during very high and low temperature could cause health hazards.
- The Project site also needs to implement proper measures for fire safety, structural safety and any for emergency situations.
- There are two existing Transmission Lines of 400 kVA and 220 kVA passing through the Project site. Any construction activities nears these Transmission Lines will have safety risks.
- The occupational health and safety concerns mentioned above would be consistent across the Project life cycle and therefore the impacts would be similar in nature.
- During construction phase, it is anticipated that on average 500-600 workers will be deployed at site. The installation of solar panels and associated infrastructure will be done through experienced and trained workers. However, construction of other components will involve local workers who may not have earlier experience. Hence, there will be greater vulnerability for accidents. Therefore, receptor vulnerability is assessed as **Medium**.

Embedded/In-built Controls

- All construction activities should be carried out during daytime hours and vigilance should be maintained for any potential accidents;
- Project specific Health and Safety Management Plan will be put in place;
- Personal Protective Equipment (PPEs) including safety shoes, helmet, goggles, ear muffs , face shield, insulating (rubber) gloves with leather protectors, insulating sleeves, and flame-resistant (FR) clothing and face masks;
- Use of permit to work system (hot work, electrical, work at height)
- Cranes and other lifting equipment are operated by trained and authorised persons;
- Excavated areas should be temporarily fenced to avoid access to outsiders and wildlife;
- An up-to-date first aid box should be provided at all construction sites and a trained person should be appointed to manage it;
- Electrical and maintenance work should not be carried out during poor weather and during lightning strikes.

Impact Magnitude

As mentioned above, the majority of activities such as installation of solar panels and associated infrastructure will be done through experienced and trained workers and unskilled workers will be mainly involved in building construction activities. With above embedded controls, the magnitude of impacts will be **small**.

Impact Significance

As per the impact significant assessment matrix (refer Figure 5.2) a combination of small impact magnitude with medium receptor sensitivity results in impact significance as **minor.**

Additional Mitigation Measures

- Health & safety training to be provided during both construction and operation phase;
- Prior to start of work, workers should be informed about the related safety risks and precautions to be taken through tool box meetings;
- Manual lifting by adult men to be less than 55 kg and for women it should be less than 30 kg;
- Adequate PPEs to be provided for all activities at site including for welding, cutting or similar operations which may cause hazard to eyes;
- All persons performing construction work to wear safety shoes and helmets confirming to national standard;
- Every worker engaged in handling sharp objects which may cause injury to hand shall be provided suitable hand gloves;
- While working in hot conditions, measures such as work break at regular intervals, keeping hydrated by drinking water and liquids, covering face with damp cloth etc. shall be used;
- Obtain and check Contractor's safety method statements;
- Monitor health and safety performance and have an operating audit system;
- Permitting system should be implemented to ensure that cranes and lifting equipment is operated by trained and authorized persons only;
- Appropriate safety harnesses and lowering/raising tools should be used for working at heights;
- All equipment should be turned off and checked when not in use;
- Emergency contact numbers and route to the nearest hospital to be displayed at the construction site;
- The local/ host community to be kept at safe distance from construction site;
- Site specific safety or emergency response plan should be in place to account for natural disasters, accidents and any emergency situations;
- Site specific/ activity specific Hazards Identification and Risk Assessment (HIRA) should be developed prior to start of the activities at site; and
- Provide H&S achievement information to employees.

Residual Impact Significance

After implementation of additional mitigation measures, significance of residual impact will remain **minor.**

Impact	Occupational health and safety

Impact Nature	Negative		Positive		Neutral
Impact Type	Direct		Indirect		Induced
Impact Duration	Temporary	Short-term		Long-term	Permanent
Impact Extent	Local		Regional		International
Impact Scale	The construction work involves construction of Solar Park along with construction of internal cabling and O&M activities				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Vulnerability of Receptors	Low		Medium		High
	The construction of Solar Park and erection of internal cabling will be done through experienced and trained workers. However, construction of other components will involve local workers who may not have earlier experience. Hence, there will be greater vulnerability for accidents.				
Impact Significance	Negligible	Minor		Moderate	Major
	Considering the overall impact magnitude and vulnerability of social receptors, the impact significance is assessed as **minor**.				
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Large
Residual Impact Significance	Negligible	Minor		Moderate	Major
	Significance of impact is considered **Minor.**				

6.2.3 Operation Phase

The list of activities during operation and maintenance phase considered for the assessment of impacts on physical environment includes:

- Routine cleaning of PV modules;
- Control of vegetation viz. weeds, bushes etc. within the site and those immediately surrounding it;
- Routine inspection of all PV modules and associated structures viz. cables, transformers, inverters, mounting structures etc.;
- Operation and maintenance of pooling substation; and
- Inspection and maintenance of internal site pathways/access roads

6.2.3.1 Soil Environment

Context and Receptor Sensitivity

- During operation phase 225 employees/workers will be deployed at site. Operation phase will generate small amount of municipal waste from site office and waste such as broken solar panels. The hazardous waste generated at substation include used/spent oil, oil soaked cotton and filter waste, waste containers/tins of paints, used lead acid batteries, nonferrous scrap, insulated aluminium and copper wires/cables, waste dry chemical residues etc. which needs proper storage and disposal.
- During operation phase, the large area of the Project site will remain non concrete (beneath solar panels) and will have soil contamination risk due to improper waste management. Further the agricultural land existing in the surroundings may also get impacted due to random disposal of waste in the surroundings. The receptor sensitivity is assessed as **medium**.

Embedded/In-built Control

- Spill control measures such as the storage and handling of chemicals and fuel in concrete areas with secondary containment will be implemented to minimize impacts in the event of a spill;
- The O&M contractors will have control over the amount and types of waste (hazardous and non-hazardous) produced at the site;
- The hazardous wastes to be stored onsite temporarily at separate designated covered area provided with impervious flooring and secondary containment and to be disposed in accordance with Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016; and
- Workers will be strictly instructed/ trained about random disposal of any waste generated from the O&M activities.

Impact Magnitude

The quantity of waste generation will be negligible and O&M contractors will have proper waste management plan for implementation on site. The municipal waste from the site office will only be routed through proper collection and handover to local municipal body for further disposal. There will be only periodic generation of hazardous wastes during any repair and O&M activity. The waste will be disposed off through approved vendors in accordance to Hazardous Wastes Rules, 2016. The solar panels contains antimony containing glass, hence, improper disposal of used/broken solar panel may cause harm to environment. The impact magnitude has therefore been assessed as **small**.

Impact Significance

- As per the impact significant assessment matrix (refer ***Figure 6.2***) a combination of negligible impact magnitude with medium receptor sensitivity results in impact significance as **minor.**

Additional Mitigation Measures

- SPD shall prepared SOP for storage and disposal of broken solar panels and tie up with an authorized dismantling agency for disposal of panels. MNRE had prepared a concept note for storage and disposal of used solar panels. The recommendations such as recycling of glass, storage of discarded panels in cover shed etc. shall be adopted in the Project; (1)
- The broken solar panels shall not be mixed with normal glass.
- RUMSL shall prepare a waste audit checklist as part of their routine site monitoring and auditing plan during operation phase for monitoring of waste management at site.

Residual Impact Significance

- After implementation of additional mitigation measures, significance of residual impact will remain **minor.**

Impact	Impact on soil environment due to waste generation (hazardous and non-hazardous)			
Impact Nature	Negative	Positive	Neutral	
Impact Type	Direct	Indirect	Induced	
Impact Duration	Temporary	Short-term	Long-term	Permanent
Impact Extent	Local	Regional	International	
Impact Scale	Limited to Project area			

(1) http://164.100.94.214/sites/default/files/webform/notices/DraftBluePrintAntimony.pdf

Frequency	Occasionally				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Resource/Receptor Sensitivity	Low		Medium		High
Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **minor.**				
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Large
Residual Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **minor.**				

6.2.3.2 Water Resources and Availability

Context and Receptor Sensitivity

During operation phase, total water requirement for the Neemuch Solar Park is estimated as below

- 308 KLD per annum for solar panel cleaning;
- 10 KLD domestic water, assuming 225 no. of O&M staff and 45 LPCD;
- 7 KLD for green belt maintenance (as per DPR);
- 32 KL for firefighting and miscellaneous

The water requirement for the project will be mainly fulfilled through ground water abstraction and nearby surface water bodies.

As described in ***Section 4.2.10.1***, the resource sensitivity for ground water and surface water resources is assessed as **high**.

Embedded/In-built Controls

Nil

Impact Magnitude

The total domestic water requirement during operation phase is estimated as ~ 10 KLD. It is understood that total domestic water requirement will be met by ground water abstraction and bottled mineral water.

The quantity of ground water required for cleaning of solar panels during operation phase is evaluated to be ~11 ham (assuming 2.5 litre per sqm and 12 cleaning cycles in a year, as per DPR).

As per a report of Central Ground Water Board, Ministry of Water Resources 2017 (1), the status of ground water in the district is as below:

Table 6.8 Status of Ground water in Project District

S. No.	Particulars	Details
1.	District	Neemuch
2.	Annual Extractable Ground Water Resources (ham)	40882.44
3.	Annual Ground Water Draft for all uses (ham)	35748.52
4.	Projected Demand for Domestic uses upto 2025 (ham)	1876.26

(1) http://cgwb.gov.in/GW-Assessment/GWRA-2017-National-Compilation.pdf

S. No.	Particulars	Details
5.	Ground Water Availability for future use (ham)	4738.5
6.	Stage of Ground Water Extraction (%)	87.44
7.	Stage of Ground Water Extraction (%)- Jawad Block	96.10
8.	Estimated water requirement for solar panel cleaning (ham)	~11

Source: http://cgwb.gov.in/GW-Assessment/GWRA-2017-National-Compilation.pdf

The primary source of water in the area is ground water. Presently, annual ground water extraction for domestic purposes is 1480.84 ham, which is assumed to increase upto 1876.26 ham by 2025. The Jawad Block falls under Critical category for ground water abstraction. The stage of ground water development in Jawad Block is deteriorated from 2013 (Semi critical) to 2017 (Critical).

If ground water is abstracted for Project, there will be additional groundwater abstraction of 281 ham over period of 25 years of operational phase of the Project. As it is evident from the above table, the stage of ground water extraction is on higher side with 96.10% in Jawad Block, the utilization of ground water for operation phase of the project may compromise with competitive users (drinking water requirement of villages and irrigation purposes) in the district based on ground water availability. Hence, magnitude of stress on ground water resources is assessed as **high**.

Impact Significance

As per the impact significant assessment matrix (refer ***Figure 6.2***) a combination of medium impact magnitude with high receptor sensitivity results in impact significance as **major.**

Additional Mitigation measures

Conserving Water Resources

- Dry robotic cleaning of modules to be explored as recommended by MNRE (1);
- Alternate sources of water shall be explored
- Ground water abstraction shall be done in accordance to CGWB guidelines.
- Implement rainwater harvesting and/or groundwater recharge and replenishment opportunities within Site premises especially near the low-lying and gently sloping area.
- Optimising water usage in the SCADA building by application of water conservation measures such as sensor based taps, low flush urinals etc.;
- Maintain logbook for water consumption;
- Implement groundwater and wastewater monitoring vis-à-vis quality/quantity;
- Adopt less water consuming module cleaning methods;
- The surface runoff from during solar panel cleaning shall be diverted to a settlement tank for settlement of suspended solids. The overflow shall be treated in water treatment unit and recycled in the Project.
- Use of water from multiple sources to avoid dependency on one particular source (groundwater or surface water). This also includes tapping of rainwater received during the monsoons for the long-term and uninterrupted operations.
- The Project should implement principles of water stewardship to ensure water security not just for the site, but also for other stakeholders within the watershed. Some of the water stewardship

(1) MNRE had issued a letter dated 3 June 2019 to Principal Secretaries of States and Solar Association of all States regarding optimal utilization of water and preferably use Robotic technology for cleaning of modules.

frameworks/ standards that can be adopted are UN Global Compact's CEO Water Mandate or AWS Standards.

- Identify stakeholders directly impacted by the groundwater use at the Project site and develop long- term stakeholder engagement plan particularly focused on stakeholders near site to develop positive perception towards Project and its operations.

Rain Water Harvesting

In order to comply with CGWB guidelines for ground water abstraction, ground water recharge is mandatory in the Project. RUMSL shall plan to provide rainwater harvesting provision at site. For this purpose, rainwater harvesting pond shall be provided at site. In addition, groundwater recharge shall be undertaken within the Site to replenish the shallow aquifer zones.

Piezometers to be installed to monitor the groundwater level changes in the aquifer trapped by the abstraction wells at Project site.

Water Quality

- Ensure proper cover and stacking of loose construction material at site to prevent surface runoff and contamination of receiving water body;
- Open defecation and random disposal of sewage will be strictly restricted;
- Planning of toilets, soak pits and septic tanks, waste collection areas away from natural drainage channels;
- Provision of number of toilets across with easily accessible location as the project site is spread across large area of both the Units;
- Use of licensed contractors for management and disposal of waste and sludge;
- Labourers will be given training towards proactive use of designated areas/bins for waste disposal and encouraged for use of toilets;
- Provision for impervious storage area, especially for fuel & lubricant, hazardous waste, etc. will be made onsite; and
- Spill/ leakage clearance plan to be adopted for immediate cleaning of spills and leakages.

Other Management Aspects

Preparing an inventory of water consumption during construction and O&M activities and all pollution sources from the Project activities is essentially the first step towards managing the impacts. The Management Plan will involve preparation of an up to date inventory of all areas of water consumption and wastewater discharge sources based on the latest Project activity related information. This inventory will helps in formulating the following management approaches:

- Source reduction
- Resource recovery options
- Recycle options
- Optimal treatment strategies and technologies
- Post-treatment, resource recovery and recycle options
- Ultimate disposal considering the local environmental sensitivities
- The inventory database of discharge sources shall be kept as a living document and updated as and when any new sources are cited at any point in time of the Project period. Any intermittent water requirement and discharge sources shall also be identified and included in the inventory.

- A Water Management Plan is provided as **Appendix F**.

Residual Impact Significance

Residual significance of impacts will be **major to moderate.**

Impact	Water resources				
Impact Nature	Negative	Positive	Neutral		
Impact Type	Direct	Indirect	Induced		
Impact Duration	Temporary	Short-term	Long-term	Permanent	
Impact Extent	Local	Regional	International		
Impact Scale	Limited to Project areas and surroundings				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Resource/Receptor Sensitivity	Low	Medium	High		
Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **major.**				
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Major
Residual Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **major to moderate**				

6.2.3.3 Occupational Health and Safety

Context and Receptor Vulnerability

- During operation phase, it is anticipated that on average 225 employees/ workers will be deployed at site. The staff will be well experienced and qualified for their work. The pooling substation will be managed by RUMSL/ PGCIL through O&M contractor having Health and safety team, whereas the Solar Project Developer will be responsible for O&M of Solar Park area and have to deploy qualified H&S team. Receptor vulnerability is assessed as **medium**.

Embedded/In-built Controls

- Project specific Health and Safety Management Plan will be put in place.
- Personal Protective Equipment (PPEs) including safety shoes, helmet, goggles, ear muffs , face shield, insulating (rubber) gloves with leather protectors, insulating sleeves, and flame-resistant (FR) clothing and face masks;
- Use of permit to work system (hot work, electrical, work at height)
- Cranes and other lifting equipment are operated by trained and authorised persons;
- An up-to-date first aid box should be provided at all construction sites and a trained person should be appointed to manage it;
- Electrical and maintenance work should not be carried out during poor weather and during lightning strikes;
- Fire fighting measures will be maintained at substation.

Impact Magnitude

As mentioned above, the O&M activities will be carried out by qualified team. With above embedded controls, the magnitude of impacts will be **small**.

Impact Significance

As per the impact significant assessment matrix (refer ***Figure 6.2***) a combination of small impact magnitude with medium receptor sensitivity results in impact significance as **minor.**

Additional Mitigation Measures

- Periodic Health & safety training to be provided to team;
- Activity specific Hazards Identification and Risk Assessment (HIRA) should be conducted and accordingly SOPs shall be prepared for all O&M activities.
- The lock in-lock out system will be followed during maintenance/ repair activities at substation and Transmission Line;
- Records of incident/ accidents shall be maintained;
- Root cause analysis shall be carried out for any incident/ accident
- All persons performing maintenance/repairing work to wear safety shoes and helmets confirming to national standard;
- Appropriate safety harnesses and lowering/raising tools should be used for working at heights;
- All equipment should be turned off and checked when not in use;
- Emergency contact numbers and route to the nearest hospital to be displayed at the construction site;
- The local/ host community to be kept at safe distance from construction site;
- Site specific safety or emergency response plan should be in place to account for natural disasters, accidents and any emergency situations;
- Provide H&S achievement information to employees.

Residual Impact Significance

- Residual significance of impacts during construction phase will be **minor to negligible.**

Impact	Occupational health and safety				
Impact Nature	Negative	Positive	Neutral		
Impact Type	Direct	Indirect	Induced		
Impact Duration	Temporary	Short-term	Long-term	Permanent	
Impact Extent	Local	Regional	International		
Impact Scale	O&M activities				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Vulnerability of Receptors	Low	Medium	High		
	The O&M activities shall be carried out qualified and experienced staff/workers				
Impact Significance	Negligible	Minor	Moderate	Major	
	Considering the overall impact magnitude and vulnerability of social receptors, the impact significance is assessed as **minor**				

Residual Impact Magnitude	Positive	Negligible	Small	Medium	Large
Residual Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **minor to negligible.**				

6.2.4 Photovoltaic Heat Island Effect (PVHI)

The term “heat island” is mostly used with the prefix “urban” and termed as Urban Heat Island Effect (UHI), because it is generally described for the surface structure and overlying atmospheric layers of big cities and metropolitan areas.

PV modules are produced by the electrical assembly of PV cells which provides electricity generation. The most widely-used and commercial PV cells are manufactured from crystalline silicon (c-Si). Because the final products of these cell and module types have the physical and electrical properties that can bring limited conversion efficiencies (15-30%), dark-colored surfaces, packing density and/or arrays with gaps etc., a possible PVHI can be induced in a similar way to UHIs. The large Solar Parks cover the big and untouched areas in a rural environment. After a large-scale deployment, the large number of PV arrays and the corridors between these arrays may disturb the incoming solar radiation and outgoing IR radiation amounts of the previous land surface by landscape albedo change and alteration(1). This land use change may induce a heat island effect and increase the local temperatures which is termed as Photo Voltaic Heat Island Effect (PVHI).

The localized increase in ambient temperature by 3-4^{o}C in Solar Park area could be due to following reasons(2) (3) :

- PV installations shade a portion of the ground and therefore could reduce heat absorption in surface soils;
- PV panels are thin and have little heat capacity per unit area but PV modules emit thermal radiation both up and down, and this is particularly significant during the day when PV modules are often 20 °C warmer than ambient temperatures;
- Vegetation is usually removed from PV power plants, reducing the amount of cooling due to transpiration; and
- PV panels reflect and absorb upwelling longwave radiation, and thus can prevent the soil from cooling as much as it might under a dark sky at night.

The research studies (4) (5) (6) reported that

- The degree of PVHI effect varies depending on the season, likely because of changing sun angles and background temperatures;
- Though the PVHI effect are detectable in the day, the real significant warming occurs in the evening hours, partially because these large photovoltaic installations took longer to cool down in the night time hours;

(1) https://www.researchgate.net/publication/327838950_Impacts_of_a_PV_Power_Plant_for_Possible_Heat_Island_Effect

(2) Barron-Gafford, G. A. et al. The Photovoltaic Heat Island Effect: Larger solar power plants increase local temperatures. Sci. Rep. 6, 35070; doi: 10.1038/srep35070 (2016); https://www.nature.com/articles/srep35070

(3) https://pvbuzz.com/photovoltaic-heat-island-effect/

(4) https://assets.cleanenergycouncil.org.au/documents/events/event-docs-2019/SIF-2019/Presentations/03-Bronte-Nixon.pdf

(5) Barron-Gafford, G. A. et al. The Photovoltaic Heat Island Effect: Larger solar power plants increase local temperatures. Sci. Rep. 6, 35070; doi: 10.1038/srep35070 (2016); https://www.nature.com/articles/srep35070

(6) https://pvbuzz.com/photovoltaic-heat-island-effect/

- The increase in localized temperature may cause discomfort to the habitation and wildlife in the vicinity of Solar Park;
- The heating effect may dissipate after 300 m distance from Solar Park.
- It is to be noted that the PVHI is still a less studied aspect for assessing the impact of large Solar Parks on micro climate change and requires further in depth research. Limited empirical data exists regarding the heat island effect resulting from the installation of large scale Solar Parks.

Recommendations

Based on limited above understanding, following recommendations are proposed:

- The existing ground vegetation in the Solar Park area shall be disturbed to minimum extent;
- Ground vegetation shall be planted in the buffer areas/open areas available in the Solar Park;
- The feasibility of mixed land use development in the Solar Park shall be explored.

6.2.5 Natural hazards- Flood Likelihood Assessment

ERM has adopted a qualitative risk based categorization to identify potential risks and vulnerabilities associated with flooding, inundation and waterlogging. The risks are defined considering the likelihood of their occurrence and potential severity of the impact broadly following the risk matrix presented in the table below. Refer ***Appendix E*** for detailed Flood Likelihood Assessment.

Risk = Likelihood of an impact occurring x Potential severity of the impact.

		Probability of Occurrence		
		Low	**Medium**	**High**
Potential Impact	Low			
	Medium			
	High			

Note: The study was carried out to evaluate and understand the likelihood of flood impact on the Site only. Risk categorization has been adopted merely for providing broad level perspective on the potential for impact from floods / inundation / water logging on the Site and to emphasize specific areas for further evaluation prior to developing Site specific mitigation measures only.

A likelihood analysis of potential flooding event in and around the Site has been undertaken. The same has been presented in the ***Table 6.9*** below.

Table 6.9 Likelihood of flood evaluation

Attributes	**Likelihood**		
	High	**Medium**	**Low**
Site Setting			
■ Unit-1 is in close proximity of S1, S2 and Bardawada Pond, Unit-2 is in close proximity of Kawai Pond, S2 and S3 and Unit-3 is in close proximity of Badi Pond, S3 and S4; ■ The Site Units are located along the left bank of Brahmani River. Brahmani River is located at distances of ~1.6 km, ~3.1 km and ~3.3 km to the South of the Unit 1, Unit 2 and Unit 3 respectively; ■ Site Units are located ~30 km north-west from the confluence of Brahmani River with Chambal River;			

Attributes	Likelihood		
	High	Medium	Low
■ Two major dams namely Rana Pratap Sagar (~35 km south-west of the Site units) and Gandhi Sagar (~50 km south-west of the Site units) are built across Chambal River at the upstream of the Site.			
Watershed Characteristics			
■ The Site lies within the Brahmani River Basin. The Site is located at the central portion of the basin and ~30 km north-west from the confluence of Brahmani River with Chambal River at Bhainsrorgarh Village, in Rajasthan. ■ The Site is located along the left bank of the Brahmani River and the predominant gradient in the region is along the north to south vector; ■ The Site units is located in a rural setting surrounded primarily by scrub land followed by forest land, agricultural land, residential settlements and water bodies.			
Historical Flooding and Inundation Events			
■ Per community consultation, it was found that Brahmani River breached its banks in the years of 2019, 2016, 2010 and 1994 due to excessive rains causing widespread inundation in settlements along the river and SH 9A which is the primary access to the Site; ■ The extent of flooding due to overflow of Brahmani River along its left bank has never exceeded beyond SH 9A (~ 1.3, ~2 km and ~2.5 km south of the unit-1, unit-2 and unit-3); ■ During September 2019, Brahmani River was overflowing due to backflow associated with high water levels in Chambal River. Therefore, the seasonal streams draining the Site area were not able to quickly discharge into Brahmani River. Minor effects of backflow were observed in the Site area and ponds. ■ Per community consultation, no history of widespread flooding/ inundation due to overflow from Brahmani River, nallas and/or embankment ponds was reported on-Site. However localized inundation in low-lying areas within Site was reported.			
Hydro-meteorological Data			
■ Average annual rainfall for period of 1980-2018 for Neemuch was 824 mm with the highest annual rainfall of 1,352 mm recorded in 2016; ■ Maximum daily probable rainfall for 25, 50, and 100 year return periods in Neemuch District are <220 mm, <240 mm, and <280 mm respectively;			
Hydrological and Geomorphological Data			
Catchment Analysis			
■ The Site and its immediate surroundings were observed to have very flat to gentle slopes with slopes varying between 0 – 10%. ■ In the Site area, the general slope of the Site area was observed to be from north to south. ■ Continuous gradient of 6.3 m/km, 7.1 m/km and 7.3 m/km were observed to be along the north to south vector in Unit-1, Unit-2 and Unit-3 respectively. ■ Most of Unit-1 area falls in the elevation range of 390-400 m amsl. South-western and south-eastern portions lying near Barwada Pond and S2 respectively were the lowest points varying between 390-400 m amsl within Unit-1. ■ Unit-2 area falls in the elevation range of 390-400 m amsl. South-eastern portion along the S3 were the lowest points varying between 370-390 m amsl. ■ Similarly, Unit-3 area falls in the elevation range of 370-400 m amsl. South-western portion comprising of areas near S4 and Badi Pond and south-eastern portion were the lowest points varying between 390-400 m amsl within Unit-3. ■ Based on the topography and slope maps, the Site area does not appear to have any pockets of 'low lying areas' with potential for water logging and flooding during rainy season which may be attributed to very gentle slopes.			

Attributes	Likelihood		
	High	Medium	Low
Secondary Data Review – Flooding and Inundation			
■ Per the District Disaster Management Plan – Neemuch District, the district is prone to floods. It was found the Site is not prone to flooding due to overflow from Gandhisagar Dam (40 km south-east of the Site, along Chambal River). ■ Per the global estimated risk index for flood hazard map developed by UNEP/GRID-Europe, the Site is not prone to flooding; ■ Per the global flood hazard map developed by FM Global, the Site is not prone to high or medium flood risk; ■ Based on Aqueduct's global flood hazard map, the Site and its surroundings fall in the "Low to Medium" river flooding hazard zone; ■ Based on global flood hazard frequency and distribution map developed by Data Basin, the Site and its surroundings is not prone to flooding.			

Based on the observations from the above-mentioned table, it appears that the overall likelihood of flooding event and its impact in and around the Project site may be considered as ***'Medium'.*** The main high probability attributes are as follows:

- The Site Units are located along the left bank of Brahmani River. Brahmani River is located at distances of ~1.6 km, ~3.1 km and ~3.3 km to the South of the Unit 1, Unit 2 and Unit 3 respectively. The Site Units are located ~30 km north-west from the confluence of Brahmani River with Chambal River;
- Unit-1 is in close proximity of S1, S2 and Bardawada Pond, Unit-2 is in close proximity of Kawai Pond, S2 and S3 and Unit-3 is in close proximity of Badi Pond, S3 and S4;
- Per community consultation, it was found that Brahmani River breached its banks in the years of 2019, 2016, 2010 and 1994 due to excessive rains causing widespread inundation in settlements along the river and SH 9A which is the primary access to the Site;
- The extent of flooding due to overflow of Brahmani River along its left bank has never exceeded beyond SH 9A. The SH 9A is located ~ 1.3, ~2 km and ~2.5 km south of the unit-1, unit-2 and unit-3;
- During September 2019, Brahmani River was overflowing due to backflow associated with high water levels in Chambal River. Therefore, the seasonal streams draining the Site area were not able to quickly discharge into Brahmani River. Minor effects of backflow were observed in the Site area and ponds.
- Per community consultation, no history of widespread flooding/ inundation due to overflow from Brahmani River, nallas and/or embankment ponds was reported on-Site. However localized inundation in low-lying areas within Site was reported per community consultation, it was found that Brahmani River breached its banks in the years of 2019, 2016, 2010 and 1994 due to excessive rains causing widespread inundation in settlements along the river and SH 9A which is the primary access to the Site;
- The extent of flooding due to overflow of Brahmani River along its left bank has never exceeded beyond SH 9A (~ 1 km south of the Site);
- During September 2019, Brahmani River was overflowing due to backflow associated with high water levels in Chambal River. Therefore, the seasonal streams draining the Site area were not able to quickly discharge into Brahmani River. Minor effects of backflow were observed in the Site area and ponds.

- Per community consultation, no history of widespread flooding/ inundation due to overflow from Brahmani River, nallas and/or embankment ponds was reported on-Site. However localized inundation in low-lying areas within Site was reported.
- Per the District Disaster Management Plan – Neemuch District, the district is prone to floods. It was found the Site is not prone to flooding due to overflow from Gandhisagar Dam (40 km south-east of the Site, along Chambal River).
- Per the global estimated risk index for flood hazard map developed by UNEP/GRID-Europe, the Site is not prone to flooding;
- Per the global flood hazard map developed by FM Global, the Site is not prone to high or medium flood risk;
- Based on Aqueduct's global flood hazard map, the Site and its surroundings fall in the "Low to Medium" river flooding hazard zone;
- Based on global flood hazard frequency and distribution map developed by Data Basin, the Site and its surroundings is not prone to flooding.
- As per the 1-D mapping where maximum water levels at Brahmani River Bridge corresponding to Aug-Sep 2019 flooding event were mapped over the DEM, it was found that the Site is not prone to flooding from Brahmani River.

Considering the above mentioned attributes, the Site is *moderately susceptible* to flooding.

Recommendations

Based on the broad level assessment, following measures are recommended to protect the assets at Site from identified 'high probability attributes' and to prevent/mitigate their impact on the Site:

- Undertake an assessment to estimate the High Flood Level (HFL) at the Site. This will help in estimation of the risks of flooding and inundation to the Site. Installation of solar panels and other critical infrastructure above the HFL will greatly reduce disruptions and losses to the Park;
- Enhance structural stability of banks of all seasonal streams such as S1, S2, S3 and S4 which are in close vicinity of the Site units and provide robust erosion protection to withstand flood water;
- Storm water drains must be designed in line with the natural topography and eventually drain into the natural seasonal streams in the Site area;
- Ensure that the Site's SWD outfalls are at an elevation higher than the maximum water levels of the natural seasonal streams;
- Provide sluice/ flap gates at the SWD outfall to prevent backflow during a backflow event;
- Make provisions for pumping infrastructure within the Site to ensure rapid evacuation of water in case of high flow/backflow associated with ponds and seasonal streams ;
- Implement an effective flood monitoring and disaster management system in place for effective mitigation of floods at a Site level;
- Coordinate with the district and local disaster management cells to update on flood early warning notifications.

6.3 Impacts on Biological Environment

The list of ecological impacts that have been scoped into this ESIA has been provided below:

Table 6.10 Identified interactions that can result in an impact to ecological resources

Potential Impacts	Causes for Impacts
Permanent and/or temporary loss/modification of habitat (terrestrial and aquatic) during the site clearance and preparation process of the construction phase	■ Clearance of vegetation across the Project site land parcels; ■ Site preparation, levelling, excavation and foundation construction that will affect the soil chemistry and subsequently the floral and faunal composition; and ■ Sedimentation of water bodies due to erosion and construction materials input into nearby water bodies.
Disturbance and displacement of ecology due to construction activities (noise pollution, light pollution, anthropogenic movement, etc.)	■ Noise and vibrational impacts from anthropogenic and vehicular movement and construction equipment noise; ■ Increased stress on resident fauna due to Project-related work causing disturbance in the existing habitats; ■ Hunting, trapping, road kills and injuring risk due to increased influx of labour and demography into the Project site and surrounding regions; and ■ Displacement of fauna from the Project site because of the Solar Park construction.
Loss of resources including the potential for barrier effects and loss of ecosystem services	■ The barrier effect wherein fauna cannot access foraging and roosting resources because of the walling of the Solar Park; and ■ Loss of ecosystem services including food resources, climate regulation, erosion control, fire regulation, aesthetic value and nutrient cycling.
Collision and electrocution risk	■ Potential for lake effect wherein birds mistake the reflection of solar rays of the solar panels as a lake and it increases the risk of collision; and ■ Electrocution risk with birds roosting along the solar modules and electrical components within the Solar Park.

6.3.1 Assessment Criteria

ERM has defined impact assessment standards based on internal parameters that identifies the significance value of the impacts as a matrix between habitat/species sensitivity and impact magnitude. The internal impact assessment standards for biodiversity impacts has been provided in ***Table 6.11*** and ***Table 6.12***.

Table 6.11 Habitat Impact Assessment Criteria

Habitat Sensitivity/ Value		Magnitude of Effect on Baseline Habitats			
		Negligible	**Small**	**Medium**	**Large**
		Effect is within the normal range of variation	Affects only a small area of habitat, such that there is no loss of viability/ function of the habitat	Affects part of the habitat but does not threaten the long-term viability/ function of the habitat	Affects the entire habitat, or a significant portion of it, and the long-term viability/ function of the habitat is threatened.
Negligible	Habitats with negligible interest for biodiversity.	**Not significant**	**Not significant**	**Not significant**	**Not significant**
Low	Habitats with no, or only a local designation / recognition, habitats of significance for species listed as of Least Concern (LC) on IUCN Red List of Threatened Species, habitats which are common and widespread within the region, or with low conservation interest based on expert opinion.	**Not significant**	**Not significant**	**Minor**	**Moderate**
Medium	Habitats within nationally designated or recognised areas, habitats of significant importance to globally Vulnerable (VU) Near Threatened (NT), or Data Deficient (DD) species, habitats of significant importance for nationally restricted range species, habitats supporting nationally significant concentrations of migratory species and / or congregatory species, and low value habitats used by species of medium value.	**Not significant**	**Minor**	**Moderate**	**Major**
High	Habitats within internationally designated or recognised areas; habitats of significant importance to globally Critically Endangered (CR) or Endangered (EN) species, habitats of significant importance to endemic and/or globally restricted-range species, habitats supporting globally significant concentrations of migratory species and / or congregatory species, highly threatened and/or unique ecosystems, areas associated with key evolutionary species, and low or medium value habitats used by high value species.	**Not significant**	**Moderate**	**Major**	**Critical**

Table 6.12 Species Impact Assessment Criteria

Baseline Species Sensitivity/ Value		Magnitude of Effect on Baseline Species			
		Negligible	Small	Medium	Large
		Effect is within the normal range of variation for the population of the species	Effect does not cause a substantial change in the population of the species or other species dependent on it	Effect causes a substantial change in abundance and/or reduction in distribution of a population over one, or more generations, but does not threatened the long term viability/ function of that population dependent on it.	Affects entire population, or a significant part of it causing a substantial decline in abundance and/or change in and recovery of the population (or another dependent on it) is not possible either at all, or within several generations due to natural recruitment (reproduction, immigration from unaffected areas).
Negligible	Species with no specific value or importance attached to them.	**Negligible**	**Negligible**	**Negligible**	**Negligible**
Low	Species and sub-species of LC on the IUCN Red List, or not meeting criteria for medium or high value.	**Negligible**	**Negligible**	**Minor**	**Moderate**
Medium	Species on IUCN Red List as VU, NT, or DD, species protected under national legislation, nationally restricted range species, nationally important numbers of migratory, or congregatory species, species not meeting criteria for high value, and species vital to the survival of a medium value species.	**Negligible**	**Minor**	**Moderate**	**Major**
High	Species on IUCN Red List as CR, or EN. Species having a globally restricted range (i.e. plants endemic to a site, or found globally at fewer than 10 sites, fauna having a distribution range (or globally breeding range for bird species) less than 50,000 km^2), internationally important numbers of migratory, or congregatory species, key evolutionary species, and species vital to the survival of a high value species.	**Negligible**	**Moderate**	**Major**	**Critical**

6.3.2 Habitat Modification and Loss

Context

The habitat mapping exercise in the ecological baseline (***Section 4.3.3***) has identified four kinds of habitat in the study area – forest land, scrub land, agricultural land and water bodies. Based on the proposed siting locations for the Project components, only scrub land and agricultural land, i.e. only "Modified Habitat" will be modified/lost for the Project construction. Additionally, the banks of the [Water Body Unit 3] located at the southern end of Unit 3 of Neemuch may be completely modified or lost due to the Project construction.

The habitat with the highest sensitivity in the Project site is the scrub land adjacent to [Water Body adjacent Unit 3]. The water body supports migratory and resident bird species including small colonies of the Vulnerable Woolly-necked Stork. As vegetation surrounding the water body is commonly utilized by resident bird species, the loss of these habitats could result in displacement of fauna from the area. Storks are also commonly found perched at heights on Transmission Lines or trees near water bodies and therefore the loss of vegetation would affect the Vulnerable Woolly-necked Stork. The habitat has therefore been classified as **medium** sensitivity based on ***Table 6.11,*** as it is known to support species classified as vulnerable in the latest IUCN Red List.

Embedded/In-built Controls

The following embedded controls have been incorporated into the Project planning:

- The forest land located within Arnea Reserve Forest block (300 m- 1 km north of the Project site) has been avoided for the siting of Project components and ancillary facilities;
- Existing village roads are being widened and utilized for access to the Project site to the extent possible and therefore clearance of vegetation has been limited for road construction; and
- The Project site is located at least 300 m south of the forest land and therefore the resultant vegetation clearance will not create an edge effect[1] for the local ecology.

Impact Magnitude

*Base*d on the current site layout, the scrubland along the west to north of [Water Body Unit 3] (cardinal direction 225° to 0° SW to N) will be modified or cleared for the construction of Unit 3 of the Project. The loss of the scrubland adjacent to the pond may result in displacement of some aquatic bird species especially species that roost along the vegetation cover near water bodies. If displacement occurs, then species may move to the south to southeast end of the water body where frequent livestock movement was identified or migrate to alternate habitat in the area. The largest water bodies in the surrounding areas include *Mandol Dam (~ 5 km north) and the Rana Pratap/Gandhi Sagar Dam areas.* The loss of the vegetation could therefore result in displacement of species up to 5 km north of the current roosting site. The displacement however, has not been considered significant because most individuals would prefer using the less developed areas of the water body as long as other impacts from noise, human-wildlife conflict and anthropogenic movement is not significant.

The impact has therefore been classified as **small** because there is availability of similar habitat in the surrounding areas or the species can travel to other large water bodies within the 5 km radius.

[1] Edge effect refers to the modification or loss of habitat in a habitat transition area e.g. forest edges. The edge habitat is important for biodiversity and displays a higher floral and faunal diversity than the individual habitats because of higher sunlight penetration and larger range of foraging resources.

Impact Significance

The impact significance has been classified as **minor** as per ***Table 6.11.***

Additional Mitigation Measures

- The primary concern from habitat loss and modification is the loss of vegetation around [Water Body Unit 3] and the resultant impacts. The mitigation measures that can be implemented for reduction of impacts to surrounding habitats has been provided below:
- Larger mature trees with significant height and girth should be avoided to the extent possible when constructing the Solar Park. Larger trees can be set aside within the Solar Park and avoided as part of the micro-siting of the solar modules
- The Kawai Pond and Bardawada Pond is located within 500 m and 100 m from Unit 2 and 1 respectively. The vegetation surrounding these ponds should be avoided to the extent possible when siting temporary facilities (i.e. labour camps, contractor facilities, batching plant, etc.).
- A natural canal delineates the border between Kawai and Badi Villages. The canal was dry during the site visit despite the assessment being immediately after the monsoon season. The canal may pass through Unit II and/or Unit III after the compound is constructed. The natural drainage through the canal should not be blocked due to construction and operation/maintenance activities.
- If changes in the boundaries of the proposed units or any further expansions are anticipated than the areas surrounding the Arnea Reserve Forest block should be avoided to prevent increased risk of edge effects.
- The area around the [Water Body Unit 3] should be avoided for the siting of any ancillary facilities including access roads, contractor facilities or labour accommodation and even siting of equipment (e.g. DG set, waste storage area, material storage area, etc.) should not be undertaken adjacent to the water body.

Residual Impact Significance

The residual impact significance will remain **minor** because the biggest impact i.e. loss of scrub habitat around [Water Body Unit 3] can only be prevented/reduced but not completely mitigated.

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Impact	Habitat Modification and/or loss				
Impact Nature	Negative	Positive	Neutral		
Impact Type	Direct	Indirect	Induced		
Impact Duration	Temporary	Short-term	Long-term	Permanent	
Impact Extent	Local	Regional	International		
Impact Scale	Limited to Project site and ancillary facilities				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Resource/ Receptor Sensitivity	Low	Medium	High		
Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **minor**				
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **minor**				

6.3.3 Impacts due to Construction Activities

Context

The following impacts from the construction phase has been considered:

- Laying of approach road, walling of the Solar Park, installation of the solar modules, construction of other Project components (e.g. transformers, storage sheds and control monitoring building), batching plant operations, Diesel Generator set operation and anthropogenic/vehicular movement will create noise and vibrational impacts in the surrounding areas.
- Constant and/or periodic movement of vehicles and people around the Project site will create a disturbance to local fauna and force them to remain in an alert mode for extended periods of time that prevents proper foraging, roosting, nesting, breeding, mating and socializing activities.
- Vegetation clearance, site levelling, site preparation and excavation will change the local soil properties by compacted soil layers, loosing top soil strength and increase soil erosion. The resultant impact could affect the viability of local flora, ground-roosting bird species and ground-dwelling fauna.
- Fauna would eventually adjust to the increased disturbance levels within the Project site and move to less disturbed area. The resultant movement may create a net displacement of local fauna and affect the species composition in and around the Project site.
- Increased demographic influx into the Project site may increase the human-wildlife conflict risk including hunting/trapping/injuring of local fauna and potentially road kills. The human-wildlife risk is further increased if proper toilets and gas based stoves are not provided to any labour accommodation because the labourers may then be forced to enter forested areas for their needs and increased cutting of firewood trees. The increased movement in the forest area will force conflicts with more sensitive fauna as indicated in the ecological baseline.
- As determined in the habitat mapping exercise (***Section 4.3.3***), the habitats with the highest species sensitivity are the forest and water bodies. The proposed road segments, Project components and ancillary facilities are not passing through or adjacent to forest and water bodies. The exception again is Water body adjacent Unit 3 because vegetation clearance and site preparation may occur immediately adjacent to the pond. There is potentially an increased risk to species occupying the habitat immediately surrounding the ponds including the vulnerable Woolly-necked Stork due to noise, vibrations, increased disturbance and hunting/trapping/injury risk. Similarly, the Kawai pond located 500m from the Unit II appears to support a small flock of the vulnerable Common Pochard (*Aythya ferina*). The species in the Kawai pond may be similarly affected by noise, vibration, disturbance and hunting/trapping/injury risk. As there is a potential impact to vulnerable species, the receptor sensitivity has been classified as **medium** according to ***Table 6.11*** and ***Table 6.12.***

Embedded/In-built Controls

The following embedded controls have been incorporated into the Project:

- The forest land located within Arnea Reserve Forest block (300 m- 1 km north of the Project site) has been avoided for the siting of Project components and ancillary facilities;
- Existing village roads are being widened and utilized for access to the Project site to the extent possible and therefore impact from road construction has been limited where possible; and
- The Project has proposed the use of local demography for the labour requirement for the Project and reduced the demographic influx into the site. The resultant human-wildlife conflict risk will also therefore be reduced.

Impact Magnitude

Several impacts have been identified for the construction phase of the Project and the impact with the highest magnitude is likely noise and vibration impacts from the various point sources of noise. The resultant impact will create displacement of local fauna including vulnerable Woolly-necked Stork and Common Pochard. There is also possibility that the impact will extend into the nearby forest areas and may affect vulnerable mammals (e.g. Leopard and Sloth Bear) and critically endangered and endangered vultures (e.g. White-rumped Vulture, Red-headed Vulture and Egyptian Vulture) if the embedded controls of avoiding forest land is not followed. The impact however, will only affect a small part of the habitat because it will be restricted to the outskirts of the habitat that is in the direction of the Project site. The impact is going to affect a small part of the habitat and has therefore been classified as **small** according to ***Table 6.11.***

Impact Significance

The impact significance has been classified as **minor** assuming that no forest land will be impacted by temporary contractor/construction facilities.

Additional Mitigation Measures

The following mitigation measures can be implemented for the Project site:

- No hunting, trapping or injuring of local fauna should be communicated to labourers through a workshop or formal training exercise. The training should also communicate presence of species protected under Wildlife Protection Act, 1972 Schedule I and the penalties associated with contravention on the identified law;
- Noise control measures such as acoustic enclosures for DG sets, noise attenuation barriers in areas near sensitive habitat and proper maintenance of the vehicles used for the Project site should be implemented to reduce the effect of construction noise on local ecology;
- Set routes, consolidation of trips and no off-roading policies should be introduced by the EPC contractor to reduce the impact from noise and human-wildlife conflict;
- Adequate toilets, gas/firewood and space should be provided in any anticipated labour accommodation and the labourers should be informed not to enter or utilize any resources from surrounding forest land over the course of the construction period;
- Local semi-skilled and unskilled labourers should be used to the extent possible to reduce demographic influx into the Project site and therefore reduce the risk of disturbance to local fauna;
- Waste that is generated from the Solar Park during construction and operation should be stored in covered containers within the site premises. Uncovered waste may attract fauna to the Solar Park;
- Micrositing of project components and clear marking of project component locations in the field during construction activities should be done;
- Excavated areas should be adequately fenced and security should be deployed to prevent wildlife intrusion into these areas;
- Construction work and anthropogenic movement should be restricted near any major water bodies (including all water bodies identified in ***Table 4.29***) to reduce the impact on aquatic bird species (resident or migratory);
- Construction activities and transportation should be avoided during peak ecological activity i.e. dawn (5:30 am to 7:30 am) and dusk (5:00 pm to 7:00 pm). Night-time activities should be kept to a minimum;

- Areas with pre-existing nests, ground-roosting sites and burrows should be avoided for construction related work to reduce the impact on local fauna; and
- Hazardous materials and waste should not be stored near any drainage channels or cliff-sides to prevent contamination of the surrounding environment and impact on local flora/fauna.

Residual Impact Significance

The residual impact significance will be retained as minor because of the proximity to the water body to Unit 3 and therefore higher chance of human-wildlife conflict and disturbance to species due to movement of people, vehicle and equipment.

Impact	Impact due to construction activities				
Impact Nature	Negative	Positive	Neutral		
Impact Type	Direct	Indirect	Induced		
Impact Duration	Temporary	Short-term	Long-term	Permanent	
Impact Extent	Local	Regional	International		
Impact Scale	Limited to Project site and ancillary facilities				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Resource/ Receptor Sensitivity	Low	Medium	High		
Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **minor**				
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **minor**				

6.3.4 Ecosystem Services

Context

The Project will include the long-term loss of food resources, water, shelter, nesting sites, etc. because of the establishment of the Solar Park. It is expected that the Solar Park, which is a 1065.657 Ha land parcel will be walled off and therefore any resources existing within the land parcels will not be available. The existence of the walled compound may also hinder daily pathways taken by reptiles, mammals and birds for foraging, roosting and socializing. Specific to the Project site, the clearance of vegetation, access to the natural canal between Kawai and Badi Villages and Badi Pond will be lost due to construction of the wind farm. Additionally, access to smaller ponds located along the access roads may be affected by the Solar Park construction.

Some pictures of the resources that will be lost due to the Solar Park construction has been provided below:

Water body along the access road to Unit 3	Tree resources located at the northern end of Unit 2
Natural Drain between Kawai and Badi Villages	Weaverbird Nesting Site in Unit 3

The loss of ecosystem services due to the construction of the Solar Park has been described below:

- The loss of cultivated crops and medicinal plants that are found along the agricultural land and scrubland within the 1065.7 ha land parcel;
- Loss of some wood products and non-timber forest products (e.g. *catechu*) that is found around the Project site;
- Loss of freshwater resources as smaller ponds along the access roads;
- Loss of viability of the [Water Body Unit 3] due to any impacts (e.g. sedimentation, water contamination, etc.) from the adjacent construction work for Unit 3 of the Project;
- Loss of climate management resources including water purification, pest regulation, fire regulation, disease regulation, erosion regulation, shade, carbon sequestration and air temperature/quality regulation.
- Reduced aesthetic value of the lost scrub habitat and conversion to industrial areas; and
- Loss of primary production.
- The loss of resources includes the areas surrounding [Water Body Unit 3] that that supports vulnerable species and therefore receptor sensitivity is defined as medium in accordance to ***Table 6.11***.

Embedded/In-built Controls

The following embedded controls have been incorporated into the Project planning:

- The forest land located within Arnea Reserve Forest block (300m- 1km north of the Project site) has been avoided for the siting of Project components and ancillary facilities;
- Existing village roads are being widened and utilized for access to the Project site to the extent possible and therefore clearance of vegetation has been limited for road construction; and
- Larger water bodies such as Kawai Pond, [Water Body Unit 3] and Bardawada Pond have been avoided as part of the Project siting.

Impact Magnitude

The loss of ecosystem services includes, natural canal, smaller water bodies, mature trees and scrub habitat. Alternative habitat including larger water bodies, forested land and similar habitat types is found in the surrounding region. The Project site is also largely affecting scrub habitat consisting of thorny dry deciduous forests that have a lower ecological value because of the low floral diversity and limited foraging resources/shade cover. The loss of the resources across the construction and operation phases would therefore affect a small part of the habitat but the overall loss of long-term viability of the ecosystem will not occur due to availability of similar habitat in the region. The impact magnitude has been assessed as **small** in accordance to ***Table 6.11.***

Impact Significance

The impact significance has been assessed as **minor** for the Project site

Additional Mitigation Measures

The following mitigation measures can be implemented for the Project site:

- Nesting trees should be avoided to the extent possible when it falls within the Solar Park site.
- Larger mature trees[1] with significant height and girth should be avoided to the extent possible when constructing the Solar Park. Larger trees can be set aside within the Solar Park and avoided as part of the micro-siting of the solar modules.
- Natural drain passing between Kawai and Badi should be unaffected by the Project construction. Similar seasonal drainage pathways should not be blocked during the Project construction.
- Seeding of native plant species outside of the Solar Park especially in areas where the soil layers have been impacted and around water bodies to offset the loss of floral resources and dependent ecosystem services.
- Pollution and spill control mechanisms should be implemented and strictly enforced around [Water Body Unit 3] to ensure that there is no impact to the water quality or any drainage channels into the water body.

Residual Impact Significance

The residual impact significance will remain **minor** after implementation of mitigation measures because there will still be an impact due to the loss of smaller water bodies within the Solar Park and scrub habitat that cannot be adequately offset due to the large land requirement for the Project.

[1] Mature trees can provide several ecosystem services including firewood, non-timber forest produce, shelter, climate regulation, habitat provision and foraging resources.

Impact	Impact due to loss of resources				
Impact Nature	Negative	Positive	Neutral		
Impact Type	Direct	Indirect	Induced		
Impact Duration	Temporary	Short-term	Long-term	Permanent	
Impact Extent	Local	Regional	International		
Impact Scale	Limited to Project site and ancillary facilities				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Resource/ Receptor Sensitivity	Low	Medium	High		
Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **minor**				
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **minor**				

6.3.5 Collision and electrocution risk

Context

The solar modules being housed within the Project site are in close proximity to each other and therefore can mirror the reflection of a large water body during daytime hours. The smooth surface can also be mistaken by bats to be water bodies when using echolocation. The risk of the lake effect wherein birds and bats mistake the solar modules as a water body is more pronounced in this Solar Park because an existing water body (Water Body Unit 3) is immediately adjacent to the proposed location of Unit 3 of the Project. Species that have traditionally used the water body may have an increased risk of collision with the solar modules or internal Transmission Line infrastructure along the boundary walls during the operation phase.

Electrocution risk occurs when bird and bat species roost or nest Transmission Lines and are exposed to the uninsulated electrical components. There is also a chance of collision with the live electrical line components due to the line being not clearly visible during daytime hours (lack of reflective capacity) and night-time hours (poor light). The risk of electrocution is significantly reduced in internal Transmission Lines of solar projects because the large amount of development/disturbance in a restricted space may dissuade bird movement into the Solar Park and the transmission lines are typically covered/underground within the solar compound. The external Transmission Line, which has a higher risk of electrocution, is not scoped into this ESIA report. The risk is therefore limited to birds roosting on solar modules and getting exposed to any electrical wiring or collision with any overhead lines within the Solar Park.

Some examples of bird roosting on Transmission Lines have been provided below:

Beheaded Red-vented Bulbul below an existing Transmission Line	Feather spots under an existing Transmission Line indicating a mortality due to electrocution	Indian Roller roosting on a Transmission Line
Green Bee-eater roosting on a Transmission Line	Long-tailed Shrike roosting on a Transmission Line	Large Grey Babbler roosting on a Transmission Line

The species that were observed roosting on Transmission Lines were largely Least Concern species. Species that have been identified in the Project as vulnerable or higher as per the latest IUCN Red List are largely aquatic birds and therefore the likelihood of these species roosting on solar modules or Transmission Line components within the Solar Park is very low. The two exceptions are the species mistake the solar panels for lakes and collide with the PV modules and any Transmission Line infrastructure within close proximity to [Water Body Unit 3]. The presence of the Solar Park in close proximity to [Water Body Unit 3] can increase the risk of collision with the solar modules but the likelihood of collision/electrocution with internal transmission line infrastructure is negligible. There is a risk that the vulnerable Woolly-necked Stork would use this surrounding features for roosting during daytime hours. The presence of the vulnerable stork results in a receptor sensitivity that is **medium** in accordance to ***Table 6.12.***

Embedded/In-built Controls

As is typically undertaken in solar projects, the array cables from the solar modules to the connector box/inverter will be underground cabling and will not be exposed to create any electrocution risk to roosting fauna.

Impact Magnitude

Birds and bats will adjust to the presence of the Solar Park over time and therefore avoid the structure entirely. The biggest collision and electrocution risk is from impact with power evacuation infrastructure, which is minimal for internal transmission lines because the lines are typically covered or underground. The impact from collision and electrocution risk with the Solar Park will therefore be greatly reduced. From a long-term viability perspective, it is anticipated that a very small portion of the local population will be affected and there won't be a significant change in the population numbers or species composition. The impact magnitude has therefore been assessed as **small** in accordance to ***Table 6.12***.

Note: the above impact magnitude has been considered only for collision with solar modules and internal transmission line infrastructure. The impact magnitude does not consider collision and electrocution risk with external transmission line infrastructure that has been separately covered in another ESIA.

Impact Significance

The impact significance has been assessed as **minor**.

Mitigation Measures

- Restrictions should be imposed so that dead carcasses are not disposed near the Solar Park. The O&M team should be trained on removing any carcasses found around these Project components in a timely manner to ensure that no vulture or birds of prey are attracted to the Project site.
- RUMSL should maintain a carcass register as part of the Operation and Maintenance (O&M) phase to record any bird carcasses or suspected bird carcasses. The register should include a date, type of specie (to the extent identifiable), geographic location and nearest Transmission Line infrastructure for each carcass entry. If possible, the register should be backed-up with photo-documentation of any identified carcasses or remains. If the number of carcasses are significant, then RUMSL should commissioning an ecologist to suggest more stringent mitigation measures at the sensitive Project components.
- The O&M team should be instructed to regularly inspect areas around transmission line and solar module infrastructure as part of their periodic maintenance and rounds of the operational Solar Park. The purpose is to identify any roosting or nesting of bird species.
- The internal Transmission Line, if any, should be marked with diffractors/diverters at a spacing of 10m apart including bird guards/diverters in low voltage lines/cables.

Residual Impact Significance

The impact magnitude for collision/electrocution risk due to internal Transmission Line infrastructure and solar modules can be reduced to **negligible** after implementing the above mitigation measures.

Impact Nature	Negative	Positive	Neutral		
Impact Type	Direct	Indirect	Induced		
Impact Duration	Temporary	Short-term	Long-term	Permanent	
Impact Extent	Local	Regional	International		
Impact Scale	Limited to Project site and ancillary facilities				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Resource/ Receptor Sensitivity	Low	Medium	High		
Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **minor**				
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Large
	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **negligible**				

6.4 Impacts on Social Environment

The maximum impacts of the project related activities will be in the Project villages, on the land owners, Patta Land holders and households that are using the land formally and informally as encroachers, agricultural labourers, graziers, etc. Specifically, the impacts will be due to use of Government land identified for the project, within which several uses exist, as elaborated in ***Section 4.4.6***. The project design features went through an avoidance exercise to reduce the need for private land and Patta Land for the project to the extent feasible. As part of the optimization exercise, no *Abadi* area (area with village habitation and residential structures) has been included in the project footprint.

6.4.1 Avoidance and optimisation of the Project footprint

As understood from the project documents, there have been multiple optimization exercises, in order to ensure maximum avoidance of land used for agriculture and habitation in Project villages. The land originally identified for the project is presented below.

Table 6.13 Land identified for the Project at the DPR stage

Land Category	Bardawada (ha.)	Kawai (ha.)	Badi (ha.)	Total land (Hectare)
Government Land	201.4	245.7	521.9	969
Private Land	5.1	13.9	15.5	34.6
Patta Land	50.7	26.2	10.8	87.7
Sum	**257.2**	**285.8**	**548.3**	**1091.3**

Source: DPR, October 2019

Additionally, details of and identified by the project, based on ownership and use, are presented in the table below.

Table 6.14 Details on land identified for the project

Ownership and community use	Bardawada	Kawai	Badi	Total
Total land requirement (ha and %)	**257.7 (23.5%)**	**285.9 (26.2%)**	**549.1 (50.3%)**	**1092.7**
Government land (total) (ha)	202	245.7	521.2	968.8
Private land (ha)	5.1	13.9	16.5	35.5
No of Private parcels	6	12	30	48
Patta land (ha.)	50.7	26.2	10.8	87.7
No of Patta parcels	43	22	8	73

Source: Data shared by RUMSL on 3June 2020

The land optimization exercise has resulted in reduction in the requirement of private land for the project, which has been compensated by addition of Government land as per project's requirements. The area of land to be used for the project is as presented in the table below.

Table 6.15 Details of land footprint finalised for the Solar Park

Land Category	Unit 1 (ha.)		Unit 2-(ha.)		Unit 3 (ha.)	Total land (Hectare)
	Bardawada	**Kawai**	**Kawai**	**Badi**	**Badi**	
Government Land (both NRED allotted & identified)	201.8	89.6	156. 1	163.2	351.7	962. 5
Private Land	5.1	4.2	0	1.7	10.4	21.4
Patta Land	50.7	0	22.4	3.6	5	81.7
Sum	**351.5**		**347**		**367**	**1065.7**

Source: Land Data provided by RUMSL, 3 June 2020, included in the Final DPR July 2020

The impacts of land take on these villages will flow from all categories of land, whether government, patta or private, and will potentially affect livelihoods and easements (traditional access and use) but

also on availability of land for future generations. Some impacts may be possible to mitigate or manage while others will need to be compensated, while certain residual impacts will continue to remain even after implementation of the mitigation measures.

6.4.2 Potential impacts from Project activities on stakeholder categories

The land identified for procurement for the Neemuch project comprises 21.4 ha. Private land (nearly 2% of total land required), 81.7 ha. Patta Land (approximately 8% of the total land required) and 962.5 ha of Government Land (comprising nearly 90% of the total land). There are 48 Private land owners and 73 Patta land holders associated with the land that has been identified for the project. Considering the fact that the average size of the household in the project area is 5 (as presented in ***Table 4.39***), the total number of Project Affected population belonging to Private and Patta land holder families is nearly 600. Furthermore, there are households that are impacted due to loss of grazing land in vicinity or loss of income due to agricultural activity on land parcels encroached/ squatted upon. Additionally, there will be some households whose members work as agricultural labourers on private, patta and encroached Government land parcels that are identified for the Solar Park. The details and number of agricultural labourers will be captured through RAP survey.

The table below describes the potential impacts that are likely to result from Project activities in various stages of the project, comprising, Planning, Construction and Operation, on various socioeconomic and community aspects, including from the land requirements of the project, as noted in the ***Table 6.16***. Additionally, the table below and the sections 6.4.4, 6.4.5, 6.4.6, 6.4.7 and 6.4.8 detail out the embedded controls and mitigation measures for specific impacts, as drawn from the ESMF for the project and enhanced through specific impacts identified.

Table 6.16 Summary of Potential impacts from project activities

Impact Categories	Impacts	Impacted Stakeholders	Mitigation measure
Planning Phase Impacts			
Private Land (Purchased through MP Mutual Consent Policy, 2014	■ Approx. 21 ha. of private land is being considered for purchase by the project, which forms nearly 2% of the total area identified for the project; ■ The private land parcels that are identified are not being used for residential purposes, thus there is no physical displacement due to project; however, **economic displacement** will occur for the private land sellers whose land parcels will be purchased for project related activities affecting livelihoods and incomes; ■ **Landlessness** may potentially result due to purchase of private land parcels in some cases. The total land holding and proportion of land remaining with the sellers after the mutual consent based sale, is not known currently, but will be assessed during the RAP survey; ■ Agricultural labourers employed by the land owners of the private land parcels identified for purchase for the project will experience **loss of livelihood opportunities**; ■ Loss of access or easement for the local community due to diversions/ barricading of areas due to construction phase activities.	■ Private land owners; ■ Agricultural labourers employed seasonally; ■ Local Community.	■ The private land sellers should be provided with either alternate land parcels with similar nature of productivity and financial assistance to prepare the land for cultivation or adequate compensation, at twice the value of land and assets, as per MP Mutual Consent Policy, 2014; ■ After assessing the applicability and need during the RAP Survey, a Resettlement Action Plan-Livelihoods Restoration Plan is required to be formulated to address: - Livelihood impacts on the land owners if the holdings that remain are sub-optimal, or owners are rendered landless; - Additional livelihood assistance to vulnerable households, or women headed households, with skill trainings or entrepreneurship support, etc. under the LRP; - Impacts on land users or regular agricultural labourers affected - The general community being impacted due to access restrictions/easements; Other displacement impacts on private and patta land owners. ■ Preference to members (vulnerable) of the families post selling land to the project for employment opportunities in the Construction/operation phase, small contracts;

Impact Categories	Impacts	Impacted Stakeholders	Mitigation measure
			■ Timely sharing of project related information with all relevant stakeholders; ■ Provision of Grievance Redressal Mechanism to all impacted stakeholders in order to raise and register their grievances.
Pattta Land (Negotiated purchase through MP Mutual Consent Policy)	■ Approx. 81.7 ha. of Patta land is being considered for purchase by the project, which forms approx. 8% of the total area identified for the project ; ■ **Economic displacement** will occur for the Patta Land holders who have invested cost and efforts in the Patta land to make it cultivable and are currently undertaking agricultural activities; ■ The Tarmeem process demarcated the location of 43 Patta land parcels in Bardawada, 22 Patta land parcels from Kawai and 8 patta land parcels in Badi and while the recorded Patta land holders can be based on the available records, these will need to be updated during the RAP survey to get the current number of affected households and persons (reasons outlined below).; ■ Typically Patta land owners are likely to be from vulnerable households like SC, ST and other previously landless households and the land purchase for the project may lead to cases of **landlessness, (which is more likely to be in this category than the category of private land holders, as landlessness is a baseline criteria for initial award of pattas)**; ■ It is understood that certain Patta Land parcels have been sold off based on a 'verbal agreement' by the household it was originally allotted to, without a change in records. Although this is not allowed as per the terms of the allotment, it is reported as a practise. In such cases, the households using the Patta lands through this arrangement are also understood to be impacted, in	■ Patta Land Holders; ■ Non-recognised 'patta owners' who have procured the patta based on a verbal agreement with the original (and registered) patta holder ■ Agricultural labourers; ■ Local Community.	■ Patta is being treated at par with ownership, for the land procurement process. Thus treatment of Patta Land holders will be similar to Private land owners and Patta holders shall be provided with either alternate land parcels with similar nature of productivity and financial assistance to prepare the land for cultivation or adequate compensation at twice the value of land and assets, as per MP Mutual Consent Policy, 2014; ■ After assessing the applicability and need during the RAP Survey, a Resettlement Action Plan-Livelihoods restoration Plan is required to be formulated to address: - Livelihood impacts on the land owners if the holdings that remain are sub-optimal, or owners are rendered landless; - Additional livelihood assistance to vulnerable households, or women headed households, with skill trainings or entrepreneurship support, etc. under the LRP; - Impacts on land users or regular agricultural labourers affected - The general community being impacted due to access restrictions/easements;

Impact Categories	Impacts	Impacted Stakeholders	Mitigation measure
	addition to original owners, who are still on record as 'patta holders'; ■ Agricultural labourers working at the Patta land parcels identified for purchase for the project will experience **loss of livelihood opportunities**; ■ **Loss of access or easement** for the local community due to diversions/ barricading of areas due to construction phase activities.		- Other displacement impacts on private and patta land owners. ■ Preference to members (rendered landless or with sub-optimal holdings) of the families post selling land to the project for employment opportunities in the Construction/operation phase, small contracts; ■ Additional safeguards to be addressed through the RAP-LRP for Patta Land owners; ■ Timely sharing of project related information with all relevant stakeholders; ■ Provision of Grievance Redressal Mechanism to all impacted stakeholders in order to raise and register their grievances. ■
Government Land (LUPA between RUMSL and New and Renewable Energy Department, Government of MP): Used Land (permitted uses): Grazing, easements, cultural heritage sites, water sources, fuel wood collection and collection of other resources;	■ Government land being identified for the project from the three project villages amounts to 962.5 ha, which forms nearly 90% of the total land required for project. ■ This land has different uses by the local community: - Livestock grazing in the open as well as within encroached and bounded 'fodder lots' created by encroachers(see below); - Incidental collection of non-timber products like 'kattha'; - Easements, access to assets and other resources not within the project boundary, etc. and the change in use and ownership of Government land will affect the users in the community to varying degrees. ■ The Impacts on users of this land type comprise the following:	■ Local Community; ■ Livestock Owners or Graziers whose livestock grazes in the identified land for 8 months in a year (except summers), from 3 project villages and other villages that are sending their livestock for grazing in identified land;	■ Provision for alternate grazing land for livestock near the project village, or confirmation of adequacy of remaining grazing land; ■ Development of community fodder lots may be explored as a Livelihood restoration activity in the area as part of Resettlement Action Plan. This, if feasible, shall serve the purpose of augmentation of grazing land and as an income generating activity for people losing land based livelihoods. ■ Provision of easements shall be maintained in order to not sever the access to CPRs for the community; ■ Timely sharing of project related information with all relevant stakeholders; ■ Provision of Grievance Redressal Mechanism to all impacted stakeholders in order to raise and register their grievances.

Impact Categories	Impacts	Impacted Stakeholders	Mitigation measure
	– Loss of Grazing land for the livestock in the area and loss of livelihood and nutritional security due to possible reduction in livestock herd size due to reduced access to grazing land (potential vulnerability) – Loss or severance of access for the community, livestock, etc.; – Loss of cultural resources in terms of religious trees, structures, etc.		
Government Land (LUPA between RUMSL and New and Renewable Energy Department, Government of MP): Informally occupied Land: Captured/encroached for agriculture or grazing, prohibiting use by other people	■ Additionally, a portion of this Government land has been informally (and illegally) encroached by local land owners for cultivation of crops, livestock grazing, etc. Anecdotal evidence suggests that most of the encroachment is done by land owners from the Dhakad community, it is also reported that people from this community are skilled (more than others) in local forms of agriculture and able to develop dry land and make it cultivable. ■ It was also reported that the encroachers/occupiers paid fines to the Government (revenue department) self-reporting a smaller proportion of land than is actually squatted upon/ encroached. There are no reliable records of the actual extent of government land encroached/occupied for agriculture. The amount of land encroached has grown in recent years, with the availability of regular power supply, enabling the use of deeper bore-wells to extract ground water for irrigation. ■ Out of the 968.9 ha. Government land for the project, anywhere between 10-20% may be encroached and / or squatted upon by land owners, leaving a lesser amount of land for common usage by the larger community. If captured land is taken for the project it would affect the following groups: – Encroachers/squatters who have occupied (and developed) government land for agriculture (these are	■ Squatters and Encroachers; ■ Local Community.	■ RUMSL shall serve a three months advance notice to the project affected persons (PAPs) to manage the potential losses to standing crops; ■ In case of crop losses ensuing from project activities, RUMSL shall pay compensation for crops, at full replacement cost, as per the ESMF; ■ Timely sharing of project related information with all relevant stakeholders, in order to serve advance notice and reduce the extent of losses/ impacts; ■ Employment to members of such encroacher and squatter households, based on qualification; ■ Skill development of members of such encroacher and squatter households, based on any existing skill set (if any), and self-declared interests. ■ Provision of Grievance Redressal Mechanism to all the key stakeholders in order to raise and register their grievance.

Impact Categories	Impacts	Impacted Stakeholders	Mitigation measure
	all reported to be land owners) and belonging to the three Project villages – Agricultural labour employed seasonally, to work in these fields – The community at large, using common grazing land is already deprived of these areas as they are no longer available to them for grazing due to squatting and encroachment, so, they will not be affected.		
Construction Phase Impacts			
Temporary occupation of land for construction phase activities: ■ Labour Camps; ■ Safety Setbacks; ■ Storage areas; ■ Parking areas; ■ Other construction related temporary land requirements, etc.	■ The land required for temporary activities like setting up of a number of labour camps for the required duration, land for safety setbacks, storage areas, parking areas and other construction related temporary land requirements, if these are located outside the boundary of the Project Area. If all these activities can be accommodated with the Project footprint, the impacts from temporary land lease-rent, will be avoided; ■ Other impacts, from noise, nuisance, resource use, etc., are discussed below. ■ COVID 19 related infection risks may persist and may be enhanced for workers, living and working in close proximity of each other	■ Owners of land required for temporary occupation and use ■ Users of land ■ Local Community	■ Adequate lease/ rents to the land owners; ■ Restoration of land to its original state, or better, at the time of handing it back to the owners; ■ Compensation for the loss of livelihoods to the users of the land required for temporary use as this will temporarily economically displace them; ■ Application of all precautions to implement and follow the COVID-19 related safeguards, as relevant and as prescribed by the government, at that time ■ Timely dissemination of project related information with all relevant stakeholders, in order to serve advance notice and reduce the extent of losses/ impacts; ■ Provision of Grievance Redressal Mechanism to all the key stakeholders in order to raise and register their grievance.
Community Health and Safety including accident risks for animals	■ The movement of material and machinery would pose health and safety risks to the community and livestock as the vehicular movement will increase in the area and may result in collision and accident risks, and create additional vehicular and dust pollution, affecting people, animals and	■ Local Community; ■ Livestock Owners or Graziers;	■ Stakeholder engagement through the project cycle and an effective Grievance Redressal Mechanism to avoid, mitigate and mange conflicts and disagreements. ■

Impact Categories	Impacts	Impacted Stakeholders	Mitigation measure
	potentially affecting crops in the vicinity of the corridor of movement; ■ Labour influx in the area due to construction phase may lead to community health and safety related impacts which may include - Potential spread of communicable diseases (infectious and vector-borne), if external labour will be sourced from outside the region, - The issue of COVID-19 related infections may remain a relevant concern and may need to be especially managed both, within labour camps and in the interactions of workers and the local community - Conflicts with local community resulting from disagreements over other issues and local impacts	■ Workers engaged during construction phase	■ As part of the stakeholder engagement and information disclosure process, ■ The community will be provided with an understanding of the activities to be undertaken and the precautions taken for safety; ■ The project will also propagate health and safety awareness amongst the community; ■ The traffic movement for the project in the area will be regulated to ensure road and pedestrian (including livestock) safety; ■ RUMSL shall maintain safe distance of project components from schools, hospitals, etc. in order to avoid interactions with community hotspots and hence risks of accidents; ■ The Contractor shall be informed of the EHSS practices that are expected from its workers during the construction phase engagement. Obligations like preparation of Traffic Management Plan, Local Procurement Plan, EHSS Plan, etc. shall be communicated to them at the time of selection and appropriate clauses should be included at the time of contract finalization; ■ The contractor shall be required to adhere to IFC's accommodation guidelines, for the labour camps in terms of provisions, sanitation facilities, etc. thus limiting the probability of diseases and infections in the local community on account of improper management of waste; ■ The movement of workers from the project site and labour camps should be regulated and similarly the project boundary and labour accommodation to check for unauthorized

Impact Categories	Impacts	Impacted Stakeholders	Mitigation measure
			visitors/ outsiders entering the site in order to avoid any possible tensions between the migrant workforce and host community; ■ RUMSL shall put in place a grievance redressal mechanism to allow for the workers and community members to report any concern or grievance related to project activities.
Stress on Community resources - Water and Forest, Roads	■ Depletion of ground water resources in the area may take place due to use for project related activities like construction, use for drinking water, cooking and sanitary purposes, etc. potentially affecting water availability for the local population, that depends on the same resources; ■ Potential loss of forest resources due to exploitation triggered by influx of labour in the area, thereby affecting the stock available for the local community; ■ Wear and tear of roads may take place due to movement of heavy machinery on the roads, creating movement problems and risks for local road users.	■ Local Community; ■	■ There will be a worker Code of Conduct defined by RUMSL that prevents workers and contractors from using the local resources like water, forest. Refer ***Section 6.2.2*** for other mitigation measures; ■ An induction session will be organised for the migrant workers where they will be sensitized on the Do's and Don'ts during their stay near project location, which would include aspects on conservation of community's resources; ■ The contractor shall be asked to use Tanker water supply during the summer months, which are dry months in which water scarcity issues are reported by the community; ■ Periodic maintenance activities for roads used for transportation of goods for the project shall be the undertaken by the Solar Park operator , through its contractors; ■ There will be a set of contractor obligations that require preparation of Traffic Management Plan, Local procurement plan, etc. in order to safeguard community's resources; ■ Provision of Grievance Redressal Mechanism to all the key stakeholders in order to raise and register their grievance on misuse of locally available resources.

Impact Categories	Impacts	Impacted Stakeholders	Mitigation measure
Employment and entrepreneurship opportunities during construction	■ The construction phase will provide a boost to the local employment as a higher number is expected to be engaged as construction labour during construction phase; ■ Development of smaller vendors in the area through petty shops, petty contractors, etc. providing essential goods and services during the construction phase; ■ There will be an impact on local food basket due to increased demand for agricultural products and food items.	■ Members of local community that can be engaged as labours for the construction phase; ■ Existing vendors.	■ **Enhancement measures** ■ The sourcing of local labour wherever possible should be made obligatory for the Solar Project Developers and sub-contractors and in all major procurement activities; ■ Preference should be given to the land losers and vulnerable population in the Project Villages, to the extent practicable; ■ Employment of members of SC-STs and Women Headed households should be encouraged by the Solar Project Developers through documented agreement with contractors/ sub-contractors and may be set at a minimum of 30% of total workers or person-days of employment; ■ Engagement of local vendors, to the extent possible, for the goods and services required for the project during construction phase; ■ The project proponent will establish a mechanism to audit subcontractors and suppliers with respect to compliance of utilizing local labour and resources; ■ Provision of Grievance Redressal Mechanism to all the key stakeholders in order to raise and register their grievance with respect to information sharing related to jobs and access to jobs.
Operations Phase Impacts			
Community Health and Safety	■ The Operations phase would have very limited activity outside the project site as the construction phase would have been over and the scale of activity and workforce at the project footprint area would have reduced significantly. This would lead to far fewer impacts: ■ Less or negligible noise,	■ Local Community; ■ Livestock and Livestock Owners	■ Community engagement and sensitization sessions should be re-organised at the beginning of Operations phase, in order to mention about the new developments in the area and provide

Impact Categories	Impacts	Impacted Stakeholders	Mitigation measure
	■ Fewer workers at site on near project villages, ■ Reduced traffic load (compared to construction phase) from the movement of people and goods.		an understanding of the precautions to be taken for safety; ■ Additional precautions may be needed to address the COVID-19 related safeguards, as relevant and as prescribed by the government, at that time ■ Project's Grievance Redressal Mechanism for the community shall still be in implementation to deal with any concerns of community health and safety, being raised by the local community.
Impact on Employment	■ The Operations phase would require much smaller workforce as compared to construction phase and the skillset of the required workforce shall be different. The Operations phase would require Engineers, Technicians to manage the Plant operations and amongst the requirement of semi-skilled workers in limited numbers for housekeeping and Security related jobs, on the payroll of RUMSL. Additionally, there may be some vacancies with the private Solar Project Developers (SPDs) that may have some local employment, if feasible	■ Local Community	■ **Enhancement Measures** ■ RUMSL shall ensure that the Solar Project Developers (SPDs) advertise the roles of Technical staff required during operations phases, in the local newspapers to enable hiring of competent people from nearby areas, to the extent feasible; ■ Preference shall be given (to the extent feasible) to hire competent members from PAHs for semi-skilled jobs like housekeeping or Security Guards.
	Impacts on Vulnerable Groups		
Impacts on Indigenous Communities/ Vulnerable Groups	■ Out of the three phases, the Indigenous Communities and vulnerable groups are understood to be impacted the most during Planning phase of the project, on account of loss of livelihoods linked to land being procured for project. Since these agricultural workers are not rightful owners or users of land as per records, the project related compensation measures would not be directly reaching out to this group.	■ SC/ ST communities ■ Vulnerable households	■ To identify and assess the extent of impacts on this group, a review of the scope of FPIC and IPP, in terms of remaining impacts on IP groups, their traditional livelihoods and customary land use; including dependence on natural resources, will be undertaken; ■ Based on this review, the target groups for the FPIC process will be identified in terms of villages and number of households in each village.

Impact Categories	Impacts	Impacted Stakeholders	Mitigation measure
			■ It should be noted that the exact number of households may be identified only post the site walk through and social mapping. ■ Review the consultation process carried out as part of allotment process of unoccupied government land through discussions with personnel from the Land Division of District Magistrate office to access the Gram Sabha resolutions as part of the land allotment process. ■ Relevant details in relation to the Gram Sabha Resolution will be collected to understand implications for any legacy issues. ■ As part of the stakeholder engagement, ensure adequate representation of the Indigenous groups and vulnerable groups, and specific engagement activities are undertaken with these groups; ■ Ensure that the grievance management mechanism established is accessible to these groups.
	Impacts on Women		
Impact on Women (Construction phase)	■ There are 6 female private land owners and 12 female Patta land holders identified from the list of 48 private land owners and 73 Patta land holders, respectively ■ Potential impacts on women within households affected by private and patta land procurement, where women are not land owners: - Women may be potentially affected more severely in such households, if they are being rendered land-less - Risk of gender based violence from delayed payments or other land ownership based conflicts	■ Women community members in Project villages; ■ Women Headed households	■ A Gender Action Plan is prepared for the Project where women focussed engagement is detailed (refer ***Appendix F)***. ■ Ensure that the employment of women from vulnerable households is done for the project and efforts are made for development of women owned enterprises in the area, from where procurement for project related needs is undertaken; ■ Undertake a profiling of the various social groups in the Study Area, to understand the

Impact Categories	Impacts	Impacted Stakeholders	Mitigation measure
	■ Women Headed households (both Joint as well as independent) may potentially become more vulnerable in cases of sale of land for the project, if land is not in their name, or they do not receive the benefits. ■ Women land owners may face additional risks of not being included in negotiations, or other key meetings due to prevailing cultural norms and may not therefore receive the benefits and advantages compared to those who do participate ■ Access to jobs during the construction phases generally skews in favour of males, thus preventing women from availing project benefits. ■ Women and girls are disproportionately at risk in terms of safety (gender based violence, harassment, curtailed movement, reduced access to resources) during the construction phase, with the arrival of migrant labourers in the construction phase and their accommodation being planned near the project villages.		individual needs and concerns of the various women belonging to different social groups and design community development and CSR programmes in light of the same; ■ As part of the stakeholder engagement, RUMSL shall ensure and communicate to the private Solar Project developers, that Women focussed discussions are conducted in order to ensure adequate representation of the Women and their needs and concerns in order to design specific engagement activities; ■ Provision of Grievance Redressal Mechanism to all the stakeholders in order to raise and register their grievances.
Operations Phase	■ The nature of impacts are envisaged on women in the Operations phase will be as following: – The extent of outsiders and migrant population in the area would have reduced along with risk to their safety; – There would be limited requirement of labourers jobs or vendor-ship opportunities in Operations phase, which might render them in search of livelihood options again.		

6.4.3 Assessing the Significance of Impacts

For the assessment of social impacts, the sensitivity and magnitude criteria outlined in ***Section 6.1*** has been used. The social impacts associated with the planning, construction, operations and decommissioning stages have been assessed qualitatively and in some cases quantitatively (subject to availability of data), using professional judgement and based on past experience from similar projects.

6.4.4 Planning Phase Impacts

6.4.4.1 Impact due to Private Land Purchase

Context and Receptors

The Private land identified for the Neemuch Solar Park comprises approximately 21.4 ha. and is largely used for agricultural activity. Some of the private land parcels that were initially identified that were part of an inhabited settlement and have been carved out to an extent from the Project boundary, as avoidance measures. Thus, there is understood to be economic displacement due to project related private land purchase and no physical displacement is anticipated and the same will be confirmed during RAP surveys to be conducted in October- 2020.

There is agricultural labour engaged at these private agricultural land parcels which comprise of members of households with smaller or no landholdings, which may also face loss of livelihoods linked to these land parcels; however the estimate of people working as agricultural labour on these land parcels is not currently known.

Furthermore, the area surrounding the private identified land for project would still be used for cultivation and livestock grazing in future and the project may restrict access or make accessibility difficult for the local community, livestock, etc. especially during the construction phase. The potential impacts caused due to procurement of Government land are detailed in ***Table 6.16.***

Embedded/In built control

- RUMSL shall procure private land based on principles of negotiated settlement, to the extent possible and the price to be paid for the land sale shall be determined using the principles of MP Mutual Consent Policy 2014. However, RFCTLARR 2013 Act may only be used for land parcels that either do not have clear titles, or have ownership related disputes.
- To clarify, as stated in Section 2, the RAP-LRP will be prepared for all impacted families including the consenting private land owners who are economically displaced wherever negotiated settlement process have been undertaken. The LRP will also cover economic displacement impacts on agricultural labor, working on the procured/purchased private land.
- An amount of INR 2 lakhs per MW per annum has been envisaged to be provided to the local district collector to facilitate development activities in the area and these activities may range for skill development, training, restoration of local water bodies and other local development works.

Impact significance

The impact of change in land ownership and use which imposes restrictions to the identified private land and surrounding agricultural land in the construction phase is evaluated to be **Moderate** and the nature of change is irreversible.

Additional Mitigation Measures

- The private land sellers should be provided with either alternate land parcels with similar nature of productivity and financial assistance to prepare the land for cultivation or adequate compensation at twice the value of land and assets, as per MP Mutual Consent Land Purchase Policy, 2014;
- A Resettlement Action Plan shall be formulated to cover economic displacement categories (subject to the qualifications stated under embedded controls) to address the following:
  - Livelihood impacts on the land owners if the holdings that remain are sub-optimal, or owners are rendered landless;
  - Additional livelihood assistance to vulnerable households, or women headed households, with skill trainings or entrepreneurship support, etc. under the LRP;
  - Impacts on land users or regular agricultural labourers affected
  - The general community being impacted due to access restrictions/easements;

  Other impacts on private land owners.
- Preference to members of the families rendered landless or with sub-optimal holdings post selling land to the project for employment opportunities in the Construction/operation phase and/or small contracts;
- Timely sharing of project related information with all relevant stakeholders;
- Provision of Grievance Redressal Mechanism to all impacted stakeholders in order to raise and register their grievances.

Residual Impacts

After the implementation of these mitigation measures, the residual impact significance is expected to be **Minor**.

Impact	Impact on private land sellers, agricultural labourers and community due to change in land ownership and use				
Impact Nature	Negative	Positive	Neutral		
Impact Type	Direct	Indirect	Induced		
Impact Duration	Temporary	Short-term	Long-term	Permanent	
Impact Extent	Local	Regional	International		
	Project villages				
Frequency	Planning Phase				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Vulnerability of social Receptors	Low	Medium	High		
Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **Moderate.**				
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Large
Residual Impact Significance	Negligible	Minor	Moderate	Major	

6.4.4.2 Impact due to Patta Land Purchase

Context and Receptors

The Patta Land identified for the project comprises approximately 81.7 ha. and 73 Patta land holders are understood to be identified, some of whom would be impacted by the purchase.

The Patta land is understood to be largely used for agriculture. As mentioned in ***Section 4.4.6.2*** the Patta holders are typically from SC and ST communities that were granted Pattas by the Government by dint of their landlessness and vulnerability. Some Patta holders are using the lands for their own purpose (agriculture or grazing), while some Patta holders have sold of their lands in lieu of economic benefits from the sale, probably in times of distress (refer ***Section 4.4.6.2*** for more details). Thus the impacts of negotiated purchase of Patta Lands shall be on Patta holders, non-recognised Patta owners (those who purchased rights to use Patta land through a verbal agreement without a legally documented sale of land by original and registered Patta holders), agricultural labourers engaged on the identified land parcels and the community affected due to access restriction to their assets or grazing land for livestock.

Embedded/In built control

- RUMSL shall procure Patta land based on the MP Mutual Consent Land Purchase Policy 2014;
- To clarify, as stated in Section 2, the RAP-LRP will be prepared for all impacted families including those who are economically displaced. The LRP will also cover economic displacement impacts on agricultural labor, working on the procured/purchased patta land.
- An amount of INR 2 lakhs per MW has been envisaged to be provided to the local district collector to facilitate development activities in the area and these activities may range for skill development, training, restoration of local water bodies and other local development works.

Impact significance

The impact of change in land ownership and use which imposes restrictions to the identified Patta land and surrounding agricultural land is evaluated to be **Moderate** as the number of households to be impacted from the change is understood be higher for 81.7 ha. Patta land and the nature of change is irreversible.

Additional Mitigation Measures

- Patta is being treated at par with ownership, for the land procurement process. Thus treatment of Patta Land holders will be similar to Private land owners and Patta holders shall be provided with either alternate land parcels with similar nature of productivity and financial assistance to prepare the land for cultivation or adequate compensation at twice the value of land and assets, as per MP Mutual Consent Land Purchase Policy, 2014;
- A Resettlement Action Plan-shall be formulated to cover economic displacement categories (subject to the qualifications stated under embedded controls) to address:
    - Livelihood impacts on the land owners if the holdings that remain are sub-optimal, or owners are rendered landless;
    - Additional livelihood assistance to vulnerable households, or women headed households, with skill trainings or entrepreneurship support, etc. under the LRP;
    - Impacts on land users or regular agricultural labourers affected
    - The general community being impacted due to access restrictions/easements;
    - Other impacts on patta land owners.

- Preference to members (rendered landless or with sub-optimal holdings) of the families post selling land to the project for employment opportunities in the Construction/operation phase and/or small contracts;
- Additional safeguards to be addressed through the RAP-LRP for Patta Land owners, including those who may have 'purchased' the patta informally from the original allottees based on a verbal agreement and without documentation
- Timely sharing of project related information with all relevant stakeholders;
- Provision of Grievance Redressal Mechanism to all impacted stakeholders in order to raise and register their grievances.

Residual Impact Significance

After the implementation of these mitigation measures, the residual impact significance is expected to be **Minor**.

Impact	Impact on Patta land owners (formal and informal), agricultural labourers and community due to change in land ownership and use				
Impact Nature	Negative	Positive	Neutral		
Impact Type	Direct	Indirect	Induced		
Impact Duration	Temporary	Short-term	Long-term	Permanent	
Impact Extent	Local	Regional	International		
	Project villages				
Frequency	Planning phase				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Vulnerability of social Receptors	Low	Medium	High		
Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **Moderate.**				
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Large
Residual Impact Significance	Negligible	Minor	Moderate	Major	

6.4.4.3 Impact due to LUPA of Government Land

Context and Receptors

The proportion of Government land identified for the project is approximately 90%. The various uses of Government land (discussed in ***Section 4.4.6.2)*** are encroachment and squatting by private and Patta land owners for agriculture, livestock grazing, cultivation of fodder lots for commercial purposes, etc. Thus, the stakeholders likely to be impacted by long lease of Government land by RUMSL are local community using the land for access to their assets and Common property resources, livestock owners whose Livestock grazes on the Government land for approximately 8 months in a year, and squatters and encroachers, who are not rightful users of the land, but their livelihoods will be affected due to non-availability of the land, that they have prepared by investing cost, for cultivation and are cultivating. The impacts caused due to procurement of Government land are detailed in ***Table 6.16.***

Embedded/ In built control

- There is a provision in the MP Land Revenue Code that a minimum of 2% of total agricultural land available in the Project villages must be secured for grazing of livestock, even after setting up of project.

- Grazing rights on areas -Charnoi/charagah- designated in government records are not allotted for projects. However, in some villages, it may be the case that less than 2% land is available for grazing (charnoi/charagah) even before the project allotment. In such cases, the District Collector can designate other government land as charagah and charnoi, for grazing. However, the functional adequacy will be more a function of quality and access.

Impact Significance

The impact of long terms lease of Government land by RUMSL imposes restrictions to the current economic activity, impacts access and easements for the community and affects livestock grazing significantly, as it is a large area (962.5 ha. approximately). Thus, the significance of this impact is evaluated to be **Major** as the number of households likely to be impacted from the change is understood be higher and the nature of change is irreversible.

Additional Mitigation Measures

- Provision for alternate grazing land for livestock shall be made near the project villages or confirmation of adequacy of remaining grazing land, to be confirmed during the RAP survey (including the assessment of access and quality of the remaining area);
- Development of a program to include grazing area improvement and fodder intensification (cultivation) in designated areas, as agreed with the Tehsil office and the local dependent community of graziers. This may include the development of community fodder lots under the Livelihood restoration activity in the area as part of Resettlement Action Plan. This, if feasible, shall serve the purpose of improving the quality of the grazing land, ensuring access and as an income generating activity for people losing land based livelihoods.
- The project developer is also encouraged to explore identifying unused areas within the solar park boundary and a part of the area with solar panels (10% area), for fodder cultivation, or controlled and managed open grazing of goats, or agriculture (selected crops), to explore the potential of 'mixed land use' areas in solar parks that benefit the local community too. This may be done with the agreement of RUMSL and in partnership with domain specialist agencies and local organisations working in the region. Additional positive effects may include countering the 'heat island effect' described in Section 6.2.4.
- Provision of easements shall be maintained in order to not sever the access to CPRs for the community;
- Preference of members of Project affected households (PAH), as identified in the RAP, in employment opportunities during construction phase;
- In case of Squatters and encroachers, RUMSL shall serve a three months advance notice to the project affected persons (PAPs) to manage the potential losses to standing crops;
- In case of crop losses ensuing from project activities, RUMSL shall pay compensation for crops, as defined in the RAP (entitlement matrix);
- Timely sharing of project related information with all relevant stakeholders in order to serve advance notice and reduce the extent of impacts and losses;
- Provision of Grievance Redressal Mechanism to all impacted stakeholders in order to raise and register their grievances.

Residual Impact Significance

After the implementation of these mitigation measures, the residual impact significance is expected to be **Moderate**.

Impact	Impact due to LUPA of Government land		
Impact Nature	Negative	Positive	Neutral

Impact Type	Direct	Indirect	Induced		
Impact Duration	Temporary	Short-term	Long-term	Permanent	
Impact Extent	Local	Regional	International		
	Project villages				
Frequency	Planning Phase				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Vulnerability of social Receptors	Low	Medium	High		
Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **Major.**				
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Large
Residual Impact Significance	Negligible	Minor	Moderate*	Major	

*If additional enhancement measures are included by the project developer, with RUMSL's consent, it may provide positive benefits to the community over the life of the project, further reducing the residual impact significance to minor or negligible.

6.4.5 Construction Phase Impacts

6.4.5.1 Temporary occupation of Land for Construction Phase Activities

Context and Receptors

The construction period for the Neemuch Solar Park is expected to last for about 21 months, during which various construction related activities will be in progress and would may additional land (apart from identified land for project) for the following activities:

- Setting up of Labour Camps;
- Safety Setbacks;
- Storage areas for construction material;
- Parking area for vehicles;
- Other construction related temporary land requirements, etc.
-
- The additional land for temporary activities like setting up of a number of labour camps for the required duration, land for safety setbacks, storage areas, parking areas and other construction related requirements, if required, would be met by renting/ leasing additional land from the local community; however would lead to increased disruptions in access for local community.
- If all these activities can be accommodated with the Project footprint, the impacts from temporary land lease-rent, will be avoided.

The impacts caused due to temporary occupation of private land for construction phase activities are detailed in ***Table 6.16***.

Impact Significance

The significance of this impact is evaluated to be **Minor** based on the nature, duration and extent of the activity.

Additional Mitigation Measures

- Provision of adequate lease on rental amounts to the land owners shall be ensured by RUMSL;

- The land leased/ rented shall be restored to its original state (or made better) at the time of handing it back to the owners;
- Provision of compensation for the loss of livelihoods to the users of the land required for temporary use as this will temporarily economically displace them;
- Timely dissemination of project related information with all relevant stakeholders, in order to serve advance notice and reduce the extent of losses/ impacts;
- Provision of Grievance Redressal Mechanism to all the key stakeholders in order to raise and register their grievance.

Residual Impact Significance

After the implementation of these mitigation measures, the residual impact significance is expected to be **Negligible**.

Impact	Impact due to temporary occupation of land during construction phase				
Impact Nature	Negative	Positive	Neutral		
Impact Type	Direct	Indirect	Induced		
Impact Duration	Temporary	Short-term	Long-term	Permanent	
Impact Extent	Local	Regional	International		
	Limited to Project Footprint area and Project villages				
Frequency	Construction Phase				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Vulnerability of social Receptors	Low	Medium	High		
Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **Minor.**				
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Large
Residual Impact Significance	Negligible	Minor	Moderate	Major	

6.4.5.2 Community Health and Safety

Context and receptor

The receptors for impacts on community health and safety include the local community within the Study Area who may be present in the vicinity of the project, for grazing purposes or while commuting as well as the workers engaged during construction phase. The construction phase activities, laying down of Transmission Line towers and construction of substations and movement of material and personnel may result in impacts on the health and safety of the community. These activities will involve the use of machinery and power Transmission Lines. Furthermore, the movement of material and personnel via the access roads may result in damage to human life or livestock due to accidents, especially during night time.

Additionally, the establishment of labour camps for workers from outside areas/ states may lead to spread of infections and diseases due to interactions between the migrant workers and local community, improper management of waste and underdeveloped sanitation facilities, etc. The situation of infections become grim, especially with the arrival of Covid 19 and due to which special provisions for engagement and management of migrant labourers will have to be ensured. The Community health and safety impacts in construction phase are detailed in ***Table 6.16.***

The embedded controls, as derived from the ESMF comprise the following:

- Alternate arrangement for fuel wood, heating and cooking should be made to meet fuel wood requirement of the labour;
- Migrant workforce should be prohibited from disturbing the flora, fauna including hunting of animals, Wildlife hunting, poaching and tree felling.
- Treated Water shall be made available at Site for Labour drinking purpose.
- The movement of heavy machinery and equipment's shall be restricted to defined routes.
- Proper signage's to be displayed at major junctions.

Impact Significance

Based on the above understanding, the impact is assessed to be **Moderate**.

Additional Mitigation Measures

In addition to the embedded measures, the following risk mitigation measures are suggested to minimize the potential risks/hazards to community:

Responsibilities of RUMSL

- Ensuring stakeholder engagement through the project cycle and provision of an effective Grievance Redressal Mechanism to avoid, mitigate and mange conflicts and disagreements;
- As part of the stakeholder engagement and information disclosure process, the community will be provided with an understanding of the activities to be undertaken and the precautions to be taken for safety;
- RUMSL shall maintain safe distance of project components from schools, hospitals, etc. in order to avoid interactions with community hotspots and hence risks of accidents;
- The Contractors to be engaged by RUMSL shall be informed of the EHSS practices that are expected from its workers during the construction phase engagement. Obligations like preparation of Traffic Management Plan, Local Procurement Plan, EHSS Plan (including for managing COVID 19 related risks), etc. shall be communicated to them at the time of selection and appropriate clauses should be included at the time of contract finalization;
- The contractor shall be required to adhere to IFC's accommodation guidelines, for the labour camps in terms of provisions, sanitation facilities, etc. thus limiting the probability of diseases and infections in the local community on account of improper management of waste;
- RUMSL shall put in place a grievance redressal mechanism to allow community members to report any concern or grievance related to project activities. The contractors engaged shall also be contractually required to put in place a similar mechanism to deal with concerns raised by the community (or external stakeholders) and the workers engaged during construction phases.
- *Contractors*
- The contractor shall induct migrant workers on health and safety awareness and practices to be followed at site during construction phase;
- The contractors shall cordon off areas that are under construction and put relevant safety signs to restrict movement of local community members or workers engaged at site, which may become safety threats;
- The Contractors shall prepare a Traffic Management Plan and traffic movement due to the project in the area will be regulated to ensure road and pedestrian (including livestock) safety;
- Additionally, training on vehicular safety shall be organised for the transport workers.

- The movement of workers from the project site and labour camps shall be regulated and similarly the project boundary and labour accommodation to check for unauthorized visitors/ outsiders entering the site in order to avoid any possible interactions leading to conflicts or tensions between the migrant workforce and host community;
- Contractors shall ensure that regular health check-ups are conducted for the construction phase workers (especially migrant workers staying in temporary labour accommodation) and any major illnesses are reported in the Block level medical authorities at the earliest; The labour accommodation should be clean and hygienic and disposal of kitchen waste and food waste shall be done on a daily basis in an appropriate manner;
- Proper sanitation facilities shall be provided, taking into account the number of labourers that will be using the facilities, both at construction site, as well as labour accommodation;

Residual Impact Significance

The significance of impact will be reduced to **minor** on implementation of mitigation measures.

Impact	Impact on Community Health and Safety				
Impact Nature	Negative	Positive	Neutral		
Impact Type	Direct	Indirect	Induced		
Impact Duration	Temporary	Short-term	Long-term	Permanent	
Impact Extent	Local	Regional	International		
Impact Scale	Limited to Project Footprint area, Project villages and Study area for transportation related activities				
Frequency	Construction Phase				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Resource/Receptor Sensitivity	Low	Medium	High		
Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **Moderate**				
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Large
Residual Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of Residual Impacts is considered **as Minor**				

6.4.5.3 Stress on Community Resources

Context and Receptors

The community resources like water, forest resources and roads will be the prime receptors for the impact caused by project activities. The project related construction activities are understood to span across 21 months and would require water for drinking, cooking and sanitary purposes. As per DPR, construction water requirements will be met through tanker water and no ground water will be abstracted. The water consumption during construction phase will put stress on water resources used for tanker water supply, which are presently not known (Refer **Section 6.2.2** for details).

Additionally, the impact on forest resource can take place due to labour influx and their unregulated movement around the Project footprint area and project villages.

The roads used by the community would also face wear and tear due to transportation of heavy machinery and material, which shall lead to early damages than their anticipated life span. The Impacts due to stress on community resources in construction phase are detailed in ***Table 6.16.***

Impact Significance

- The significance of impact from the above activities is understood to be **Minor.**

Additional Mitigation Measures

RUMSL responsibilities

- There will be a worker Code of Conduct defined by RUMSL that prevents workers and contractors from using the local resources like water, forest, which will be shared with private SPDs for onward sharing with sub-contractors and its workers;
- An induction session will be organised for the migrant workers where they will be sensitized on the Do's and Don'ts during their stay near project location, which would include aspects on conservation of community's resources;
- The contractor shall be asked to use Tanker water supply during the summer months, which are dry months in which water scarcity issues are reported by the community;
- Periodic maintenance activities for roads used for transportation of goods for the project shall be the undertaken by RUMSL, through its contractors;
- Provision of Grievance Redressal Mechanism to all the key stakeholders in order to raise and register their grievance on misuse of locally available resources.

Residual Impact Significance

- The significance of impact will be reduced to **Minor (for water) to Negligible** on implementation of mitigation measures.

Impact	Impact on Community Resources				
Impact Nature	Negative	Positive	Neutral		
Impact Type	Direct	Indirect	Induced		
Impact Duration	Temporary	Short-term	Long-term	Permanent	
Impact Extent	Local	Regional	International		
Impact Scale	Limited to Project Footprint area, Project villages and Study area for transportation related activities				
Frequency	Construction Phase				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Resource/Receptor Sensitivity	Low	Medium	High		
Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **Minor**				
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Large
Residual Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of Residual Impacts is considered **as Minor to Negligible**				

6.4.5.4 Impact on Employment and Entrepreneurship Opportunities

Context and Receptors

The construction phase will provide a boost to the local employment, as a higher number of unskilled labourers is required to be engaged for construction activities. Additionally, there would be some skilled labour required that would be brought in from other states (if not present in local area) that would also lead to spike in economic activity in the area, during construction phase. This would lead to better business opportunities for smaller vendors in the area owning petty shops, petty contractors firms, etc. for providing essential goods and services to the project.

Additionally, there would be increased demand for agricultural products, animal based food products, etc., that may require enhanced production of associated items and opportunities for traders.

Impact Significance

The significance of this impact is understood to be **Moderate**.

Enhancement Measures

- The sourcing of local labour wherever possible should be made obligatory by RUMSL (through contractual provisions) for the Solar Project Developers and sub-contractors and in all major procurement activities;
- Preference should be given to the land losers and vulnerable population in the Project Villages, to the extent practicable;
- Employment of members of SC-STs and Women Headed households should be ensured by the Solar Project Developers through documented agreement with contractors/ sub-contractors;
- Engagement of local vendors, to the extent possible, for the goods and services required for the project during construction phase;
- The project proponent will establish a mechanism to audit subcontractors and suppliers with respect to compliance of utilizing local labour and resources;
- Provision of Grievance Redressal Mechanism to all the key stakeholders in order to raise and register their grievance with respect to information sharing related to jobs and opportunities for vendor-ship.

6.4.6 Operations Phase Impacts

6.4.6.1 Community Health and Safety

Context and Receptors

The Operations phase would have very limited activity at the project site as the construction phase would have been over and the scale of activity and workforce at the project footprint area would have reduced significantly. This would lead to less or negligible noise, lesser workers at site on near project villages, reduced traffic load (compared to construction phase) and the general material supply related traffic would reduce.

However, the community shall still be a receptor of the impacts due to increased traffic, compared to the pre-project phase. There would be additional Transmission Lines installed/ erected and may create access issues for the community movement, if necessary precautions are not taken by the local residents.

As discussed in Section 6.2.4, communities that are residing close to the Solar Park may experience the Heat Island Effect due to the expanse of the PV solar panels (based on local conditions, for a few days in the year), but this is understood to dissipate over a 300m distance.

Impact Significance

Based on the above understanding, the impact is assessed to be **Minor**.

Additional Mitigation Measures

- In addition to the embedded measures, the following risk mitigation measures are suggested to minimize the risks/hazards of construction activities onsite:

- Where community residential clusters are closer to the project boundary, keep a safety setback (as relevant) to mitigate the heat island effect.
- Community sensitization sessions should be re-organised at the beginning of Operations phase, in order to mention about the new developments in the area and provided an understanding of the precautions to be taken for safety;
- Project's Grievance Redressal Mechanism for the community shall still be in implementation to deal with any concerns of community health and safety, being raised by the local community.

Residual Impact Significance

The significance of impact will be reduced to **negligible** on implementation of mitigation measures.

Impact	Impact on Community Health and Safety				
Impact Nature	Negative	Positive	Neutral		
Impact Type	Direct	Indirect	Induced		
Impact Duration	Temporary	Short-term	Long-term	Permanent	
Impact Extent	Local	Regional	International		
Impact Scale	Limited to Project Footprint area				
Frequency	Operations Phase				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Resource/Receptor Sensitivity	Low	Medium	High		
Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered **Minor**				
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Large
Residual Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of Residual Impacts is considered **as Negligible**				

6.4.6.2 Impact on Employment

Context and Receptors

The Operations phase would require much smaller workforce as compared to construction phase and the skillset of the required workforce shall be different. The Operations phase would require Engineers, Technicians to manage the Plant operations and amongst the requirement of semi-skilled workers in limited numbers for housekeeping and Security related jobs, on the payroll of RUMSL. Additionally, there may be some vacancies with the private Solar Project Developers (SPDs) that may have some local employment, if feasible.

Impact Significance

The significance of this impact is understood to be **Minor**.

Enhancement Measures

- The private SPDs shall advertise the roles of Technical staff required during operations phases, in the local newspapers to enable hiring of competent people from nearby areas, to the extent feasible;
- Preference shall be given (to the extent feasible) to hire competent members from PAHs for semi-skilled jobs like housekeeping or Security Guards.

6.4.7 Impact on Indigenous Communities/ Vulnerable Groups

Context and Receptors

Vulnerability in the society is defined on the basis of the economic status of the households, and the difference in access to social, economic and political power between men and women. Thus households with limited landholdings and resources are relatively vulnerable to changes in the immediate surroundings, affecting their livelihoods.

As discussed in ***Section 4.4.4***, the Study Area is characterised by a SC population of 7.2% and ST[1] population of 18.4%. The majority of the ST population consists of Bhils and Rabaris, with a majority of Bhil tribe groups. While there is no caste based distinction reported in terms of habitation patterns, practices, etc., the SC and ST households are generally reported to have lesser land holding than the general population.

Table 6.17 Demographic Profile for Neemuch Solar Park

Village Name	Total Population	No of households	ST Population
Bardawada	399	77	22
Kawai	527	106	105
Badi	1121	257	249

Source: Census of India 2011, PCA.

Of the three villages in Neemuch Solar Park footprint, only Badi village is reported to have multiple hamlets. The villages of Kawai and Bardawada were reported to be a single compact settlements; while Badi village has four hamlets, the details of which are presented below.

Table 6.18 Hamlets within Badi village with High Bhil population

Hamlets of Badi	Number of households in hamlet*	Bhil HHs in Hamlet
Mama Basti	40	~40
Sutaru ki Badi	65	0
Meetro ka Jhopda	45	0
Jhero ka Jhopda	35	~35

Source: Consultation with Badi Sarpanch

While the land for the project is a combination of private, Government and Patta Lands, the details of the profile of private and patta land owners, in terms of financial and social profile are presently not available. The land identified for the project is used by the local community for grazing purposes, and does not have any specific SC/ST group usage in terms of grazing, cultivation, water body and cultural/religious property. However, since this is understood from the baseline that SC and ST households on an average has limited landholdings compared to other caste groups, the probability of members of these groups working as agriculture labourers is higher. Additionally, this groups is also understood to possess ownership of a relatively higher number of sheep and goats, compared to other groups in the community.

Out of the three phases, the Indigenous Communities and vulnerable groups are understood to be impacted the most during Planning phase of the project, on account of loss of livelihoods linked to land being procured for project. Since these agricultural workers are not rightful owners or users of land as per records, the project related compensation measures would not be directly reaching out to this group or may be reaching in a diminished manner.

[1] ST community is considered akin to Indigenous population in India generally; however there are a number of ST groups present in India, some of whom have merged with the mainstream population in terms of habitation and occupational patterns, language, etc., while certain groups continue to follow distinguished cultural practices.

Embedded/In Built Control

As part of the Community Development Activities in the local villages, the Project proponent will identify specific programmes for SC/ST groups and vulnerable groups.

Impact Significance

Based on the profile of the stakeholder group, the impact significance is assessed to be **Moderate.**

Additional Mitigation Measures

- In addition to the embedded measures, the following additional mitigation measures are identified:
- To identify and assess the extent of impacts on this group, a review of the scope of FPIC and IPP, in terms of remaining impacts on IP groups, their traditional livelihoods and customary land use; including dependence on natural resources, will be undertaken;
- Based on this review, the target groups for the FPIC process will be identified in terms of villages and number of households in each village.
- It should be noted that the exact number of households may be identified only post the site walk through and social mapping.
- Review the consultation process carried out as part of allotment process of unoccupied government land through discussions with personnel from the Land Division of District Magistrate office to access the Gram Sabha resolutions as part of the land allotment process.
- Relevant details in relation to the Gram Sabha Resolution will be collected to understand implications for any legacy issues.
- As part of the stakeholder engagement, ensure adequate representation of the Indigenous groups and vulnerable groups, and specific engagement activities are undertaken with these groups;
- Ensure that the grievance management mechanism established is accessible to these groups.

Residual Impact Significance

The significance of impact will be reduced to **Minor** after implementation of mitigation measures suggested.

Impact	Indigenous Communities/Vulnerable Groups				
Impact Nature	Negative	Positive	Neutral		
Impact Type	Direct	Indirect	Induced		
Impact Duration	Temporary	Short-term	Long-term	Permanent	
Impact Extent	Local	Regional	International		
Impact Scale	The SC/ST Community and vulnerable groups may be negatively impacted by the project, in case the economic or developmental opportunities generated by the project are not equally accessible to them in comparison to other social groups.				
Frequency	Planning and Construction Phase				
Likelihood	Possible				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Resource/Receptor Sensitivity	Low	Medium	High		
Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered to be **Moderate**				
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Large
Residual Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of Residual Impacts is **Minor**				

6.4.8 Impact on Women

6.4.8.1 Construction Phase

Context and Receptors

As per the list of potential land owners identified for the Private and Patta land (provided by RUMSL on 3rd June 2020), the break-up of land ownership (in terms of area and number) of male and female land owners is provided below.

Table 6.19 Gender disaggregated data for identified land owners (in terms of land area)

	Badi Village (In ha.)		Kawai Village (In ha.)		Bardawada Village (In ha.)		Total
	Private	Patta	Private	Patta	Private	Patta	
Female	0.86	0	3	5.224	0.62	7	16.7 (13.5%)
Male	15.6	10.8	10.942	21*	4.466	43.71	85.5 (86.5%)
Total	**16.46**	**10.8**	**13.942**	**26.224**	**5.086**	**50.71**	**123.2**

Table 6.20 Gender disaggregated data for identified land owners (in terms of no of owners)

No. of Land Owners	Badi Village		Kawai Village		Bardawada Village		Total
	Private	Patta	Private	Patta	Private	Patta	
Females	2	0	3	6	1	6	18 (14.7%)
Males	28	8	9	16*	5	37	104 (85.3%)
Total	**30**	**8**	**12**	**22**	**6**	**43**	**122**

As per the data provided there are 14.75% female private land owners and 12 female Patta land owners out of 48 private land owners and 73 Patta land holders that are identified for the project. This list is for a larger portion of land that has been identified for the Neemuch Solar Park (1092.7 ha), whereas the land to be used for the project (1065.7 ha) is lesser and the actual number of land owners to be impacted from the identified will be confirmed during the RAP survey. For the purpose of this assessment, the broader list is used which states that out of the private and patta land identified for the project, the combined ownership by women (Private +Patta land) is 13.5% overall with 5.2% in Badi village, while 26.4% in Kawai and 14.2% Bardawada villages.

As stated in Section 4.4.11, women from most social and caste groups, take equal responsibilities of working on agricultural fields owned by the household, taking care of domestic chores of cooking, cleaning, fetching water from community water points to their respective houses, caretaking of children and elderly as well as tending to livestock owned by the family.

Women take care of domestic livestock management responsibilities but are not engaged in grazing of livestock outside the household premises. Male members of the household are responsible for livestock grazing near the villages, sale and purchase of livestock, livestock feed and by products. There have not been any cases reported for women working as construction labourers or in any enterprise outside their respective villages.

On the agricultural fields, women are involved in cutting, sowing, threshing, watering, and collecting fuel wood however this is usually unpaid labour by women on the fields owned by their families, while are paid an amount of INR 100-200 per day when they work as agricultural labourers on others' fields, which is less as compared to wages paid to men for a day's work.

Ownership of land and assets by women is also understood to be minimal and in cases where women own land legally, the management of the same in terms of sale, purchase or usage is largely decided by men, with limited or no consultations with women. The proceeds from sale of land and its usage is also usually discussed within households but the final decision on usage of money is taken by male members of the household.

The Women headed households (both joint as well as independent, as discussed in detail in *Section 4.4.11*) face additional risks of not being included in negotiations, or other key meetings due to prevailing cultural norms and may not therefore receive the benefits and advantages compared to those who do participate. Thus they become a little more vulnerable in cases of sale of land for the project, where there is a chance that the proceeds from sale of land do not reach them.

Additionally, the probability of access to jobs during the construction phases is also sometimes skewed in the favour of males, thus making these households more vulnerable. Women and girls are disproportionately at risk in terms of safety (gender based violence, harassment, curtailed movement, reduced access to resources), with the arrival of migrant labourers in the construction phase and their accommodation being planned near the project villages.

Embedded/In Built Control

- As part of the Community Development Activities in the local villages, the Project proponent will identify specific programmes for women groups and Women Headed households.
- The migrant workforce engaged during construction phase shall be inducted in the initial phases on the Do's and Don'ts during their stay, which shall include limited engagement with local community, not causing disturbances to the community, etc.
- Provide alternative arrangements for land, and create access for ease of use to collect fuelwood, and fodder.

Impact Significance

Based on the above the impact after implementing the embedded controls is assessed to be **Moderate.**

Additional Mitigation Measures

In addition to the embedded measures, the following additional mitigation measures are identified:

- A Gender Action Plan is being prepared for the Project where women focussed engagement is detailed in ***Appendix F***;
- Ensure that the employment of women from vulnerable households is done for the project and efforts are made for development of women owned enterprises in the area, from where procurement for project related needs is undertaken;
- Undertake a profiling of the various social groups in the Study Area, to understand the individual needs and concerns of the various women belonging to different social groups and design community development and CSR programmes in light of the same;
- As part of the stakeholder engagement, RUMSL shall ensure and communicate to the private Solar Project developers, that Women focussed discussions are conducted in order to ensure adequate representation of the Women and their needs and concerns in order to design specific engagement activities;
- Include provisions of coverage of women under skill training and Financial literacy training programs, as part of livelihood restoration activities by the project or through developmental programs of SPDs;

- Provision of Grievance Redressal Mechanism to all the stakeholders in order to raise and register their grievances.

Residual Impact Significance

The significance of impact will be reduced to **Minor** after implementation of mitigation measures suggested in construction phase

Impact	Women in the project villages				
Impact Nature	Negative	Positive	Neutral		
Impact Type	Direct	Indirect	Induced		
Impact Duration	Temporary	Short-term	Long-term	Permanent	
Impact Extent	Local	Regional	International		
Impact Scale	The women in the Project villages are understood to be impacted during Planning and construction phases				
Frequency	Planning and Construction Phases				
Likelihood	Possible				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Resource/Receptor Sensitivity	Low	Medium	High		
Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered to be **Moderate**				
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Large
Residual Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of Residual Impacts is **Minor**				

6.4.8.2 Operations Phase

Context and Receptors

The nature of impacts are envisaged on women in the Operations phase will vary from construction phase as the extent of presence of outsiders and migrant population in the area would have reduced along with risk to their safety. Furthermore, there would be limited requirement of labourers' jobs or vendor-ship opportunities in Operations phase, which might render them in search of livelihood options again.

Embedded / In built Measures

The duration (months) and nature of employment (temporary) shall be communicated in advance to this group in order to manage impacts due job reductions.

Impact Significance

Based on the above the impact after implementing the embedded controls is assessed to be **Minor.**

Additional Mitigation Measures

The SPDs shall ensure appropriate measures for hiring of women, as per required skill set, are put in place, during the Operations phases.

Residual Impact Significance

The significance of impact will be reduced to **Negligible** in operations phase.

Impact	Women in the project villages				
Impact Nature	Negative	Positive	Neutral		
Impact Type	Direct	Indirect	Induced		
Impact Duration	Temporary	Short-term	Long-term	Permanent	
Impact Extent	Local	Regional	International		
Impact Scale	The women in the Project villages are understood to be impacted during Planning and construction phases				
Frequency	Operations Phase				
Likelihood	Possible				
Impact Magnitude	Positive	Negligible	Small	Medium	Large
Resource/Receptor Sensitivity	Low	Medium	High		
Impact Significance	Negligible	Minor	Moderate	Major	
	Significance of impact is considered to be **Minor**				
Residual Impact Magnitude	Positive	Negligible	Small	Medium	Large
Residual Impact Significance	Negligible	Minor	Moderate	Major	

6.5 Summary of pre and post mitigation Impact Significance

The table below presents the summary outcome of the comprehensive assessment of identified impacts pre and post mitigation during various phases of the Project.

Table 6.21 Summary of Impacts

Category	Impact Significance (without mitigation measures)	Impact Significance (post-mitigation)
Planning Phase		
Impact due to private land purchase	Moderate	Minor
Impact due to Patta land purchase	Moderate	Minor
Impact due to LUPA of Government Land	Major	Moderate
Construction Phase		
Land use and Land cover	Moderate	Moderate
Soil compaction and erosion	Minor	Negligible
Waste generation and soil contamination	Minor	Minor
Topography and Drainage	Minor	Minor
Water resources and availability	Major	Major to Moderate
Water quality	Minor	Minor
Ambient air quality	Minor	Minor to Negligible
Ambient noise quality	Moderate	Minor
Occupational health and safety	Minor	Minor
Habitat Modification and Loss	Minor	Minor
Impacts due to construction Activities	Minor	Minor
Ecosystem Services	Minor	Minor
Impact due to temporary occupation of Land	Minor	Negligible
Community Health and Safety	Moderate	Minor
Impact due to Stress on Community Resources	Minor	Minor to Negligible
Impact due to Noise nuisance and Dust	Minor	Negligible
Impact on Employment and Entrepreneurship Opportunities	Moderate (positive benefits)	

Category	Impact Significance (without mitigation measures)	Impact Significance (post-mitigation)
Operation Phase		
Soil Environment	Minor	Minor
Water resources and availability	Major	Major to Moderate
Health and safety	Minor	Minor to Negligible
Collision and Electrocution risks	Minor	Negligible
Community Health and Safety	Minor	Negligible
Impact on Employment	Minor	Minor
Impacts on specific stakeholder categories		
Impact on Indigenous Communities (Construction and Operations Phases)	Moderate	Minor
Impact on Women (Construction Phase)	Moderate	Minor
Impact on Women (Operations Phase)	Minor	Negligible

7. ANALYSIS OF ALTERNATIVES

An analysis of probable alternatives for the chosen technology and location of Project site along with other similar factors that contribute to the Project as a whole has been carried out. The following scenarios have been taken into consideration:

- Project vs No Project scenario;
- Alternate Source for Power Generation;
- Location for Project Site.

7.1.1 Project vs No Project scenario

The state of Madhya Pradesh is endowed with high solar radiation with around 300 days of clear sun. The state offers good sites having potential of more than 5.5 kWh/ sq.m/per day for installation of Solar based power projects. State wise targets by MNRE requires MP to achieve 5,675 MW of Solar power by 2022. As on July 2018, the State has commissioned solar capacity of 1,358 MW and under-construction capacity of 685 MW. Renewable Purchase Obligation (RPO) target and current status for the state of Madhya Pradesh is as presented in ***Figure 7.1*** below.

Figure 7.1 RPO target and compliance status of Madhya Pradesh

Source: Detailed Project Report, 500 MW Neemuch Solar Park, July 2020

The proposed project will enable state to meet their target for solar power and renewable purchase obligations. In addition, the clean power generated by these solar projects play a role for reducing India's carbon footprint, promote high-end technical investments and empower local communities.

7.1.2 Alternate Source for Power Generation

There are different modes for power generation depending upon the source of energy such as coal energy, natural gas energy, wind energy, solar energy, nuclear energy, geothermal energy and waste to energy. Solar energy is the eco-friendly mode of power generation providing a non-polluting source of energy that can displace greenhouse gas emissions from conventional power. Besides this:

- Negligible emissions from the operation (mainly vehicular emissions);
- No fuel required for operation of the Solar Park;
- The gestation time required for solar energy projects is comparatively less than conventional power generation and requires short lead time to design, install, and start-up.

Manufacturing of parts, related up-stream and downstream activities in a typical solar energy development projects, are associated with emissions due to consumption of fossil fuels which contributes to Green House Gases (GHGs). The lifecycle emissions from various power sources is shown in ***Table 7.1.***

Table 7.1 Life-cycle Emissions from Power Sources

LCA Emissions (g CO_2 equivalent/kWh)	Wind	Solar	Nuclear	Coal
Implementation	13.7	37.5	1.2	3.6
Operation	4.7	12.0	12.4	918.8
Decommissioning	0.6	0.5	0.4	52.2
Total	**19**	**50**	**14**	**975.3**

Source: Report on developmental impacts and sustainable governance aspects of renewable energy Projects, Ministry of New and Renewable Energy, 2013

As evident of ***Table 7.1*** above, the emission of CO_2 per kWh of energy generated from a Coal based power plant is more than that of the emission from a solar based power plant. The only emissions from the Renewable energy technologies are the emissions from fossil sources used in the production and manufacturing of equipment, waste disposal during construction, recycling etc. These life-cycle emissions are significantly lower as indicated in the table above.

The advantages and disadvantages of various power generation systems are shown in ***Table 7.2*** below.

Table 7.2 Environmental Advantages and Disadvantages of Power Generation System

Mode	Disadvantage	Advantage
Thermal Power Plant	■ High fossil fuel consumption. ■ Large quantities of water requirement for cooling ■ High volume of emissions from operation ■ Accumulation of fly ash (in case of coal powered installations) ■ Upstream impact from mining and oil exploration ■ GHG emission estimated as 228gCeq/kWh	■ Large scale production potential ■ Moderate gestation period ■ Relatively inexpensive ■ Wider distribution potential
Hydropower Plant	■ Site specific, dependent on reservoir/river etc. ■ Downstream impact on flow ■ Long gestation period ■ Acute and chronic social and ecological impacts	■ GHG emission estimated as low as 1.1gCeq/kWh for run of river Projects
Nuclear Power	■ Availability of fuel source ■ Hazards associated with radioactive material ■ High cost of Project ■ Long gestation period ■ Risk of fallout and meltdown scenarios and its impacts on the local populace and environment.	■ Cheaper power generation ■ GHG emissions as low as 2.5gCeq/kWh
Wind Power	■ Overall land requirement is large ■ Site specific (associated to wind pattern) ■ Expensive installation	■ Pollution levels are insignificant ■ Inexpensive power generation ■ Inexhaustible source ■ GHG emissions as low as 2.5gCeq/kWh for the Production Chain
Solar Power	■ Large land requirement ■ Site specific to solar insolation ■ Expensive installation ■ Concrete foundation on larger area	■ Pollution levels are insignificant ■ Inexpensive power generation ■ Inexhaustible source ■ GHG emissions as low as 8.2gCeq/kWh for the Production Chain

Source: International Atomic Energy Agency (IAEA)

Table 7.3 Green House Emissions from Different Electricity Production Chains

Technology	Mean tonnes (CO_2e/GWh)	Low tonnes (CO_2e/GWh)	High tonnes (CO_2e/GWh)
Lignite	1054	790	1372
Coal	888	756	1310
Oil	733	547	935
Natural Gas	499	362	891
Solar PV	85	13	731
Biomass	45	10	101
Nuclear	29	2	130
Hydroelectric	26	2	237
Wind	26	6	124

Source: World Nuclear Association (WNA); http://www.world-nuclear.org/uploadedFiles/org/WNA/Publications/Working_Group_Reports/comparison_of_lifecycle.pdf

Further to the above mentioned reasons, it can be conclude that:

- The Project is environment friendly with minimal greenhouse gas emissions;
- It is the most feasible choice of power generation in the State of Madhya Pradesh; and
- It will contribute towards the state of Madhya Pradesh attaining self-sufficiency in power supply.

7.1.3 Location for Project Site

7.1.3.1 Availability of Solar Radiation

Solar Projects are non-polluting energy generation Projects, which are site specific and dependent on the availability of solar irradiance resource. Solar irradiance mapping, in India is the responsibility of the Solar Energy Centre (SEC) of India and the National Renewable Energy Laboratory (NREL) of the United States of America as part of the initiatives of the U.S.-India Energy Cooperation /Partnership to Advance Clean Energy (PACE), which is mapped and quantified based on which potential areas that are notified by the SEC, based on hourly data.

Based on the review of data obtained from The US National Aeronautics and Space Administration (NASA), NREL, Meteonorm; the average daily and monthly Global Horizontal Irradiance (GHI) values at Neemuch are presented in ***Table 7.4*** below.

Table 7.4 Daily and Monthly GHI at Neemuch Solar Park Site

Month	GHI (kWh/m2/ day)			GHI (kWh/m2/ month)		
	NASA	NREL	Meteonorm 7	NASA	NREL	Meteonorm 7
January	4.34	4.42	4.16	135	137	129
February	5.11	5.41	5.43	143	151	152
March	5.91	6.42	6.29	183	199	195
April	6.48	7.05	6.93	194	212	208
May	6.53	7.14	7.00	202	221	217
June	5.91	6.46	6.07	177	194	182
July	4.55	5.29	5.03	141	164	156
August	4.19	5.00	4.71	130	155	146
September	5.09	5.80	5.57	153	174	167
October	5.09	5.53	5.35	158	172	166

Month	GHI (kWh/m2/ day)			GHI (kWh/m2/ month)		
November	4.49	4.58	4.37	135	138	131
December	4.07	4.16	4.06	126	129	126
Annual Average	**5.14**	**5.60**	**5.41**	**156**	**170**	**165**

Source: Detailed Project Report, 500 MW Neemuch Solar Park, July 2020

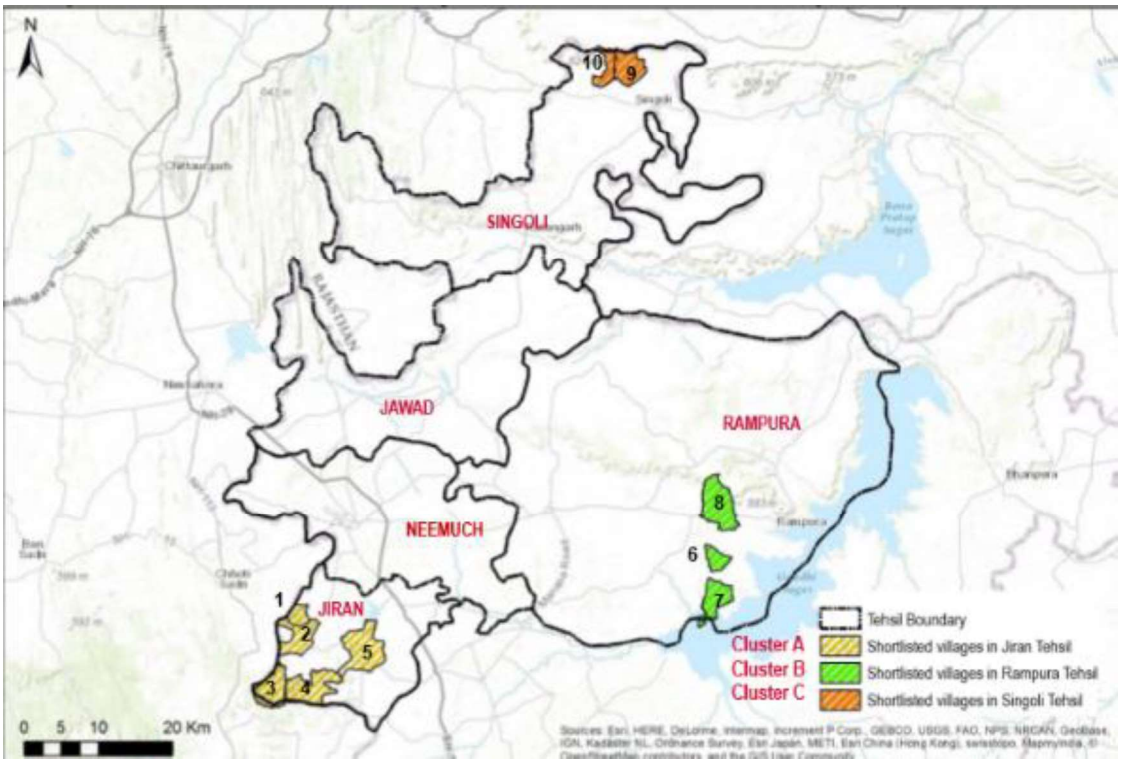
The site selected has average Global Horizontal Irradiance of 5.77 kWh/m^2/day. and annual GHI of more than 1876 kWh/m^2 is observed at the project site which is appropriate for a Solar PV project development.

7.1.3.2 Availability of land

During Project conceptualization stage, RUMSL had identified three locations for establishment of Solar Park in Neemuch District, viz. Singoli Tehsil (final selected site), Jiran Tehsil and Rampura Tehsil.

One of the key requirement for Solar Park is availability of contiguous land parcels. At Jiran and Rampura sites, majority of large size government land parcels available in cluster were allotted to forest department. In addition, at Rampura site, other larger area land parcels were allotted to Gandhi Sagar Dam. At Neemuch site, clusters of government contiguous land parcel are available.

Figure 7.2 Map Showing Initially Identified Locations for Solar Park



Source: Knight Frank report, 2017

The selected Project site has following other location advantages:

- Site with high solar irradiation;
- ~ 90% of Land area is government land;
- Most of the land parcels selected are scrubland with barren rocky surfaces with sparse vegetation;

- No physical displacement for Project;
- No ecological sensitive receptor such as National Parks, Wildlife Sanctuary, within 5 km radius;
- There are no places of Archaeologically Important Places (ASI recognized);
- There exists no major obstacles around the site in the form of trees, buildings etc. that could lead to near shading; and
- Site is approachable through State Highway 9A and National Highway (NH) – 76 connecting Kota and Chittorgarh.

8. ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

The purpose of an Environmental and Social Management Plan (hereinafter referred as ESMP) is to ensure that social and environmental impacts, risks and liabilities identified during the ESIA process are effectively managed during the construction and operation of the proposed Project. This is in accordance to MNRE Environmental and Social Management Framework, February, 2017, which emphasizes the importance of managing social and environmental performance through the lifecycle of the Project.

The key objectives of the ESMP are to:

- Formalize and disclose the program for environmental and social management;
- Provide a framework for the implementation of environmental and social management initiatives.

The ESMP describes the mitigation measures for all the identified potential impacts associated with the proposed project during its construction and operation phases. The ESMP delineates the monitoring and management measures to avoid and/or minimize such impacts by allocating management responsibility and suggesting skill requirement for implementation of these measures. Also the ESMP shall ensure a continuous communication process between RUMSL, EPC contractor, workers (including sub-contractors), local community and other stakeholders. RUMSL have an obligation to ensure compliance to all the commitments towards Environment, Social, Health and Safety Standards while executing all the project related activities for the proposed project.

8.1 Environmental and Social Management Plan

This section outlines the potential impacts, mitigation measures, monitoring and management responsibilities during construction and operation phases of the Project. ESMP measures already embedded/ in-built are not included in the ESMP presented in Table below. As a part of ESMP specific management plans including waste management plan, water management plan, occupational health & safety plan, disaster management and emergency response plan, contractor and labour management, gender action plan and stakeholder engagement plan has also been prepared for the project which are provided in ***Appendix F.***

Table 8.1 Planning Phase ESMP

Activity	Potential Impacts	Mitigation Measures	Responsibility	Reporting to RUMSL
Land Procurement	Impacts due to Private land purchase	■ The private land sellers should be provided with either alternate land parcels with similar nature of productivity and financial assistance to prepare the land for cultivation or adequate compensation at twice the value of land and assets, as per MP Mutual Consent Policy, 2014; ■ A Resettlement Action Plan- Livelihood Restoration Plan shall be formulated to address the following: - Livelihood impacts on the land owners if the holdings that remain are sub-optimal, or owners are rendered landless; - Additional livelihood assistance to vulnerable households, or women headed households, with skill trainings or entrepreneurship support, etc. under the LRP; - Impacts on land users or regular agricultural labourers affected - The general community being impacted due to access restrictions/easements; Other impacts on private land owners. ■ Preference to members of the families rendered landless or with sub-optimal holdings post selling land to the project for employment opportunities in the Construction/operation phase and/or small contracts; ■ Timely sharing of project related information with all relevant stakeholders;	RUMSL	-

Activity	Potential Impacts	Mitigation Measures	Responsibility	Reporting to RUMSL
		■ Provision of Grievance Redressal Mechanism to all impacted stakeholders in order to raise and register their grievances.		
	Impact due to Patta land purchase	■ Patta is being treated at par with ownership, for the land procurement process. Thus treatment of Patta Land holders will be similar to Private land owners and Patta holders shall be provided with either alternate land parcels with similar nature of productivity and financial assistance to prepare the land for cultivation or adequate compensation at twice the value of land and assets, as per MP Mutual Consent Policy, 2014; ■ A Resettlement Action Plan-Livelihoods restoration Plan is required to be formulated to address: - Livelihood impacts on the land owners if the holdings that remain are sub-optimal, or owners are rendered landless; - Additional livelihood assistance to vulnerable households, or women headed households, with skill trainings or entrepreneurship support, etc. under the LRP; - Impacts on land users or regular agricultural labourers affected - The general community being impacted due to access restrictions/easements; Other impacts on private land owners. ■ Preference to members (rendered landless or with sub-optimal holdings) of the families post selling land to the project for employment opportunities in the Construction/operation phase and/or small contracts;	RUMSL	-

Activity	Potential Impacts	Mitigation Measures	Responsibility	Reporting to RUMSL
		■ Additional safeguards to be addressed through the RAP-LRP for Patta Land owners; ■ Timely sharing of project related information with all relevant stakeholders; ■ Provision of Grievance Redressal Mechanism to all impacted stakeholders in order to raise and register their grievances.		
	Impact due to LUPA of Government Land	■ Provision for alternate grazing land for livestock shall be made near the project villages or confirmation of adequacy of remaining grazing land; ■ Development of community fodder lots shall be explored as a Livelihood restoration activity in the area as part of Resettlement Action Plan. This, if feasible, shall serve the purpose of augmentation of grazing land and as an income generating activity for people losing land based livelihoods. ■ Provision of easements shall be maintained in order to not sever the access to CPRs for the community; ■ Preference of members of Project affected households (PAH) in employment opportunities during construction phase; ■ In case of Squatters and encroachers, RUMSL shall serve a three months advance notice to the project affected persons (PAPs) to manage the potential losses to standing crops; ■ In case of crop losses ensuing from project activities, RUMSL shall pay compensation for crops, at full replacement cost; ■ Timely sharing of project related information with all relevant stakeholders in order to serve advance notice and reduce the extent of impacts and losses;	RUMSL	-

Activity	Potential Impacts	Mitigation Measures	Responsibility	Reporting to RUMSL
		■ Provision of Grievance Redressal Mechanism to all impacted stakeholders in order to raise and register their grievances.		
	Impact on Women	■ A Gender Action Plan shall be prepared for the Project where women focussed engagement shall be detailed; ■ Ensure that the employment of women from vulnerable households is done for the project and efforts are made for development of women owned enterprises in the area, from where procurement for project related needs is undertaken; ■ Undertake a profiling of the various social groups in the Study Area, to understand the individual needs and concerns of the various women belonging to different social groups and design community development and CSR programmes in light of the same; ■ As part of the stakeholder engagement, RUMSL shall ensure and communicate to the private Solar Project Developers, that Women focussed discussions are conducted in order to ensure adequate representation of the Women and their needs and concerns in order to design specific engagement activities; ■ Provision of Grievance Redressal Mechanism to all the stakeholders in order to raise and register their grievances.	RUMSL along with SPDs	Monthly reports on number of women engaged in the project activities
Water Resources		■ As part of project designing, SPD shall consider the rainwater harvesting ponds in the open area depending on the topography, slope, natural drainage etc. Accordingly infrastructure such as drains/ piping system/ size of pond etc. shall be designed.	SPD	-

Activity	Potential Impacts	Mitigation Measures	Responsibility	Reporting to RUMSL
		■ Similarly, in case water is sourced from surface water bodies, infrastructure requirements shall be identified and planned in project design.		

Table 8.2 Construction Phase ESMP

Activity	Potential Impacts	Mitigation Measures	Responsibility	Reporting to RUMSL
Site preparation - Site clearing, excavation and levelling	Change of topography and disturbance to drainage pattern.	■ Project designing shall be done in a way to utilize existing topography to maximum; ■ Project shall ensure to avoid any unnecessary changes in the topography especially during the preconstruction and construction phase; ■ Micro drainage channel should be particularly avoided when constructing access roads or planning the Transmission Line pathway in order to ensure no change to the topography of the area.	EPC Contractor/ Sub-contractor	Monthly Report to RUMSL
	Habitat Modification and Loss	■ Larger mature trees with significant height and girth should be avoided to the extent possible when construction the Solar Park. The trees can be incorporated into the solar compound construction but avoided during the siting of individual solar modules. ■ The Kawai Pond and Bardawada Pond is located within 500m and 100m from Unit 2 and 1 respectively. The vegetation surrounding these ponds should be avoided to the extent possible when siting temporary facilities (i.e. labour camps, contractor facilities, batching plant, etc.). ■ A natural canal delineates the border between Kawai and Badi Villages. The canal was dry during the site visit despite the assessment being immediately after the monsoon season. The canal may pass through Unit 2 and/or Unit 3 after the compound is constructed. The natural drainage through the canal should not be blocked due to construction and operation/maintenance activities. ■ If changes in the boundaries of the proposed units or any further expansions are anticipated than the areas surrounding the Arnea Reserve Forest block should be avoided to prevent increased risk of edge effects.	EPC Contractor/Sub Contractor in association with RUMSL Planning Team	Monthly Report to RUMSL Planning Team

Activity	Potential Impacts	Mitigation Measures	Responsibility	Reporting to RUMSL
Construction Activities at Site	Change in land use	■ Construction activities should be restricted to designated area; ■ On completion of construction activities, land used for temporary facilities such as Contractor office, batching plant (if any), stockyard, labour camp should be restored to the extent possible ■ The land use in and around permanent Project facilities should not be disturbed; and ■ The land should be restored back to the original state to the extent possible after completion of life cycle of the Project and in case there are plans not to continue further at the site.	EPC Contractor/ Sub-contractor	Monthly Report to RUMSL
	Soil Compaction and Erosion	■ The topsoil present in the construction shall be removed and stock pilled in separate area; ■ The stock pile should be protected from natural elements to prevent from erosion and also degradation; ■ Topsoil to be reused on site for landscaping purpose; ■ Defined routes for transportation and construction vehicles, workers etc. to minimize soil compaction; ■ Good drainage as per the natural slope condition should be provided to reduce surface runoff and associated erosion; ■ Back filling and revegetation of the area disturbed will be undertaken phase wise immediately after the completion; and ■ Site clearance, piling, excavation and access road construction will not be carried out during the monsoon season to minimize erosion and run-off.	EPC Contractor/ Sub-contractor	Monthly Report to RUMSL

Activity	Potential Impacts	Mitigation Measures	Responsibility	Reporting to RUMSL
	Soil Contamination	■ Construction and Demolition Waste should be stored separately and be periodically collected by an authorized treatment and storage facility; ■ All waste should be stored in a shed that is protected from the elements (wind, rain, storms, etc.) and away from natural drainage channels; ■ Designated areas should be provided for Solid Municipal Waste and daily collection and period disposal should be ensured; ■ The hazardous wastes to be stored onsite temporarily at separate designated covered area provided with impervious flooring and secondary containment and to be disposed in accordance with Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016; ■ A log book should be maintained for quantity and type of hazardous waste generated; ■ EPC Contractor should ensure that no unauthorized dumping of used oil and other hazardous waste is undertaken at the site; ■ Hazardous waste to be disposed through MPPCB authorised vendors; ■ In case of accidental/unintended spillage, the contaminated soil should be immediately collected and stored as hazardous waste; and ■ E waste, used discarded batteries shall be disposed off in accordance to e waste management rules and batteries management and handling rules.	EPC Contractor/ Sub-contractor	Monthly Report to RUMSL
	Impact on Water Resource and Availability	■ Construction labour deputed onsite to be sensitised about water conservation and encouraged for optimal use of water; ■ No ground water shall be abstracted for construction activities; ■ Regular inspection for identification of water leakages and preventing wastage of is necessary for efficient utilisation of water; ■ Maintain logbook for water consumption	EPC Contractor/ Sub-contractor	Monthly Report to RUMSL

Activity	Potential Impacts	Mitigation Measures	Responsibility	Reporting to RUMSL
	Impact on Water Quality	■ Ensure proper cover and stacking of loose construction material at site to prevent surface runoff and contamination of receiving water body; ■ Open defecation and random disposal of sewage will be strictly restricted; ■ Planning of toilets, soak pits and septic tanks, waste collection areas away from natural drainage channels; ■ Provision of number of toilets across with easily accessible location as the project site is spread across large area of 3 units; ■ Use of licensed contractors for management and disposal of waste and sludge; ■ Labourers will be given training towards proactive use of designated areas/bins for waste disposal and encouraged for use of toilets. Open defecation and random disposal of sewage will be strictly restricted; ■ Provision for impervious storage area, especially for fuel & lubricant, hazardous waste, etc. will be made onsite; and ■ Spill/ leakage clearance plan to be adopted for immediate cleaning of spills and leakages.	EPC Contractor/ Sub-contractor	Monthly Report to RUMSL
	Impact on Air Quality	■ The construction site shall be barricaded; ■ Keeping areas of open excavation to a minimum; ■ Minimising stockpiling by coordinating excavations, spreading, re-grading, compaction activities; ■ Cease or phase down work if excess fugitive dust is observed, investigate source and take suppression measures; ■ Speed of vehicles on site to be limited to 10-15 km/hr; ■ The emissions from diesel generator shall be by optimised operations, orientation at the site and providing adequate stack height for wider dispersion of gaseous emissions ■ Switch off machinery and equipment when not in use; ■ Prevent idling of vehicles and equipment; and ■ Vehicle engines will be properly maintained and will have a valid Pollution under Control (PUC) to ensure minimization in vehicular emissions.	EPC Contractor/ Sub-contractor	Monthly Report to RUMSL

Activity	Potential Impacts	Mitigation Measures	Responsibility	Reporting to RUMSL
	Impact on Noise Quality	■ Only well-maintained equipment to be operated on-site; ■ If it is noticed that any particular equipment is generating too much noise then lubricating moving parts, tightening loose parts and replacing worn out components to be carried out to bring down the noise. It is to be ensured that such machinery are kept far away from the households; ■ Machinery and construction equipment that may be in intermittent use to be shut down or throttled down during non-work periods; ■ Low noise equipment shall be used as far as practicable; ■ The number of equipment operating simultaneously shall be reduced as far as practicable; ■ DG set with acoustic enclosures shall be used; ■ Vehicular movement through village roads should be planned to avoid traffic jam and inconvenience to local residents; ■ Equipment noise should be 85 dB (A) at 1 m from the source in line with WB/IFC EHS guidelines; and ■ Minimal use of vehicle horns needs to be encouraged through induction training and periodic toolbox training sessions.	EPC Contractor/ Sub-contractor	Monthly Report to RUMSL

	Impacts due to construction activities	■ No hunting, trapping or injuring of local fauna should be communicated to labourers through a workshop or formal training exercise. The training should also communicate presence of species protected under Wildlife Protection Act, 1972 Schedule I and the penalties associated with contravention on the identified law; ■ Noise control measures such as acoustic enclosures for DG sets, noise attenuation barriers in areas near sensitive habitat and proper maintenance of the vehicles used for the Project site should be implemented to reduce the effect of construction noise on local ecology; ■ Set routes, consolidation of trips and no off-roading policies should be introduced by the EPC contractor to reduce the impact from noise and human-wildlife conflict; ■ Adequate toilets, gas/firewood and space should be provided in any anticipated labour accommodation and the labourers should be informed not to enter or utilize any resources from surrounding forest land over the course of the construction period; ■ Local semi-skilled and unskilled labourers should be used to the extent possible to reduce demography influx into the Project site and therefore reduce the risk of disturbance to local fauna; ■ Waste that is generated from the Solar Park during construction and operation should be stored in covered containers within the site premises. Uncovered waste may attract fauna to the Solar Park; ■ Excavated areas should be adequately fenced and security should be deployed to prevent wildlife intrusion into these areas; ■ Construction work and anthropogenic movement should be restricted near any major water bodies (including all water bodies identified in Table 4.29) to reduce the impact on aquatic bird species (resident or migratory); ■ Construction activities and transportation should be avoided during peak ecological activity i.e. dawn (5:30 am to 7:30 am) and dusk (5:00 pm to 7:00 pm). Night-time activities should be kept to a minimum and if essential, should be done with prior intimation to the neighbouring communities; ■ Areas with pre-existing nests, ground-roosting sites and burrows should be avoided for construction related work to reduce the impact on local fauna; and ■ Hazardous materials and waste should not be stored near any drainage channels or cliff-sides to prevent contamination of the surrounding environment and impact on local flora/fauna.	EPC Contractor/Sub-contractor	Report to RUMSL Construction Team

Activity	Potential Impacts	Mitigation Measures	Responsibility	Reporting to RUMSL
		■ The area around the [Water Body Unit 3] should be avoided for the siting of any ancillary facilities including access roads, contractor facilities or labour accommodation and even temporary siting of equipment (e.g. DG set, waste storage area and material storage area) should not be undertaken adjacent to the water body or its drainage channels.		
	Loss of Ecosystem Services	■ Nesting trees should be avoided to the extent possible when it falls within the Solar Park site. ■ Natural drain passing between Kawai and Badi should be unaffected by the Project construction. Similar seasonal drainage pathways should not be blocked during the Project construction. ■ Seeding of native plant species outside of the Solar Park especially in areas where the soil layers have been impacted and around water bodies to offset the loss of floral resources and dependent ecosystem services. ■ Pollution and spill control mechanisms should be implemented and strictly enforced around [Water Body Unit 3] to ensure that there is no impact to the water quality or any drainage channels into the water body. ■ Larger mature trees with significant height an girth should be avoided to the extent possible when construction the solar compound. Larger trees can be set aside within the Solar Park and avoided as part of the micro-siting of the solar modules.	EPC Contractor	Report to RUMSL Construction Team

Activity	Potential Impacts	Mitigation Measures	Responsibility	Reporting to RUMSL
	Occupational Health & Safety	■ Health & safety training to be provided; ■ Prior to start of work, workers should be informed about the related safety risks and precautions to be taken through tool box meetings; ■ Manual lifting by adult men to be less than 55 kg and for women it should be less than 30 kg; ■ Adequate PPEs to be provided for all activities at site including but not limited to welding, cutting or similar operations which may cause hazard to eyes; ■ All persons performing construction work to wear safety shoes and helmets confirming to national standard; ■ Every worker engaged in handling sharp objects which may cause injury to hand shall be provided suitable hand gloves; ■ While working in hot conditions, measures such as work break at regular intervals, keeping hydrated by drinking water and liquids, covering face with damp cloth etc. shall be used; ■ Obtain and check Contractor's safety method statements; ■ Permitting system should be implemented to ensure that cranes and lifting equipment is operated by trained and authorized persons only; ■ Appropriate safety harnesses and lowering/raising tools should be used for working at heights; ■ All equipment should be turned off and checked when not in use; ■ Emergency contact numbers and route to the nearest hospital to be displayed at the construction site; ■ The local/ host community to be kept at safe distance from construction site; ■ At a minimum, implement all COVID-19 related safety and emergency response measures, as relevant and as prescribed by the government ■ A Site specific safety or emergency response plan should be in place to account for natural disasters, accidents and any emergency situations; ■ Site specific/ activity specific Hazards Identification and Risk Assessment (HIRA) should be developed prior to start of the activities at site; and ■ Provide H&S achievement information to employees.	EPC Contractor/ Sub-contractor	Monthly Report to RUMSL

Activity	Potential Impacts	Mitigation Measures	Responsibility	Reporting to RUMSL
	Photovoltaic Heat Island Effect	■ The existing ground vegetation in the Solar Park area shall be disturbed to minimum extent; ■ Ground vegetation shall be planted in the buffer areas/open areas available in the Solar Park; ■ The feasibility of mixed land use development in the Solar Park shall be explored	SPD and RUMSL	-
	Flood Risk	■ Undertake an assessment to estimate the High Flood Level (HFL) at the Site. This will help in estimation of the risks of flooding and inundation to the Site. Installation of solar panels and other critical infrastructure above the HFL will greatly reduce disruptions and losses to the Park; ■ Enhance structural stability of banks of all seasonal streams which are in close vicinity of the Site units and provide robust erosion protection to withstand flood water; ■ Storm water drains must be designed in line with the natural topography and eventually drain into the natural seasonal streams in the Site area; ■ Ensure that the Site's SWD outfalls are at an elevation higher than the maximum water levels of the natural seasonal streams; ■ Provide sluice/ flap gates at the SWD outfall to prevent backflow during a backflow event; ■ Make provisions for pumping infrastructure within the Site to ensure rapid evacuation of water in case of high flow/backflow associated with ponds and seasonal streams ; ■ Implement an effective flood monitoring and disaster management system in place for effective mitigation of floods at a Site level; ■ Coordinate with the district and local disaster management cells to update on flood early warning notifications	SPD and RUMSL	

Activity	Potential Impacts	Mitigation Measures	Responsibility	Reporting to RUMSL
Social impacts due to ongoing construction activities	Temporary occupation of land for construction phase activities	■ Provision of adequate lease on rental amounts to the land owners shall be ensured by RUMSL; ■ The land leased/ rented shall be restored to its original state (or made better) at the time of handing it back to the owners; ■ Provision of compensation for the loss of livelihoods to the users of the land required for temporary use as this will temporarily economically displace them; ■ Timely dissemination of project related information with all relevant stakeholders, in order to serve advance notice and reduce the extent of losses/ impacts; ■ Provision of Grievance Redressal Mechanism to all the key stakeholders in order to raise and register their grievance.	RUMSL	-

	Impact on Community Health and Safety	*Responsibilities of RUMSL* ■ Ensuring stakeholder engagement through the project cycle and provision of an effective Grievance Redressal Mechanism to avoid, mitigate and mange conflicts and disagreements; ■ As part of the stakeholder engagement and information disclosure process, the community will be provided with an understanding of the activities to be undertaken and the precautions to be taken for safety; ■ RUMSL shall maintain safe distance of project components from schools, hospitals, etc. in order to avoid interactions with community hotspots and hence risks of accidents; ■ The Contractors to be engaged by RUMSL shall be informed of the EHSS practices that are expected from its workers during the construction phase engagement. Obligations like preparation of Traffic Management Plan, Local Procurement Plan, EHSS Plan, etc. shall be communicated to them at the time of selection and appropriate clauses should be included at the time of contract finalization; ■ The contractor shall be required to adhere to IFC's accommodation guidelines, for the labour camps in terms of provisions, sanitation facilities, etc. thus limiting the probability of diseases and infections in the local community on account of improper management of waste, special measures may be required to additionally manage the risk of the COVID-19 related infections and emergency response; ■ RUMSL shall put in place a grievance redressal mechanism to allow community members to report any concern or grievance related to project activities. The contractors shall also be contractually required to put in place a similar mechanism to deal with concerns raised by the community (or external stakeholders) and the workers engaged during construction phases. ■	RUMSL along with Contractors	Monthly reports to RUMSL from EPC contractors

Activity	Potential Impacts	Mitigation Measures	Responsibility	Reporting to RUMSL
		■ *Contractors* ■ The contractor shall induct migrant workers on health and safety awareness and practices to be followed at site during construction phase; ■ The contractors shall cordon off areas that are under construction and put relevant safety signs to restrict movement of local community members or workers engaged at site, which may become safety threats; ■ The Contractors shall prepare a Traffic Management Plan and traffic movement due to the project in the area will be regulated to ensure road and pedestrian (including livestock) safety; ■ Additionally, training on vehicular safety shall be organised for the transport workers. ■ The movement of workers from the project site and labour camps shall be regulated and similarly the project boundary and labour accommodation to check for unauthorized visitors/ outsiders entering the site in order to avoid any possible interactions leading to conflicts or tensions between the migrant workforce and host community; ■ Contractors shall ensure that regular health check-ups are conducted for the construction phase workers (especially migrant workers staying in temporary labour accommodation) and any major illnesses are reported in the Block level medical authorities at the earliest; ■ The labour accommodation should be clean and hygienic and disposal of kitchen waste and food waste shall be done on a daily basis in an appropriate manner; ■ Proper sanitation facilities shall be provided, taking into account the number of labourers that will be using the facilities, both at construction site, as well as labour accommodation.		

Activity	Potential Impacts	Mitigation Measures	Responsibility	Reporting to RUMSL
	Stress on Community Resources	■ There will be a worker Code of Conduct defined by RUMSL that prevents workers and contractors from using the local resources like water, forest, which will be shared with private SPDs for onward sharing with sub-contractors and its workers; ■ An induction session will be organised for the migrant workers where they will be sensitized on the Do's and Don'ts during their stay near project location, which would include aspects on conservation of community's resources; ■ The contractor shall be asked to use Tanker water supply during the summer months, which are dry months in which water scarcity issues are reported by the community; ■ Periodic maintenance activities for roads used for transportation of goods for the project shall be the undertaken by RUMSL, through its contractors; ■ Provision of Grievance Redressal Mechanism to all the key stakeholders in order to raise and register their grievance on misuse of locally available resources.	RUMSL along with contractors	Monthly reporting by contractors
	Impact due to Noise Nuisance and Dust	■ Ensure safe distance of project related activities from schools, hospitals, etc.; ■ Install enclosures around construction area, in order to reduce the extent of noise and dust emanating due to project related activities; ■ Limit construction related activities to day time in order to restrict the noise related nuisance in the evenings, where permissible noise threshold is lesser; ■ Provision of Grievance Redressal Mechanism to all the key stakeholders in order to raise and register their grievances pertinent to noise and dust related issues.	RUMSL	Monthly reporting

Activity	Potential Impacts	Mitigation Measures	Responsibility	Reporting to RUMSL
	Impact on Employment and Entrepreneurship opportunities	■ **Enhancement Measures** ■ The sourcing of local labour wherever possible should be made obligatory by RUMSL (through contractual provisions) for the Solar Project Developers and sub-contractors and in all major procurement activities; ■ Preference should be given to the land losers and vulnerable population in the Project Villages, to the extent practicable; ■ Employment of members of SC-STs and Women Headed households should be ensured by the Solar Project Developers through documented agreement with contractors/ sub-contractors; ■ Engagement of local vendors, to the extent possible, for the goods and services required for the project during construction phase; ■ The project proponent will establish a mechanism to audit subcontractors and suppliers with respect to compliance of utilizing local labour and resources; ■ Provision of Grievance Redressal Mechanism to all the key stakeholders in order to raise and register their grievance with respect to information sharing related to jobs and opportunities for vendor-ship.	RUMSL	-

Activity	Potential Impacts	Mitigation Measures	Responsibility	Reporting to RUMSL
	Impact on Women	■ Include provisions of coverage of women under skill training and Financial literacy training programs, as part of livelihood restoration activities by the project or through developmental programs of SPDs; ■ Ensure that the employment of women from vulnerable households is done for the project and efforts are made for development of women owned enterprises in the area, from where procurement for project related needs is undertaken; ■ Undertake a profiling of the various social groups in the Study Area, to understand the individual needs and concerns of the various women belonging to different social groups and design community development and CSR programmes in light of the same; ■ Provision of Grievance Redressal Mechanism to all the stakeholders in order to raise and register their grievances.	RUMSL along with SPDs	Monthly reports on number of women engaged in the project activities

Table 8.3 Operation Phase ESMP

Activity	Potential Impacts	Mitigation Measures	Responsibility	Reporting to RUMSL
Solar Park operation leasing to use of water	Water Resource	**Conserving Water Resources** ■ Dry robotic cleaning of modules to be explored as recommended by MNRE (1); ■ Alternate sources of water shall be explored ■ Ground water abstraction shall be done in accordance to CGWB guidelines. ■ Implement rainwater harvesting and/or groundwater recharge and replenishment opportunities within Site premises especially near the low-lying and gently sloping area. ■ Optimising water usage in the SCADA building by application of water conservation measures such as sensor based taps, low flush urinals etc.; ■ Maintain logbook for water consumption; ■ Implement groundwater and wastewater monitoring vis-à-vis quality/quantity; ■ Adopt less water consuming module cleaning methods; ■ The surface runoff from during solar panel cleaning shall be diverted to a settlement tank for settlement of suspended solids. The overflow shall be treated in water treatment unit and recycled in the Project. ■ Use of water from multiple sources to avoid dependency on one particular source (groundwater or surface water). This also includes tapping of rainwater received during the monsoons for the long-term and uninterrupted operations.	O&M Contractor RUMSL	Annual Report to RUMSL

(1) MNRE had issued a letter dated 3 June 2019 to Principal Secretaries of States and Solar Association of all States regarding optimal utilization of water and preferably use Robotic technology for cleaning of modules.

Activity	Potential Impacts	Mitigation Measures	Responsibility	Reporting to RUMSL
		■ The Project should implement principles of water stewardship to ensure water security not just for the site, but also for other stakeholders within the watershed. Some of the water stewardship frameworks/ standards that can be adopted are UN Global Compact's CEO Water Mandate or AWS Standards. ■ Identify stakeholders directly impacted by the groundwater use at the Project site and develop long- term stakeholder engagement plan particularly focused on stakeholders near site to develop positive perception towards Project and its operations. **Rain Water Harvesting** Rainwater harvesting pond shall be provided at site. In addition, groundwater recharge shall be undertaken within the Site to replenish the shallow aquifer zones. Piezometers to be installed to monitor the groundwater level changes in the aquifer trapped by the abstraction wells at Project site. **Water Quality** ■ Ensure proper cover and stacking of loose construction material at site to prevent surface runoff and contamination of receiving water body; ■ Open defecation and random disposal of sewage will be strictly restricted; ■ Planning of toilets, soak pits and septic tanks, waste collection areas away from natural drainage channels; ■ Provision of number of toilets across with easily accessible location as the project site is spread across large area of both the Units;		

Activity	Potential Impacts	Mitigation Measures	Responsibility	Reporting to RUMSL
		■ Use of licensed contractors for management and disposal of waste and sludge; ■ Labourers will be given training towards proactive use of designated areas/bins for waste disposal and encouraged for use of toilets; ■ Provision for impervious storage area, especially for fuel & lubricant, hazardous waste, etc. will be made onsite; and ■ Spill/ leakage clearance plan to be adopted for immediate cleaning of spills and leakages. **Other Management Aspects** ■ Preparing an inventory of water consumption during construction and O&M activities.		
Solar Park operation leading to waste generation and leaks & spill	Soil contamination	■ Designated areas should be provided for Solid Municipal Waste and daily collection and period disposal should be ensured; ■ The hazardous wastes to be stored onsite temporarily at separate designated covered area provided with impervious flooring and secondary containment and to be disposed in accordance with Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016; ■ A log book should be maintained for quantity and type of hazardous waste generated; ■ O&M Contractor should ensure that no unauthorized dumping of used oil and other hazardous waste is undertaken at the site; ■ Hazardous waste to be disposed through MPPCB authorised vendors; ■ In case of accidental/unintended spillage, the contaminated soil should be immediately collected and stored as hazardous waste; ■ The guidelines and procedures shall be prepared and followed for immediate clean-up actions following any spillages; ■ Damaged/ discarded solar panels to be disposed with the help of authorised recycling vendors/ module installation contractors;	O&M Contractor	Annual Report to RUMSL

Activity	Potential Impacts	Mitigation Measures	Responsibility	Reporting to RUMSL
		■ A SOP shall be prepared for storage and disposal of broken solar panels. MNRE had prepared a concept note for storage and disposal of used solar panels. The recommendations such as recycling of glass, storage of discarded panels in cover shed etc. shall be adopted in the Project; (1) ■ The broken panels shall not be mixed with normal glass and kept separately in accordance to HW Rules; and ■ Other wastes such as e-waste, used discarded batteries shall be disposed off in accordance to E-waste Rules and batteries management Rules.		
Solar Park operations	Occupational Health and Safety	■ At Substation, SOPs will be prepared for all O&M activities; ■ H&S training to be imparted; ■ Work permit system to be developed and implemented; ■ Appropriate PPEs for electrical work and other O&M work to be provided; ■ First aid kit to be provided; ■ Records of incident/ accidents shall be maintained; ■ Root cause analysis shall be carried out for any incident/ accident; ■ Emergency contact numbers and route to the nearest hospital to be displayed at the construction site; ■ A safety or emergency management plan should be in place to account for natural disasters, accidents and any emergency situations; and ■ Provide H&S achievement information to employees.	O&M Contractor	Report to RUMSL Team
	Collision and electrocution risk with live electrical components	■ Restrictions should be imposed so that dead carcasses are not disposed near the Solar Park or external Transmission Line infrastructure. The O&M team should be trained on removing any carcasses found around these Project components in a timely manner to ensure that no vulture or birds of prey are attracted to the Project site. ■ RUMSL should maintain a carcass register as part of the Operation and Maintenance (O&M) phase to record any bird carcasses or suspected bird carcasses. The register should include a date, type of specie (to the extent identifiable), geographic location and nearest Transmission Line infrastructure for each carcass entry. If possible, the	O&M Contractor	Report to RUMSL Team

(1) http://164.100.94.214/sites/default/files/webform/notices/DraftBluePrintAntimony.pdf

Activity	Potential Impacts	Mitigation Measures	Responsibility	Reporting to RUMSL
		register should be backed-up with photo-documentation of any identified carcasses or remains. If the number of carcasses are significant, then RUMSL should commissioning an ecologist to suggest more stringent mitigation measures at the sensitive Project components. ■ The O&M team should be instructed to regularly inspect transmission towers as part of their periodic maintenance and rounds of the operational Solar Park. The purpose is to identify any roosting or nesting of bird species. ■ The internal Transmission Line along [Water Body Unit 3] should be marked with diffractors/diverters at a spacing of 10m apart		
Social Impacts during Operations Phase	Community Health and Safety	■ Community sensitization sessions should be re-organised at the beginning of Operations phase, in order to mention about the new developments in the area and provided an understanding of the precautions to be taken for safety; ■ Project's Grievance Redressal Mechanism for the community shall still be in implementation to deal with any concerns of community health and safety, being raised by the local community.	Solar Project Developers (SPDs)	Monthly
	Impact on Employment (General, Vulnerable and Indigenous groups and women)	**Enhancement Measures:** ■ The private SPDs shall advertise the roles of Technical staff required during operations phases, in the local newspapers to enable hiring of competent people from nearby areas, to the extent feasible; ■ Preference shall be given (to the extent feasible) to hire competent members from PAHs for semi-skilled jobs like housekeeping or Security Guards; ■ Preference to Indigenous and Vulnerable groups shall be provided to the extent possible for semi-skilled jobs, like housekeeping, security guards, etc., and as Technicians and more, if there is a skill set match.		

Activity	Potential Impacts	Mitigation Measures	Responsibility	Reporting to RUMSL
		■ The SPDs shall ensure appropriate measures for hiring of women, as per required skill set, are put in place, during the Operations phases.		

8.2 Institutional Structure for Implementation

To ensure the efficacy of Environmental and social management plan, certain institutional mechanism with well-defined roles and responsibilities is essential for effective implementation of identified mitigation measures both during construction and operation phases.

8.2.1 Project Implementation- SPPD and SPD

The proposed Solar Park project will be owned by RUMSL and will be established jointly by Solar Power Park Developer (SPPD), i.e. RUMSL and Solar Project Developers (SPD). SPDs will be selected through bidding process. RUMSL had appointed PGCIL as PMC to oversee the project development. Presently, bidding process for selection of SPD is in planning stage.

8.2.1.1 Responsibilities of SPPD and SPD

The scope of SPPD and SPD is given in ***Table 8.4*** below.

Table 8.4 Responsibilities of SPPD and SPD

Project Phase/Scope	SPPD	SPD
Name of Agency	RUMSL	To be selected through bidding process
Permissions	■ Land Acquisition, Gram Panchayat NOC, ■ NA Conversion ■ Support in obtaining permissions such as - Geology & Mining NOC - PTCC Approval - CEIG Approval - Commissioning Certificate - Open Access Approval - Approval from Irrigation department - Registrations/ permissions required for work (to be executed by RUMSL)	■ Registrations/ permissions required for work to be executed by SPD such as CTO for batching plant, Registration under Contract Labour Act and other labour laws (as applicable), NOC from Gram Panchayat, Geology & Mining NOC etc. ■ PTCC Approval ■ CEIG Approval ■ Commissioning Certificate ■ Open Access Approval ■ Approval from Irrigation department
Solar Park	■ Common facilities ■ Access roads, roads within Solar Park to provide access to individual plots and other common facilities ■ lightening to the common area such as utility area, street lighting of the roads ■ The Fire Fighting & Protection System for common infrastructure such as the Pooling Substation	■ Site levelling activities for individual units ■ Development of three units (160 MW, 170 MW and 170 MW) ■ Development of internal roads within each unit ■ Labour camps

Project Phase/Scope	SPPD	SPD
Substation and Transmission Line	■ Development of internal evacuation infrastructure including three numbers of 33/220 kV substations ■ Erection of Transmission Line from Unit substations to PGCIL substation proposed at Badi village	■ 33 kV cable circuit to evacuate the generated power from each unit to Unit substation. ■ O&M of respective unit substation and internal transmission system ■
Water Requirement	■ RUMSL shall make available the construction water by way of water tankers including facilitating required necessary approvals	■ Payment of construction water cost. ■ Arrangement of water requirement during operation phase.
Construction power	■ Infrastructure for construction of power through DG set or temporary supply from Distribution Company	■ Cost of construction power to be paid by SPD.
Operation and Maintenance	■ O&M of common facilities shall be undertaken by RUMSL	■ O&M of each unit

Source: DPR, July 2020

RUMSL will appoint EPC contractor for their scope of work such as construction of external roads, substations, common facilities etc. PGCIL will be responsible to oversee the EPC contractor activities.

8.2.1.2 Power Grid Corporation India Limited (PGCIL)

PGCIL will be responsible for providing grid connectivity to the Solar Park for power evacuation. For this purpose PGCIL will construct a 220kV /400 kV ISTS substation at Badi Village.

RUMSL has also appointed PGCIL as Project Management Consultant. Under this role, the responsibilities of the PGCIL includes supervision of EPC contractor to be hired by RUMSL for construction of common infrastructure of Solar Park such as roads, control room and construction of internal evacuation infrastructure, i.e. 33kV/220 kV Pooling substations at each Unit and 220 kV Transmission Line connecting Pooling substations to ISTS substation.

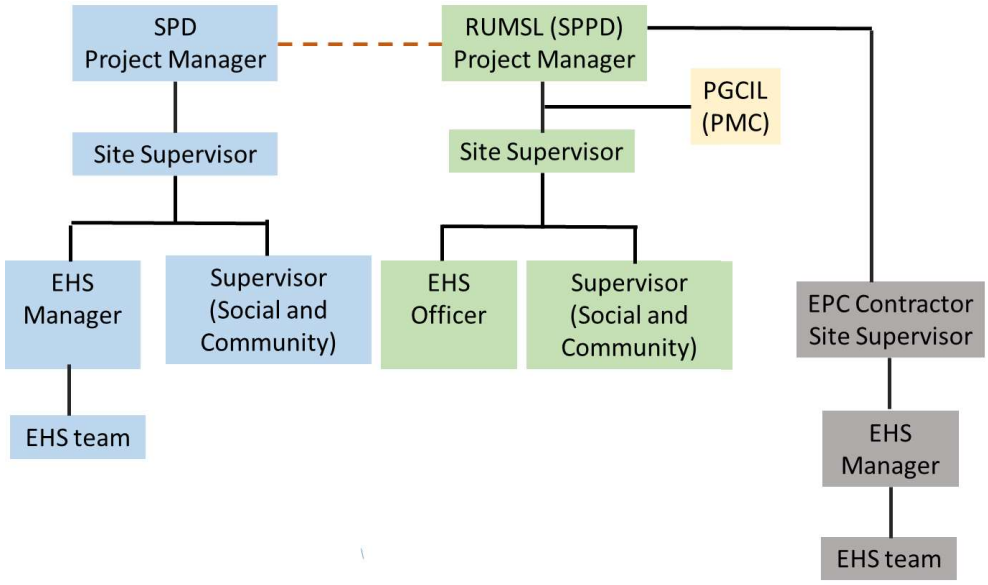
8.2.2 Implementation of ESMP

RUMSL will have ultimate responsibility for implementing the provisions of the ESMP. This role will include the on-going management of environmental and social impacts, monitoring of contractor performance as well as development of mechanisms for dealing with environmental and social problems. RUMSL will also ensure that the activities of its contractors are conducted in accordance with good practice measures, implementation of which will be required through contractual documentation.

The organizational structure of RUMSL with respect to management of EHSS issues across the project life cycle is shown in ***Figure 8.1*** below. The overall management and coordination of the Project will be the responsibility of Project Manager of RUMSL. RUMSL will engage EPC contractors to undertake construction activities for pooling substation and common infrastructure at all the three Units, i.e. Unit 1, Unit 2 and Unit 3. The project level activities will be managed at the Site by Site Supervisor(s) of respective Units. At project level, implementation of management plans and corrective actions are the responsibilities of Site Supervisor in coordination with EHS Manager, hired by the respective Unit EPC contractor. In construction and operational phase, EHS Manager of each

respective Unit will supervise the Contractor HSE Engineer's performance to implement the management action plans in coordination with Site Supervisor.

Figure 8.1 Proposed Organisation Structure for ESMP Implementation



As the project is being developed on some private land also; it is envisaged that SPD need to appoint an onsite social/admin officer to manage social (including labour and community) issues. The name and contact number of the appointed person should be displayed at the site office.

8.2.2.1 Roles and Responsibilities

This section describes the roles and responsibilities of the key persons responsible for management of onsite activities for the proposed project:

Project Manager /Site In charge

The Project Manager of RUMSL will be responsible for overall management of the project and ESMP implementation during construction and operation phase. The following tasks will fall within his/her responsibilities:

- Monitor site activities on a daily basis for compliance during construction phase and weekly during operation phase;
- Conduct internal audits of the construction site against the ESMP;
- Confine the construction site to the demarcated area;
- Reporting EHSS related issues & incidents to Chairman of RUMSL;
- Conducting meetings with Site Supervisor of Unit Developers regarding EHSS issues;
- Oversee activities of Site Supervisor and will coordinate with him for updates on the project; and
- Reviewing and updating of ESMP for its effective implementation.
- ***Site Supervisor***

Site Supervisor will be appointed by the SPD/EPC Contractor and will be responsible for the following scope of work:

- Meet the labour requirements during construction phase;

- Hiring and management of different contractors for civil, mechanical and electrical works;
- Supervise the daily activities occurring on the site during construction and operation phase; and
- Plan the traffic route for movement of material and solar panels and will communicate the same to RUMSL officials.
-
- ***EHS Manager***

EHS Manager as appointed by SPD/EPC Contractor shall be responsible for checking compliance of the contractor(s) with the requirements of this EMP and any other relevant environmental legislation for all activities associated with the contract. The general duties of the EHS Manager are as follows:

- Be familiar with the environmental management requirements contained in this ESMP;
- Regular auditing of the contractor(s) with the view of ensuring that all activities on the site are undertaken in accordance with the ESMP;
- Issuing regular audit reports to the Site Supervisor and contractor(s)regarding compliance with this EMP with help of Safety Officers; and
- Advising on environmental legal requirements regarding issues that may arise during the project to the Site Supervisor and the contractor(s).

Safety Officer

Safety Officers appointed by SPD/EPC Contractor will also be responsible for conducting an EHS audit during the construction phase of the project on a weekly basis according to the provisions of the Environmental and Social Management Plan. The major responsibilities will be:

- Stay at ground levels on daily basis and will coordinate with Contractor's representatives for all construction activities;
- Provide tool box trainings to labour and will also issue relevant PPEs to them;
- Develop formats for work permit system and will ensure its implementation;
- Conduct independent environmental audits; and
- Submit audit reports to the EHS Manager and Site Supervisor of respective Units.

Supervisor (Social and Community aspects)

- A supervisor shall be appointed by RUMSL to manage social and community aspects on site
- The Supervisor (S&C) shall be responsible for maintaining category wise records of those eligible for priority hiring of labourers by the contractors at the time of Construction activity initiation, based on the lists provided based on RAP-LRP eligibility for priority employment.
- Additionally, the Supervisor (S&C) shall be responsible for maintenance and upkeep of records related to liaison with local community including awareness and communications on construction phase activities by the project personnel, on various topics, and also be responsible for maintaining stakeholder engagement records.
- The Supervisor (S&C) shall also be designated as the Grievance Officer for the project, who is liable to maintain records of all incoming grievances (including but not limited to RAP and LRP implementation or linked to compensation payments), maintain grievance trackers and drive the communication to the aggrieved on receipt and resolution of grievances and also in cases of any delays that are anticipated in resolution of grievances.

HSE Engineer

The SPD/EPC Contractor's HSE officer shall be responsible for implementation of the ESMP and any other environmental requirements that may be identified by the Site Supervisor during the course of the contract. The Contractor(s) HSE officer shall have received basic HSE training either as part of the contract or previously. In addition to any other responsibilities, the general duties of the Contractor's HSE officer shall be:

- Ensure that all personnel (including sub-contractors) are duly informed of the requirements contained in this ESMP, and the associated responsibilities and implications of this ESMP;
- Consult with the Safety Officer of SPD/EPC Contractor regarding interpretation of the EMP and any other aspects of the contract that may impact significantly on the environment; and
- Ensure that all records needed to demonstrate compliance with the EMP requirements are obtained, filed and readily available for inspection by the Site Supervisor of Module or the Project Manager of RUMSL.

8.2.3 Monitoring and Reporting

RUMSL through the respective PMC will monitor the project to ensure conformity to the requirements of the ESMF. The monitoring will cover construction and operation phases. The list of performance indicators as provided in ***Table 8.5*** will be used to monitor project objectives.

The monitoring will be carried out through the environmental and social safeguard compliance reports that will form a part of Monthly Progress Reports (MPR) for the project during construction phase and monthly and annual reports during operation phase. Besides this, regular visits by the EHS Manager shall also be carried out for monitoring of ESMP implementation on site. Delegated personnel shall require to fully complying with the reporting programme in terms of both timely submissions of reports as per acceptable level of detail.

Reporting: Reporting is the process of measuring actual performance or how well the mitigation measures have been implemented, including the format, timing and responsibility for reporting of the monitoring results. This needs to be undertaken in form of environmental, health, safety and social check list, incident record register, environmental, health, safety and social performance reports. RUMSL shall develop and implement a programme of reporting through all stages of the project construction and commissioning, operation and maintenance.

8.2.3.1 Monitoring Indicators

Regular monitoring of critical environmental parameters is of immense importance to assess the status of environment during construction and operation stage. The monitored data can serve as an indicator for any change in environmental quality due to the Solar Park with respect to baseline environmental conditions, so that suitable mitigatory steps could be taken in time to safeguard the environment.

The monitoring action plan covering various performance indicators, frequency and institutional arrangements of the project in the construction and operation stages is given in have been presented in the following ***Table 8.5***.

Table 8.5 Monitoring Action Plan

No.	Parameter	Performance Indicator	Implementing Agency	Monitoring Agency	Frequency
A	**Construction Phase**				

No.	Parameter	Performance Indicator	Implementing Agency	Monitoring Agency	Frequency
1	Compliance to Statutory Norms	Permission for borrow area/ stone query/ explosive permit Availability of required regulatory permissions; Compliance to applicable environmental and labour laws	SPD and EPC Contractor	RUMSL	Quarterly
2	Air Quality	PM10, PM2.5, SOx, NOx, CO at 3 locations covering all the 3 Units	SPD and EPC Contractor through Approved Environmental Laboratory	RUMSL	Quarterly
3	Noise Quality	Leq Day and Night at 5 locations	SPD and EPC Contractor through Approved Environmental Laboratory	RUMSL	Quarterly
4	Water Quality	Suspended Solids (SS), Total dissolved solids (TDS), oil, grease, Heavy metals (Fe, Cr, Pb, etc.) Biological Oxygen Demand (BOD), Total coliforms, Faecal coliforms at 2 locations	SPD and EPC Contractor through Approved Environmental Laboratory	RUMSL	Quarterly
5	Soil Quality	Oil and grease, Heavy metals (Pb, Cr, Ni, Mn, Fe, etc.), N.P.K. at 2 to 3 locations covering all the 3 Units	SPD and EPC Contractor through Approved Environmental Laboratory	RUMSL	Quarterly
6	Personnel Safety	Total supply of PPEs vs number of workers working Number of workers working using PPEs Safe access Safe working platform for work site Incident investigation Number of near misses Number of incidents	SPD and EPC Contractor	RUMSL	Daily
7	Site Restoration	Visual Observation of sites including plant site, borrow area, camp site	SPD and EPC Contractor	RUMSL	After completion of works & before demobilization of the contractor
8	Debris Management	Removal of debris from site (visual Observation)	SPD and EPC Contractor	RUMSL	After completion of works & before issuing completion certificate

No.	Parameter	Performance Indicator	Implementing Agency	Monitoring Agency	Frequency
9	Habitat Modification and Loss	Visual observation of Project site to ensure that any mature trees that are set aside and vegetation around water bodies is being avoided by construction team	SPD and EPC Contractor	RUMSL	Monthly visits during the construction phase to ensure documented information is being followed.
10	Labour Camp	■ Availability of adequate potable water in labour camp and at construction site ■ Adequate toilet and bathing facilities and their maintenance ■ Adequacy of process of waste water disposal ■ Source of cooking fuel ■ Use of wood as a cooking fuel ■ Adequate lighting and ventilation in labour camo ■ Is an emergency response plan in place for the site and are the emergency contact details displayed in the camp ■ Number of first aid kit available and required first aid medicine filled ■ Key Health (Malaria/ dengue/fever/ any other) issues reported during the last month	SPD and EPC Contractor	RUMSL	Monthly
11	Social	■ Implementation of GAP, SEP, GRM	SPD and SPPD	RUMSL	Quarterly
B	**Operation Phase**				
1	Regulatory Compliances	Availability of the regulatory permissions and its compliance	O&M contractor	RUMSL	Annual
2	Waste generation	Quantity of hazardous waste generated and its disposal	O&M contractor	RUMSL	Quarterly
3	Water reuse and recycling	Water consumption reports and wash water reuse and recycling	O&M contractor	RUMSL	Monthly
4	Disposal of Batteries	Number of batteries disposed	O&M contractor	RUMSL	Annual
5	Ground water level	Monitoring of ground water level fluctuation	RUMSL through External Agency	RUMSL	Half Yearly

No.	Parameter	Performance Indicator	Implementing Agency	Monitoring Agency	Frequency
6	Soil Quality	Oil and grease, Heavy metals (Pb, Cr, Ni, Mn, Fe, etc.), N.P.K.	Contractor through Approved Environmental Laboratory	RUMSL	Half yearly
7	Health & Safety	■ Availability of PPEs; ■ Availability of procedures for preventive maintenance along Transmission Line and substation; ■ Records of incident/ accidents and their root cause analysis; ■ Display of emergency contact numbers; ■ Availability of firefighting equipment at substation.	Contractor	RUMSL	Monthly
8	Biodiversity	Maintenance of carcass registry and records of any bird nesting/roosting along Transmission Line Infrastructure	O&M Contractor	RUMSL	Half-yearly visits to check register and records and confirm the findings with local communities who can comment on presence/absence of carcasses in the area.
9	Community health and safety	The implementation of the SEP and GRM formulated for the project and monitoring against the indicators identified in it	O&M Contractor	RUMSL	Monthly

External Reporting and Communication

EHS Manager shall be responsible for ensuring that communication with government agencies and stakeholders are maintained as per the requirement. All complaints and enquiries to be appropriately dealt with and records be maintained in a Complaint/Enquiry Register.

The reporting to external agencies on Environmental and social performance of the project shall be done as agreed in contract.

8.2.3.2 Indicative Environmental Monitoring Budget

Indicative cost of environmental monitoring for the project have been presented in Table below.

Table 8.6 Environmental Monitoring Budget

Component	Item	Unit	Approx.. Unit Cost (Rs.)	Quantity
Construction Phase				
Ambient Air Quality	Quarterly monitoring of AAQ comprising of PM10, PM2.5, SOx, NOx, CO at nearby villages	Per sample	4000	3 locations covering all the three Units

Component	Item	Unit	Approx.. Unit Cost (Rs.)	Quantity
Ambient Noise Level	Quarterly ambient noise level monitoring near D.G. sets/ batching plant/ nearest receptors	Per sample	3000	5 locations covering all the three Units
Surface Water Quality	Quarterly monitoring of surface water quality Parameters as per CPCB Use-class	Per sample	7000	2 locations (nearby water bodies)
Soil Quality	Oil and grease, Heavy metals (Pb, Cr, Ni, Mn, Fe, etc.), N.P.K.	Per sample	8000	2 to 3 locations covering all the 3 Units
Operation Phase				
Ambient Noise Level	Leq Day and Night to be monitored on six monthly basis	Per sample	3000	3 locations comprising to nearest receptors to all the three Units
Surface Water Quality	Six monthly monitoring of surface water quality Parameters as per CPCB Use-class	Per sample	7000	2 locations (nearby water bodies/lakes)
Soil Quality	Six monthly monitoring of Oil and grease, Heavy metals (Pb, Cr, Ni, Mn, Fe, etc.), N.P.K.	Per sample	8000	3 locations (near storage area of all the three units)
Ground Water Level Monitoring	Ground water level to be monitored once in a year	Per sample	200000	One per Unit

8.3 ESMP Budget

The project will have its own budget for implementation of ESMP and RAP. The budget heads for Construction and O&M stage will include cost towards

- Dust Control (Construction Phase)
- Wastewater treatment;
- Waste management;
- Personal protective equipment;
- Health & Safety; and
- Hazardous material transportation & disposal

An indicative budgetary allocation for ESMP implementation during construction and O& M stage is provided in ***Table 8.7.***

Table 8.7 Indicative Budgetary allocation for ESMP Implementation

S. N.	Particular	Capital Cost (INR in lakhs)	Recurring Cost (INR in lakhs) per annum
A.	**Construction Phase**		

S. N.	Particular	Capital Cost (INR in lakhs)	Recurring Cost (INR in lakhs) per annum
1	Dust Suppression with sprinkling of water, covers of the vehicles transporting construction material. (During moderate operations 10-20 tankers will be required on daily basis depending on the season of the year)		10
2	Wastewater treatment - septic tank and soak pits	8	2.5
3	Waste Management - Construction of suitable masonry bins with concrete floors for waste collection and for further disposal as per applicable norms	8	5
4	Environment, health and safety and EMP implementation	50	10
5	Environmental monitoring		3
6	Landscaping	10	
7	Labour camp cleanliness		5
8.	RAP, LRP, FPIC measures etc.	To be decided after completion of these studies	
	Subtotal A	**76**	**35.5**
B.	**Operation and Maintenance Phase**		
1	Wastewater treatment- septic tank and soak pits	10	2.5
2	Rainwater harvesting (for roof top at pooling substation) The cost of rainwater harvesting pond in the open area shall be determined on land available, topography, slope, piping system required etc.)	20	2.0
3	Waste Management - Municipal solid waste and hazardous waste storage area sheds (impervious shed for hazardous waste storage)	5	1.5
4	Environment, health and safety training and ESMP evaluation	25	4.0
5	Dry Robotic cleaning	depends on Robot make and capacity	depends on Robot make and capacity
6	Horticulture and landscaping (including seeding of native plants around the Solar Park and adjacent to water bodies)	20	2
7	RAP, LRP, FPIC measures etc.	To be decided after completion of these studies	
	Subtotal B	**80**	**12**
	Total (Subtotal A+ Subtotal B)	**156**	**47.5**

Note: The above cost does not include cost of manpower needed for the EMP implementation

8.4 Training and Capacity Building

Successful implementation of the Project will depend on the effective implementation of the environmental and social management measures outlined in the ESMPs, RAPs, etc. Training and capacity building will be necessary for the key stakeholders in order to ensure effective implementation of the Environmental and Social Management Framework (ESMF).

Project Manager will ensure that the training needs are identified and conducted.

Training needs will be identified based on the specific requirements of ESMP and existing capacity of site and project personnel (including the EPC Contractors and Sub-contractors) to undertake the required ESMP management actions and monitoring activities.

Also general environmental awareness will be created among the project's team to encourage the implementation of environmentally sound practices and compliance requirements of the project activities. This will help in minimising adverse environmental impacts, compliance with the applicable regulations and standards, and achieving performance beyond compliance.

RUMSL in coordination with the educational / research institutions in the country who have substantial experience in the environmental and social management sector including a good understanding of the WB/IFC safeguard requirements, shall conduct classroom training sessions for all staff likely to be involved in sub-project planning & implementation. The EH&S officer can also be one of the resource persons for conducting such training programs.

An environmental management training programme will be conducted for project related activities. This will ensure capacity building for effective implementation of the management and control measures on various project activities. The training shall focus on the environmental, health and safety and social issues. The contents will basically focus on the ESMF concept, regulatory requirements, Environment and Social priority issues, project cycle, outline of Environmental Assessment / Social Assessment and report formats in respect of the Environmental aspects.

The typical training modules for formal class room training could cover the following:

- *Module 1* - ESMF Profile (Concept, regulatory requirements, ESA, reports and formats)
- *Module 2* - Environmental Assessment Process (Environmental Laws & Regulations, EIA process, Identification of Environmental Impacts, Impact Identification Methods, Identification Mitigation Measures, Formulation of Environmental Management Plan, Implementation and Monitoring, Institutional Mechanism)
- *Module 3* - Social Assessment Process (Description of R&R, tribal and gender frameworks and procedures and National requirements, LA process, Necessity for RAP and its preparation process)
- *Module 4* – List of protected and threatened species found in and around the Project site and the provisions of no hunting, trapping and injuring of the species in accordance to the Wildlife Protection Act, 1972. Proper use and avoidance of destructive practices (e.g. siting of hazardous components, tree cutting, etc.) around the Arnea Reserve Forest Block, Bardawada Pond, Kawai Pond and [Water Body Unit 3].

The program should be structured in such a way that it clearly brings out the value addition and enhancement benefits of proper management of environmental and social issues.

Also general environmental awareness will be increased among the project's team to encourage the implementation of environmentally sound practices and compliance requirements of the project activities. This will help in minimising adverse environmental impacts, compliance with the applicable regulations and standards, and achieving performance beyond compliance. The same level of awareness and commitment will be imparted to the contractors and sub-contractors prior to the commencement of the project.

9. GRIEVANCE REDRESSAL MECHANISM

Grievance management is an important component of any project's implementation. Over the duration of a project lifecycle, it encounters numerous instances of conflicts, allegations and dissatisfaction within the working and associated human capital and their interactions. Some of the areas of grievances for the project may include issues regarding land procurement, payment of compensation for land or wages to the workers, issues arising due to allotment of alternate land parcels with diminished productivity or higher upfront costs required for making it fit for cultivation, failure to fulfil commitments, poor management of construction activities, accidents due to inappropriate planning of vehicle movement, etc.

Presently, RUMSL does not have a formal grievance redressal mechanism in place for external stakeholders. In order to manage these risks, it needs an internal mechanism to allow the aggrieved party/s to lodge their complaints and get them amicably settled prior to approaching the formal legal mode of solutions.

However, according to the consultations undertaken with the local community and the project team, it was understood that the public meetings were used by the local community to voice their concerns and there have been agitations and demonstrations by the community at the Tehsil and district level Government offices. The local community representatives are also reported to have access to the contact information of the project team; however, this is an informal process and no records of such communication are maintained. For the remaining project lifecycle, a formal grievance redressal mechanism has been put in place for the project.

9.1 Objectives of the Grievance Redressal Mechanism

The primary objective of the GRM shall be to provide an accessible mechanism to the stakeholders of the project and resolve any social and environmental related grievances. For this purpose, a Grievance Redressal Cell (GRC) shall be established, to resolve non-judicial disputes arising out of various matters related to the implementation of the ESMP, as well as other aspects of the project, as deemed fit to be raised before the GRC.

9.2 Composition of the GRC

The GRC will be driven internally by the Project team and shall have representation from the following teams to ensure fair and timely solution to the grievances:

- Site Manager/Project Manager;
- EHS Officer;
- Community Relations Officer;
- Senior representation on behalf of the Project Company; and
- Any other concerned person with decision making authority in relevance to the grievance or aggrieved party.

The GRC shall be led by a Grievance Officer, who can either be the site EHS officer or Community Relations Officer. The aggrieved party shall register their grievances with the GRC. The GRC shall be empowered to take a decision which is to be considered final and binding on the Project. However, the decision of the GRC is not binding on the aggrieved person and he or she may take the grievance to the administrative setup in case any grievance channel is available at that level or take a legal course, in case not satisfied with the outcome of GRC decision.

9.2.1 Functioning of the GRC for Grievance Redress

The GRC meetings will be held on a regular basis (at least monthly) at the Project's site office. The key responsibilities of the GRC shall be as follows:

- Receive, review, consider and resolve grievances related to the social and environmental aspects of the project;
- Entertain grievances of indirectly affected persons and/or persons affected during project implementation;
- Resolve grievances within a period of two weeks at the GRC level and communication of the resolution to the aggrieved party;
- The GRC shall not engage in any review of the legal standing of an "awardee" nor shall deal with any matters pending in the court of law;
- Arrive at decisions through consensus, failing which resolution will be based on majority vote. Any decision made by the GRC must be within the purview of Environmental Management Plan, Corporate EHS and Social Policies or any such documents of relevance of that matter;
- In case the grievance relates to environmental monitoring results or engineering matters, the GRC will validate the information available to it, as provided by the Project Company's Project management team/ environmental monitoring team. However, GRC will not be in a position to question the validity of the data provided to it.
- If needed, may undertake field visits to verify and review the issues, disputes or other relevant matters.

9.3 External Grievance Redressal Mechanism of RUMSL

The medium of receiving Grievances from external stakeholders, comprising fence line community, private and patta land sellers, encroachers and squatters, etc., shall be documented and displayed at relevant locations outside the Solar Park, near entrances, on the boundary walls, etc. The external grievances may be submitted through various mediums, comprising the following:

- Face to face/Walk in;
- In written form to the address displayed by RUMSL;
- Through a toll free phone line or through direct calls to concerned officials, as set up by RUMSL; and
- Online – through website.

The Social and Community Supervisor in the SPPD team shall be responsible for coordination of grievance/complaints received. The person in-charge, based on nature of complaint, will forward the same to the concerned official. A ticket or a unique number will be generated for all such calls and messages based complaints. The complainant will follow up based on that unique number.

9.3.1 Grievance Receipt and Recording

An acknowledgement shall be sent to the aggrieved, either on the spot, or through mail. RUMSL shall maintain records of all grievances received as part of Grievance management process, in the form of a tracker, along with date of receipt of Grievance, nature and details of Grievance, concerned department or personnel linked to Grievances, resolution details and date of closure. Additionally provision of communication of resolution to the aggrieved shall also be maintained by RUMSL, during project lifecycle. The format to be used for recording of grievances is presented below.

GRIEVANCE REGISTRATION FOR EXTERNAL STAKEHOLDERS	
Case No.:	Date:
Name:	

GRIEVANCE REGISTRATION FOR EXTERNAL STAKEHOLDERS		
District:	Village:	
Contact number:		
Details of grievance:		
Name of person recording the grievance:		
Designation of recording person:		
Proposed date of response:		
Signature of the recording person	Signature of complainant	
Date of Resolution :		
Decision of the GRC (give full details):		
Complainant accepts the outcome:	Accepted	Not accepted
Signature of the complainant		
Signature of the S&C Supervisor		

Additionally, the format to be used for an external Grievance Tracker is provided below.

Table 9.1 Format for Grievance Tracker

S. No	Date	Individual Name	Department/ Village	Medium of Communication	Details of Issue	Grievance within Scope	Investigation Requirement	Concerned Department	Timeline for Closing Grievance	Present Status	Remarks

9.3.2 Grievance Resolution and Communication

All grievances lodged by the aggrieved, shall be responded within two weeks. If response is not received within 15 days, the complaint will be escalated to next level. The staffing of GRC will include Social and Community Supervisor of SPPD; and two representatives from community / beneficiary / affected persons. The head of the cell will be a person of repute but not continuing in the government service.

Any project affected person however is free to approach judiciary system of the country if he or she is not satisfied with the verdict given by GRC.

9.4 Internal Grievance Redressal Mechanism

The grievances that shall be treated as “Internal Grievances” by RUMSL, may arise from private Solar Project developers, staff, contractors and contractual workers or RUMSL, staff and workers of private Solar Project Developers, etc.

The mode of receipt of grievances coming from internal stakeholder of RUMSL shall be the following:

- Face to face/Walk in;
- In written form through suggestion boxes set up within Solar Park premises by RUMSL; and
- Through a toll free phone line or through direct calls to concerned officials, as set up by RUMSL.

9.4.1 Grievance Receipt and Recording

An acknowledgement shall be sent to the aggrieved, either on the spot, or through mail. RUMSL shall maintain records of all grievances received as part of Grievance management process, in the form of a tracker, along with date of receipt of Grievance, nature and details of Grievance, concerned department or personnel linked to Grievances, resolution details and date of closure. Additionally provision of communication of resolution to the aggrieved shall also be maintained by RUMSL, during project lifecycle. The format to be used for recording of grievances is presented below.

GRIEVANCE REGISTRATION FOR EXTERNAL STAKEHOLDERS		
Case No.:	Date:	
Name:		
District:	Village:	
Contact number:		
Details of grievance:		
Name of person recording the grievance:		
Designation of recording person:		
Proposed date of response:		
Signature of the recording person	Signature of complainant	
Date of Resolution :		
Decision of the GRC (give full details):		
Complainant accepts the outcome:	Accepted	Not accepted
Signature of the complainant		
Signature of the S&C Supervisor		

Additionally, the format to be used for an external Grievance Tracker is provided below.

Table 9.2 Format for Grievance Tracker

S. No	Date	Individual Name	Department/ SPD/ Contractor	Medium of Communication	Details of Issue	Grievance within Scope	Investigation Requirement	Concerned Department	Timeline for Closing Grievance	Present Status	Remarks

S. No	Date	Individual Name	Department/ SPD/ Contractor	Medium of Communication	Details of Issue	Grievance within Scope	Investigation Requirement	Concerned Department	Timeline for Closing Grievance	Present Status	Remarks

9.4.2 Grievance Resolution and Closure

The GRC will organize an inspection/review of the grievance received, to check the validity and severity of the grievance. The inspection will be undertaken in no later than seven days of receiving the grievance. The assigned individual will work with immediate supervisors/ managers of the concerned department or contractors to investigate the problem and identify measures to resolve the grievance as appropriate, within 15 days. This could involve provision of information to clarify the situation, undertaking measures to remedy actual problems or compensate for any damage that has been caused. Where a grievance is found to be not a real problem a clear explanation will be provided to the complainant.

A formal response detailing how the grievance has been resolved shall be provided to each complainant once a resolution is reached. Where resolution is delayed the complainant will be provided with regular updates on progress.

Once a resolution is decided and agreed upon internally, it is communicated to the aggrieved. If the GRC along with the concerned department head are not able to resolve the grievance adequately within 15 days, the same may be escalated.

9.5 Monitoring and Evaluation

Like the other project components, the GRM shall be regularly monitored to ensure that the stakeholders are having no or limited issues with the project and in case there are concerns, they are being adequately addressed as per the mandate. In order to keep track on the effectiveness of GRM, it is the responsibility of the Project Company's Environment and Social team to compile and maintain database on grievances for periodic review. The mechanism shall be based on two components, internal monitoring and reporting and external monitoring and reporting which shall run simultaneously. Mostly this shall be aligned with simultaneous process monitoring rather than doing it separately all the time.

9.6 Budgeting

RUMSL shall ensure adequate budgeting and resource allocation for implementing the GRM.

10. CONCLUSION

The ESIA has assessed the overall acceptability of environmental and social impacts likely to arise as a result of construction and operation of Neemuch Solar Park.
To summarize,

- Project's potential environmental impacts will be mostly confined to construction phase and site-specific. These impacts include change in land use, stress on ground water resources, increase noise & vibration and air quality, etc. during the site preparation of Solar Park, pooling substations and community health and safety during material transportation.
- The proposed project will require water for cleaning of solar modules during operation phase. The project area falls under semi-critical category in terms of ground water availability. Water requirement for the project will be met mainly through ground water. Considering the stress on water resources in the area, it is recommended to evaluate alternate sources or plan for dry robotic cleaning.
- The land footprint of the project is 1065.7 hectares for Solar Park. The social impacts of the project will be higher in the planning and construction phases of the project, where land linked livelihoods will be impacted, there would be an impact on community resources and community health and safety risks, during construction phases and some short term employment will be generated.
- The Environmental and Social Management Plan (ESMP) describes mitigation measures for impacts specific to Project activities and also discuss implementation mechanism. Project specific management plans are also provided for certain Project activities such as waste management, occupational health & safety, contractor and labour management plan, gender action plan, stakeholder management plan, grievance redressal, etc. This ESIA study together with mitigation measures and follow up of recommendations on management actions will help RUMSL in complying with the environmental standards.

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APPENDIX A PHOTO DOCUMENTATION

View of project site

View of project site

Agricultural field in the project area

View of project site

View of stone wall present in project area

View of Monitoring activities undertaken on site

Consultation activities undertaken on site

View of stone quarry in the project area

Consultation activities undertaken on site

Consultation activities undertaken on site

View of approach road

View of approach road

Oriental Garden Lizard

Black-headed Ibis

Common Teal

Woolly-necked Stork

Wood Sandpiper

Indian Roller

Green Bee-eater

Pied Bushchat

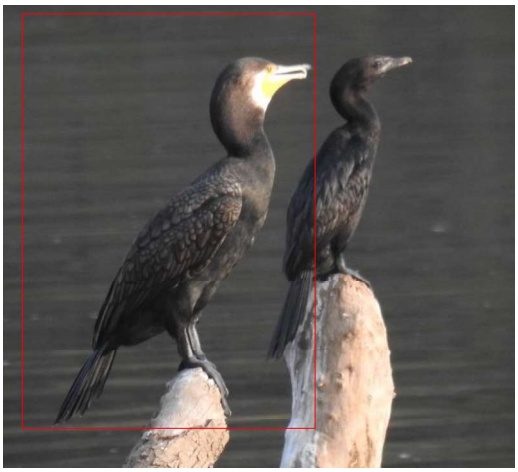
Long-tailed Shrike

Plain Prinia

Spotted Dove

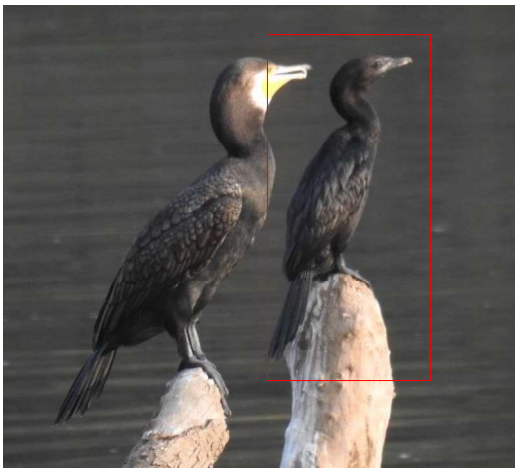
Rose-ringed Parakeet

Black-winged Stilt



Indian Cormorant

Indian Robin



Little Cormorant

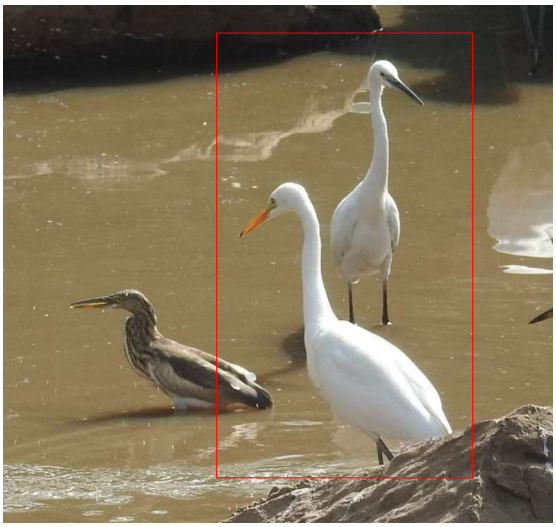
Bar-headed Goose

Ruddy Shelduck

Black Stork

Red-wattled Lapwing

Great White Egret



Intermediate Egret

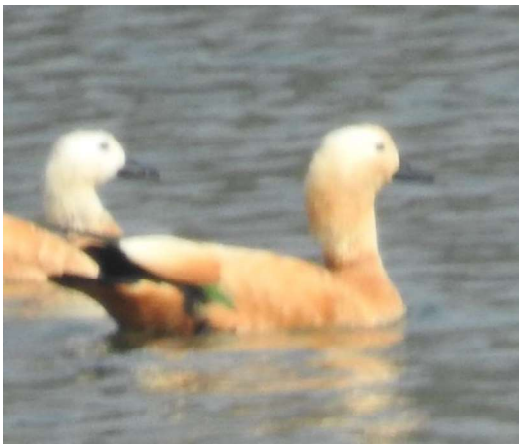
Large Grey Babbler

Common Stonechat

Red-vented Bulbul

Indian Pond Heron

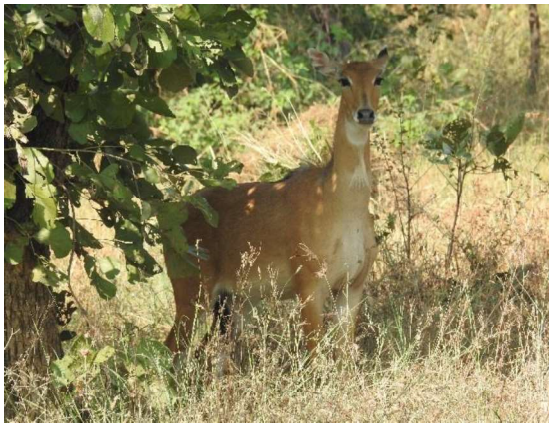
Chestnut-shouldered Petronia



Common Pochard

Ruddy Shelduck

Langur



Nilgai

Fruit Bat

APPENDIX B DETAILS OF CONSULTATIONS UNDERTAKEN DURING NEEMUCH ESIA PREPARATION

S. No	Location	Meeting with	Topics of discussion
	Date: 19 November 2019		
1.	Neemuch – Collector's Office	District Magistrate, along with RUMSL officials - Mr Sanjay Verma and Mr Bajaj	General information sharing on the commencement of ESIA related activities, initial field consultations by ERM
2.	Tehsil Office Singoli	Tehsildar in Singoli Tehsil along with Mr Sanjay Verma (RUMSL)	■ Discussion on background of project and the profile of the land owners present in the identified area; ■ Sgurr team started the drone survey on 22nd November and will take a week to complete. The result is going to be a contour map with details of drainage and water bodies ■ Discussion on ongoing site activities by Revenue Inspector and other staff from Tehsil office; ■ The team on site led by a Revenue Inspector is mapping the exact location of all the patta land within the government land parcels that have been provisionally allotted to RUMSL- while the area was noted on revenue records, the location was not. ■ This exercise is likely to take a month or so (4-6 weeks) and will be ready by mid or late Dec in paper map form.
3.	Project site, Badawada Village	Introduction Meeting with Revenue Inspector and his team	■ Discussion on the ongoing activity of site survey; ■ The site survey is expected to take about 1 month to cover all three villages; ■ The team is verifying the on ground status of private land parcels and assigned land parcels; however there are no details being recorded for land encroached by the locals; ■ It is understood that none of the teams is noting the location of 'encroached' land- which is a significant area (for 2 of 3 villages) and there are no reliable records of this available. Most of the encroachments have been in place for years and some for decades, and been passed down the family to the children.
	Date: 20 November 2019		
4.	Badi Village	Consultation with a few residents of Badi Village Audio recording	■ The water table in the village is low and water is found at 800-900 ft, which is hard water and largely used for agriculture;

S. No	Location	Meeting with	Topics of discussion
			■ The household level supply of water is also done through the borewells (400-450ft), by an infrastructure set up by Panchayat that has piped connections to some common water access points in the village as well as to some households as well; ■ There were two quarries operating on lease by mining department, but they are not being used presently; ■ There are no active quarries in the project area currently; ■ Currently, the dependence for land and animal husbandry is higher in the area while some people work as labourers in the nearby quarries, in Rajasthan; ■ The rainfall in this year has been good and that's why engagement in agriculture is gainful, otherwise agriculture is not solely sufficient for sustenance; ■ There has been damage to the crops due to excess rainfall and there have been compensation payments for the damage, approx. INR 20,000-25,000 per hectare; ■ The crops grown in the area comprise of Garlic, wheat, gram, mustard, pulses, etc.; ■ Opium (Afeem) cultivation is also undertaken by one farmer, who has the license to cultivate; ■ Opium crop fetches proceeds from sale of Poppy seeds, the flower and the case; thus leading to more profits.
5.	Kawai Village Rajput hamlet	Consultations with village groups comprising of Rajput Community and a few other people Audio recording	■ Discussion on the concerns of people on inclusion of land encroached by them for project; ■ Discussion on the aspect that only a small fraction of the total area encroached is put in records for payment of fines, while the actual on ground encroachment is much larger and unaccounted for; ■ This practice is to get the names of families registered against land, and simultaneously limiting the amount of fines to be paid for the land encroached actually, which would be higher;
6.	Kawai Village Dhakad hamlet	Consultations with village groups comprising Dhakad Community, and a few other people Audio recording	■ The village comprises of majorly Dhakad, Gujjar and Rajput communities and some households belonging to Bhil, Balai and OBC communities. The village has about 100 Households and comprises of approx. 600 people; ■ The villagers depend on agriculture and animal husbandry. The Bhil community largely has Goats and Sheep while the Gurjars and Dhakads have cows and buffaloes;

S. No	Location	Meeting with	Topics of discussion
			■ The land holdings in the villagers are relatively higher amongst Dhakads; ■ There is understood to be lot of land that is encroached by the villagers which they believe can be made productive by putting in some investment and effort; ■ The villagers have got to know about the upcoming project and that's why have practiced restraint in tilling and preparing land for cultivation; ■ There have been reportedly a lot of complaints and protests by the villagers at the Tehsil office and other offices at District level; ■ The water for irrigation is available at a depth of 600 ft and almost all the fields have either wells or tube wells; ■ It was also established during consultations that the affluent families were undertaking encroachment on the land due to higher cost involved in preparation of land to make it cultivable
7.	APMC Yard, Singoli	Discussion with the staff at APMC yard	■ Discussion on nature and extent of crops grown in the area and sold in the Mandi; ■ Kharif crops comprise of Maize, Soyabean, groundnut, pulses, etc.; ■ Maize is used for poultry business in Haryana, Soyabean is used for oil extraction, Groundnut is used for consumption as well as oil extraction; ■ Rabi crops in the area comprise of Wheat, Gram and Mustard; ■ Wheat cultivation in the area has been good in the area in the last year due to good rainfalls; ■ Jow is a less water intensive crop and is grown in absence of abundant rainfall; ■ Understanding of how Minimum support price for a crop is determined and the measures in place for implementation of MSP; ■ Rates are determined on the basis of quality of crops, the crops with higher water content are sold at relatively lower prices; ■ The rates of crops in the area are published in newspapers as well as an online portal –Agmanet; ■ Understanding of the press followed for registration of farmers and methods in place to check for legalities associated with procurement of crops by Government.

S. No	Location	Meeting with	Topics of discussion
	Date: 21 November 2019		
8.	Bardawada Village	Consultations with women's group- farmers- Badawada village	■ The villages comprises of Dhakad households in majority; ■ The women are aware of the upcoming Solar project near the village; ■ There are certain people in the village who have encroached land in the area identified for the project; ■ The encroachment is done by the residents of Badawada village and some residents of other villages as well; ■ Some of the encroachers also possess their 5 Bigha (1 hectare) Patta land assigned by the Government; ■ The criteria followed for assigning land by Government was reportedly landlessness; ■ There are understood to be certain households that have sold their assigned lands to the local villagers and are now working as labourers, etc.; ■ The women are largely engaged in the agricultural activities during the day and household work thereafter; ■ There is 1 women headed household in the villages and these families are reported to undertake cultivation on their respective fields; ■ Additionally, the extended family is also reported to support these women headed households; ■ There are reported to be grazing farms set up on the encroached land parcels where livestock is allowed to graze against a payment of INR 1000 per livestock head per year; ■ Milk from the livestock is used for self-consumption; ■ Drinking water is generally easily available in the area, with limited water scarcity problems reported during summer seasons; ■ Women have the responsibility to carry water from the community water points to their respective households; ■ Some families depend on other families for water against payment for the same; ■ Borewell construction activity takes upto INR 60,000 even if there is no water availability. In case water is found in the borewell, the cost of construction goes up to 1.5 lacs INR.

S. No	Location	Meeting with	Topics of discussion
9.		Consultations with Men's group- farmers- Bardawada village	■ The discussion focussed on the general socio-economic profile of the village in terms of occupation, land holdings, dependence on land and other occupations, infrastructure, etc. ■ This village also supported the fact that the affluent families have encroached more land compared to the families with limited or no land holdings
10.	Tehsil Office, Singoli	Discussion with Patwari of Kawai and Badi Villages	■ Discussion on the land and encroachment aspects in Badi and Kawai villages; ■ Mapping of land parcels from Patwari's maps; ■ Photographs of maps with Anupreet- to be put together.
11.	Badi Village	■ Consultations with husband of female Sarpanch of Badi Panchayat ■ Village Consultations ■ Discussion with Sarpanch and a few women from the community	■ The discussion focussed on the general socio-economic profile of the village in terms of occupation, land holdings, dependence on land and other occupations, infrastructure, etc.; ■ Discussion on seasonal agricultural practices and the profitability from the various crops grown in the area; ■ It has been reported by the husband of the Sarpanch, that about 25% of the village area is under cultivation; ■ The farmers sell their agricultural produce to individual traders and onot in the Government Mandis due to flexibility in terms of time of sale, lack of documentation required, preference for getting cash payments, against the less preferred practice of receiving cheques for sale in Mandis; ■ People from Kawai village reportedly sale through Mandi as they are affluent ■ Approx. 35% households in the village have private land holdings; ■ A lot of people are engaging in encroachment of the Government land and using it for cultivation; ■ There are a lot of men from the village that undertake labour work in stone quarries in and around the village; ■ Gurjar community households possess 15-20 buffaloes and the excess milk is sold in Singoli in a dairy or door to door.

APPENDIX C NOTE ON LAND REQUIREMENT AND PROCUREMENT PROCESS

INTRODUCTION

This note was initially prepared to inform the discussion on land procurement across various categories, to help with the planning process, and to provide a clearer understanding for the ESIA and the RAP work.
Since it is now being appended to the ESIA (to reflect the intermediate processes that informed the ESIA and RAP development), the figures have been updated to reflect the land procurement in reference to the Final DPRs (Aug 2020) and the updated solar park boundaries at all the eight unit locations,
Other than that, the contents and purpose of the document have not been altered.

ERM India Pvt. Ltd. (ERM) has been engaged by Rewa Ultra Mega Solar Limited (RUMSL) to undertake an Environmental and Social Assessment (ESIA) and Resettlement Action Plan (RAP) of three solar parks, including internal evacuation infrastructure and associated transmission lines of aggregate capacity of 1500 MW in the Neemuch, Agar and Shajapur Districts of Madhya Pradesh, India (hereafter referred to as the 'Project').

As part of the scope of work for the project, ERM is required to review the land procurement process for the project. While the ESIA will provide a detailed understanding of the land requirement for each sub-project, the procurement process and the impacts from the same, this note provides an understanding of the land procurement process prior to the ESIA submission. This note identifies potential areas of concerns prior to the finalization of the land take so as to allow for a discussion on the need for a change in approach or corrective actions, if any. This note will also inform the planning of the data collection for the RAP.

Land Requirement for the Project

This section provides an understanding of the land requirement for the three solar parks that comprise the project.

Table C.1 Land Requirement Summary for the Project

Aspect	Neemuch Solar Park	Agar Solar Park	Shajapur Solar Park
Capacity of Solar Park	500 MW	550 MW	450 MW
No. of Units	Unit 1, 2 and 3	Unit 4- Agar; Unit 5- Susner	Unit 6 and 7- Moman Badodiya; Unit 8- South Shajapur
Geographical Boundaries	Between 24°59'39.78"N and 25° 0'38.51"N 75°13'26.82"E and 75°14'48.53"E	Susner: 23°55'28.07"N and 76° 2'21.30"E Agar: 23°44'38.58"N and 76° 7'1.26"E	Moman Badodiya: 23°40'43.40"N and 76°15'18.53"E South Shajapur: 23°14'12.98"N and 76°13'20.31"E
Total Land Area	1092.7 ha	1407.08 ha	987.2 ha
Total Government land	968.8 ha	1273.36 ha	860.6 ha
Total Patta Land	87.7 ha	133.71 ha	5.2 ha
Total Private Land	34.5 ha		99.5 ha

Note: Patta land comprises of land assigned to certain (at the time) landless households in the project area by the State Government. Households from landless and constitutionally recognised socio- economic backward

communities (SCs and STs) have been assigned the Patta Land by the GoMP[1]. This land cannot be sold as per conditions of the patta though special circumstances may be considered by the District Collector, who can allow its sale.

Source: Land Data provided by RUMSL, 19 June 2020

Land Procurement Status

This section provides an understanding of the land procurement status for the solar parks. it should be noted that the land requirement for all three solar parks includes government land, private land and patta land though the preference is to use government land only and add private land only if the government land is insufficient.

RUMSL has initiated the process for land procurement few years ago and first set of allotment letters were received by RUMSL from Revenue Department, Government of MP (GoMP) in 2017. However, the land procurement process for private and patta land has not been initiated yet. The private and patta land procurement is proposed to be undertaken through the provisions of the MP Consent Land Purchase Policy, 2014. However, this will be initiated for the 3 solar parks only once the final project boundary is available, which will include an assessment of the amount of private and patta land requirement for each location.

The following subsections focus on the status of government land allotment for the three solar parks.

Government Land Allotment for Neemuch Solar Park (Unit 1, 2 and 3)

Government land has been procured through allotments and inter department transfers in keeping with the provisions of the Madhya Pradesh Land Revenue Code and conversion of the forest land as per provisions of Forest Conservation Act, 1980.

Table C.2 Dates of Government Land Allotment for Neemuch Solar Park

Timeline	Allotment Letter Number	Area Allotted (ha)	Village
17-01-2018	7/A-20(3)/2017-2018	238.68	Bardwada, Kawai and Badi
30-05-2017	26/A-20(3)/2016-2017	439.51	Kawai and Badi
Total		**678.19**	

Source: RUMSL

678.19 ha (out of total 1065.65 ha government land identified) is allotted to RUMSL through two allotment letters in the year 2017 and 2018 respectively. Both these allotment letters predate the MP Revenue Code Amendment Act 2018[2]. The process for procuring 75.72 ha of patta land and 18.62 ha of private land is yet to be initiated and will be started after finalising land requirements.

Government Land Allotment for Agar Solar Park (Unit 4, and 5)

Table C.3 provides a summary of the land allotment for the Agar Solar Park which has been undertaken between Nov 2016 and Jun 2019.

[1] Special permission needs to be sought from the District Collector to allow the sale of patta land, and this is granted only under special circumstances, at least in the first 20 years after it is granted. Any 'sale' of patta land without this permission is not considered valid, and may be treated as a violation of the terms of the grant of the 'patta'.

[2] Aspects of the amendment relevant to the allotment of land pertain to the clarified definition of freehold land holders being considered "bhumiswami' or owners, the treatment of completed freehold process as qualifying for this , and all pending matters being treated as cancelled. The amendment also designates levels of the state administration who are empowered to hear matters of dispute.

Table C.3 Dates of Government Land Allotment for Agar Solar Park

Allotment Date	Allotment Letter Number	Area Allotted (ha)	Villages
28.02.2019	7/A-19(3)/2017-2018	56.33	Bijnakhedi
28.02.2019	6/A-19(3)/2017-2018	70.53	Dudhpura
21.06.2019	31/B-121/2019-20	14.95	Dudhpura
20-06-2019	5/A-19(3)/2017-18	159.25	Karwakhedi
28.02.2019	4/A-19(3)/2017-2018	28.3	Kasaidehriya
20.06.2019	3/B-121/2019-20	197.14	Ladwan
28.02.02019	2/A-19(3)/2017-18	16.83	Madhopur
21.01.2019	1/A-19(3)/2017-18	34.92	Piplya Kumar
04.01.2018	9/A-19(3)/2017-18	60.2	Naharkheda
09.08.2018	9/A-19(3)/2017-18	26.69	Naharkheda
30.11.2016	48/19(3)/2015-16	55.62	Palda
02.01.2018	8/A-19(3)/2017-18	56.99	Palda
02.01.2018	11/A-19(3)/2017-18	161.16	Pipliya Nankar
06.01.2018	10/A-19(3)/2017-18	176.63	Umariya
09.08.2018	10/A-19(3)/2017-18	155.83	Umariya
Total		**1271.37**	

Source: RUMSL

The entire government land required for the project (1271.37 ha) has been allotted to the project over the period between 2017 and 2019, and 510.6 ha was allotted prior to MP Revenue Code Amendment Act 2018. The land procurement process for the remaining 133.03 ha of private and patta land is yet to be initiated.

Government Land Allotment for Shajapur Solar Park (Unit 6, 7, and 8)

Table C.4 provides a summary of the land allotment for Shajapur Solar Park which took place between May 2017 and Jun 2019.

Table C.4 Dates of Government Land Allotment for Shajapur Solar Park

Timeline	Allotment Letter Number	Area Allotted (ha)	Villages
26-05-2017	03/A-19(3)/2016-2017	149.91	Dehripal, Parsula, Kadula, MalyaHedi, Burlay, Jaawdi, Bhandedi, Saagdiya, Baandahedi, Peepalkheda, Dopada, Bijana, Kheriyaema, Kumhariyakhas, Dangicha, Jaaman
11-12-2017	26/A-19(3)/2016-17	618	Dehripal, Parsula, Favka, Jaavdi, Burlay, Chooma, Bijnakhedi, Dhatravada
26-05-2017	02/A-19(3)/2016-17	320.969	Kukdeshwar, Baamniyakhedi, Bordi, Khakri, Majhniya, Rehli, Rulki, Dhanda Pidoniya, Goyla, Aakya Chauhani, Palsaavad Son, Desrapur, Khokriya Tonk, Hanoti

28-06-2019	03/A-19(3)/2019-2020	88.09	Kukdeshwar, Bamniyakhedi, Bodi, Khakri, Majhaniya, Rehli, Rulki, Tanda Pindoniya, Goyla, Aakya Chauhani, Palsawaad Son, Besrapur, Khokriya Tonk, hanoti,
Total		**1176.97**	

Source: RUMSL

Of the 1349.2 hectares identified for the project, 1176.97 ha was allotted to the project over 2017-2019 out of which 1088.88 ha was allotted prior to MP Revenue Code Amendment Act 2018. The land procurement process for the private (99.5 ha) and patta land (5.2 ha) is yet to be initiated.

Documentation of the Land Procurement Process

This section provides an understanding of the land procurement process followed for the government land allotment for the solar parks.

Roles and Responsibilities for Land Parcel Finalization and Procurement

The overall land procurement process is being led by RUMSL. In this process, RUMSL is supported by administrative agencies such as the revenue department, third party entities for providing design and environmental and social support. IFC is engaged as a transaction advisor to RUMSL and is also providing overall guidance ensuring that the land take process is in keeping with the applicable reference framework for the project. The following table provides an understanding of the roles and responsibilities of the various agencies involved in the land identification and take process.

Table C.5 Roles and Responsibility for Land Allotment/Procurement for the Project

Entity	Roles and Responsibilities
RUMSL	RUMSL is overall responsible for coordination with the various other stakeholders involved in the land procurement process. as well as resolving issues that come up in terms of need for additional land to be identified or the manner in which the E&S sensitivities need to be incorporated into the project land requirement. After completion of the process, the formal possession of the land will be given to New and Renewable Energy Department Government of Madhya Pradesh (MPNRED).
Revenue and Land Reforms Department, Madhya Pradesh	The land department, includes offices such as the District Revenue Officer (first point of contact for RUMSL), Superintendent of Land Records, village Administrative office, Patwari, village Assistant amongst others. It is headed by the District Collector. This department is responsible for the maintenance of a database (textual, tabular and spatial) of all land records in their jurisdictions, ownership, patta land, records of potential encroachments on government land (though this may not be accurate or confirmed on site), etc. During the process of land allotment, this department is responsible for processing the land allotment request, in terms of verifying the land parcels requested, identifying any existing land usage or encumbrances and preparing the report for the Tehsildaar and District Collector's considerations. As required or when requested, the members of this department are responsible for undertaking the *Tarmeem* process; which will be discussed in subsequent sections. The **District Collector** (DC) is the key officer contacted by RUMSL for any land related matters. Application for land allotment is submitted to the DC who then forwards it to the district administration and Land Revenue Department officials for further processing. The DC is the authority for final communication on the decisions made on the land. He has the

Entity	Roles and Responsibilities
	authority to approve or reject allotment requests for any land parcels required for development projects. The DC will also decide/approve (after consultations) how the issue of patta land is to be addressed, in this project (whether there could be a land swap of pattas allotted but where possession has not been taken by the allottee, or other arrangements) The **Tehsildar**, is responsible for supporting the District Collector in the process of land allotment and functions at the tehsil level. This includes coordinating the process of land verification at the Tehsil level, hearing grievances on the proposed land allotment and making recommendations to the District Collector on the suitability of the allotment. The Tehsildar is also overall responsible for the coordination of the Tarmeem process and handing over the results of the same to the Project, which will be discussed in subsequent sections. The **Superintendent of the Land Records** (SLR), reports to the District Collector. The SLR maintains a database of all land ownership records in the district (such as khasra numbers, usage of land parcels, ownership, potential encumbrances such as encroachments or disputes, patta allocation etc.) and is the key officer involved with the process of verification and physical demarcation of land for allotment to the Project.
Sgurr Energy India Private Limited	Sgurr, a technical consultant engaged by IFC (as transaction advisor) is supporting RUMSL in providing technical guidance and expertise in project boundary finalization, taking into account aspects such as site suitability and adequacy, hydrology, geology, contouring, solar irradiation etc. As part of this process, on RUMSL's advice, Sgurr has also attempted to minimize the E&S risks associated with the project through avoidance measures, such as: 1. Minimizing impact on private land and patta land 2. Avoiding clusters of structures or habitations- both formal government recognized abadi area) and encroachments/ squatters (residential) 3. Avoiding water bodies to the extent possible 4. Avoiding large tree clusters Based on these considerations, Sgurr optimized the project boundary and layout in June 2020. This optimized project boundary served as the basis of the RAP.
ERM India Pvt Ltd	ERM, an Environmental and Social Consultant, has been engaged by RUMSL to undertake an Environmental and Social Impact Assessment (ESIA), Resettlement Action Plan (RAP) and FPIC process for the project. Prior to this, ERM also undertook the Scoping for the proposed project, on Environmental and Social aspects, based on which the project optimization process was initiated. One of ERM's tasks includes advising RUMSL on the project boundary optimization process. For this purpose, ERM has analysed the drone imagery collected and provided by Sgurr to identify the following environmental and social sensitivities: ■ Individual structures or clusters of structures, especially residential ■ Any visible improvements on land, such as construction of boundary wall or bore well ■ Water bodies ■ Areas potentially under agricultural land use – this data, along with the land ownership data and Tarmeem data allows for identification of potential encroachment and squatting (for agriculture) ■ Areas under use for fodder collection, and open grazing ■ Large tree clusters

Entity	Roles and Responsibilities
	This information was then shared with Sgurr through RUMSL, as part of a workshop where certain principles of avoidance were identified with RUMSL, for Sgurr to consider in the project boundary optimization process. This E&S sensitivity identification process and avoidance exercise undertaken has resulted in the reduction of land area as given below, for each Unit ■ 7.5 ha (Unit 1) ■ 14.36 (Unit 2) ■ 1.35 (Unit 3) ■ 56.46 (Unit 4) ■ 20.8 ha (Unit 5) ■ 26.02 (Unit 6) ■ 55.12 (Unit 7) ■ 257.8 ha (Unit 8)
International Finance Corporation	IFC is the transaction advisor for RUMSL. IFC is advising RUMSL in implementing this project in a manner that is consistent with the applicable reference framework (WB OP and IFC PS), in addition to the applicable legal frameworks. Their role includes activities like discussions on land finalization and avoidance measures.
World Bank	RUMSL is in discussion with World Bank to provide financial loan for the Project. (1)

(1) Reference: DPR, Neemuch Solar Park, July 2020; DPR, Shajapur Solar Park August 2020

Land Procurement Process

The following subsections provide an understanding of the land procurement process followed for the government land allotment.

Table C.6 Land Procurement Process

Timeline	Key Activity	Activity Details	Status	Remarks
2016-2017	Identification of potential project areas by Knight Frank	■ RUMSL (through assistance of Knight Frank) identified potential project areas, with large chunks of unused government land; ■ This was based on the revenue records, information available in the public domain and consultations with the revenue and land reforms department ■ The potential options were discussed in a workshop between RUMSL, World Bank and Knight Frank in 2017 and the proposed project areas were finalized ■ A high-level environmental and social baseline was prepared for the proposed project areas	Completed	
November 2016-Ongoing	The process of allotment of government land for the Project is being undertaken	■ This activity included the process of application for land allotment by RUMSL, verification at the Tehsil and village level, invitation of grievances and recommendations by the revenue and land reforms department for allotment to send to the District Collector ■ As part of the review of the RUMSL's land allotment request, the following criteria were considered by the revenue and land reforms department: - Ensuring that a threshold level of government land is secured for grazing of livestock (calculated for each village at a minimum of 2% of total agricultural land available in the village) given that these livestocks are a key factor in the village nutrition security and economy (including agricultural production), - Avoid land under the Nistar[1] rights in the village (as noted in the Nistar Patrak) – this may also include grazing areas, in addition to easements, cultural areas and other community use areas	Ongoing	The land allotment process for Government land is presently ongoing. Also, as part of the Project boundary optimization exercise, a need for new land parcel procurement has also been identified, which includes government land. The allotment

[1] Under Section 234 of the MP Land Revenue Code (LRC), The District Collector shall prepare a Nistar Patrak for every village embodying a scheme of management of all unoccupied land in the village. The Collector may divert unoccupied land, for exercise of Nistar rights for – pasture, grass, bir or fodder reserve (clause b) subject to a minimum of two (2) percent of the total agricultural land of that village.

Timeline	Key Activity	Activity Details	Status	Remarks
		- Avoid allotted patta land, - Avoid any land already allotted for other projects or to any other department for different purposes (like water shed activities, etc.), - Avoid privately owned parcels to the extent feasible. - It should be noted that in certain cases, land was earlier allotted for specific purposes, such as a PanchVan[1] in Agar solar park. However, since the land was never used for the intended purposes, the Sub-Divisional officer, through a stipulated procedure, reversed the allotment and suggested the allotment of the Khasra for the project. in ERM's discussion with the local community in Susner, it was found that the community was not aware of such a land (*panch van*)being allotted and thus never used it for the intended purpose. ■ For the Neemuch Solar Park, 678.19 ha (out of total 967.98 ha government land identified) is allotted to RUMSL through two allotment letters in the year 2017 and 2018 respectively. Both these allotment letters predate the MP Revenue Code Amendment Act 2018. The process for procuring the 75.72 ha of patta land and 18.62 ha of private land is yet to be initiated.. ■ For the Agar Solar Park, 1271.37 ha is so far allotted to the project over 2016-2019 and 510.6 ha was allotted prior to MP Revenue Code Amendment Act 2018. The land procurement process remaining 133.03 ha of private and patta land is yet to be initiated. ■ For Shajapur Solar Park, 1176.97 ha is allotted to the project over 2017-2019 and 1088.88 ha was allotted prior to MP Revenue Code Amendment Act 2018. The land procurement process for the private (10.1 ha) and patta land (191.24 ha) is yet to be initiated.		process for these new land parcels is yet to be initiated
2018	Based on the available satellite imagery, preliminary layouts were developed, and	■ The potential project boundary and tentative solar park layout was superimposed on the village boundary and land parcel boundaries data for each project site. ■ For this purpose, the land allotment details provided by RUMSL were analysed by Sgurr which included details of Khasra, land ownership, land use as per government records, the total khasra area and the area allotted to the project. In addition to this, RUMSL made available the village khasra maps through MAP IT for the purpose of analysis.	Completed	

[1] Forest Department Land

Timeline	Key Activity	Activity Details	Status	Remarks
	a land area statement was identified.	■ Based on this analysis, the land area statement and total land available for the layout was determined and tentative project boundary maps were prepared. The analysis resulted in identification of existing land ownership of government and private khasras, and identification of sensitivities within the project layout. ■ As part of this exercise, land parcels that had potential patta lands allotted within them or where only a portion of the government owned Khasra was allotted was identified, however, the demarcation of the sub-khasras was not available on the village level maps made available by MAP IT. This was further discussed with RUMSL, IFC and World Bank and the need for a Tarmeem[1] process was identified (to survey and mark out the boundaries of the patta land (or sub-khasra), within the khasra map and to match the tabular patta land data.		
August 2018-March 2019	Environment and Social Scoping Report	■ ERM India Pvt Ltd was engaged by IFC to undertake an Environmental and Social Scoping Assessment for the proposed project. ■ The Final Scoping report was submitted in March 2019 and provides an understanding of the key environmental and social issues pertaining to the project ■ As part of the scoping report, certain recommendations in terms of exclusions and avoidance were also made for the project, including avoiding certain settlements/ clusters of structures within the proposed Neemuch project area; including potential Bhil settlements ■ As part of the scoping assessment, the need for project boundary optimization and preparation of a RAP and undertaking the FPIC process was identified	Completed	This scoping report also informed the preparation of the ToR for the ESIA/RAP and FPIC process
November 2019-January 2020	Drone Survey Conducted and data processing	■ A drone survey for the existing land use and land utilization was undertaken, to get updated information, in addition to ownership data. ■ The results from this drone survey were used to undertake a contour mapping and undertaking a drainage investigation for the proposed project site. The results of these investigations were used for the process of project boundary demarcation exercise, and was to be layered with more specific ownership data from the Tarmeem process (below).	Completed	

[1] Tarmeem: ground verification process to confirm land ownership and to demarcate any patta land and/or private land that may have been identified within a government khasra

Timeline	Key Activity	Activity Details	Status	Remarks
December 2019 – February 2020	Tarmeem Process	■ In keeping with observations on the land allotment details, RUMSL; through the Tehsildar and Revenue and Land Reforms Department initiated the Tarmeem process for all three sites. ■ *According to ERM's discussions with the Tehsildaar, Tarmeem usually refers to amendments to land records, revision of land division, land use, land occupancy etc. and can involve multiple specific activities as per the requirements. This process is done by Revenue Department from time to time in the normal course of action (with or without any project). As an outcome of this process, following can be achieved: Revisions in the Patwari maps, Khasra books, Digital database, other revenue records, preparation of survey reports etc. This process is undertaken by Officials from the Revenue Department, usually inclusive of the Tehsildar, RI, Patwari etc.* ■ *Note:* - *The SLR, RI and Patwari who were consulted, say that Tarmeem is a process whereby Revenue Department officials (SLR, RI and Patwari) make revisions to the government land records that include the Patwari maps, survey reports, satellite imagery, khasra books etc.;* - *In most cases, Tarmeem involves limited or no physical inspection on the ground.* - *However, in the case of this Project, whereas after allotment the project could have moved into the demarcation phase;, division of 'min' parcels i.e. khasras with subdivision within them was not already done by the Revenue Department; and the gaps were noted between tabular and spatial extent of land parcels on the maps.; Hence, Tarmeem became an important step in boundary finalisation,* ■ The results of this data were then aimed at allowing for the identification of patta lands within the proposed project boundary and potentially carve out the same; depending upon the overall land availability ■ It should be noted that the Tarmeem process did not include an identification of encroachments or squatting on the project area, as the records of the same are not maintained by the Revenue department. ERM is in the process of identifying these potential encroachments and squatting through a process of excluding private and patta land from the area that appears to be under agriculture for the Neemuch site. This process cannot be used in Agar and Shajapur as encroachment for agriculture is reported to be unlikely and is not reported during consultations or during field observations.	Completed	It is understood that the results of the Tarmeem process were provided on physical, hand-drawn maps (that were not - georeferenced) to RUMSL, due to which there were mismatches in terms of overlaying the Tarmeem results to the project boundary drawings (done by Sgurr). This exercise has certain limitations, which will have to be verified at the land survey stage, prior to formal possession by RUMSL. As per consultations undertake with DREO, the Patwaris, the land survey was undertaken prior to June 2020

Timeline	Key Activity	Activity Details	Status	Remarks
		■ The extent of this encroachment needs to be understood in order to determine any potential impacted entities among "vulnerable groups" and "landless households" that have encroached upon and/or squatted government land. These entities (in addition to land owners and users of private and patta land) will be the focus of the resettlement surveys and the entitlement matrix; ■ *Note : The village maps being used during Tarmeem are dated 2004 and 2005. The site observations show that there are many village roads that are not reflected on these maps. While some updates may have been made, the boundaries and land parcel profiles may not be updated, and if these are digitized without field verification, the errors will be transferred to the GIS database as well.. Considering these maps are used to for digitization by the Revenue Department on MAP-IT; there is high possibility that they are not updated either. This will reflect in further discrepancies in digitization of the project footprint based on MAP-IT data alone, without field verification.*		
February 2020	Analysis of Drone Survey Imagery for E&S Sensitivities	■ ERM analysed the drone imagery made available for all three sites, for identifying the following: - Any improvements on the land parcels, including structures, boundary walls, tube wells etc. - Water bodies - Large tree clusters - Any land parcels which appeared to be under agricultural land use ■ The results of this analysis was shared with RUMSL and Sgurr and a workshop was held in Bhopal on 25th February 2020 between RUMSL, Sgurr and ERM to discuss the findings of the drone survey, Tarmeem process and ERM's analysis of the E&S sensitivities. The purpose of this workshop was to enable for the project boundary optimization process to be conducted based on the information available	Completed	It should be noted that due to certain issues with superimposing the Tarmeem process results to the existing project boundary maps, the project boundary optimization process could not be completed as part of the workshop in Bhopal and was undertaken separately
April 2020	Development of Optimized Project Boundary	■ Based on the results of the Tarmeem data, ERM's inputs on E&S sensitivities and the drone imagery analysis, optimized project boundaries for the project areas are being prepared.	Not Completed	The optimized project boundary for Neemuch was submitted on 13th

Timeline	Key Activity	Activity Details	Status	Remarks
		■ This project optimized boundaries will be discussed between RUMSL, Sgurr and ERM and any final changes needed in the layout will be identified ■ This optimized boundary will then form the common base imagery, to be used by different technical teams including ERM for the ESIA, RAP and FPIC process ■ As part of this exercise, a certain portion of the proposed project boundary had to be carved out due to (a) incorporation of exclusion and/or avoidance measures; (b) technical feasibility criteria such as slope and contiguity. For the Neemuch site, 5.46 ha was deducted due to the avoidance measures identified and 38 ha was deducted due to technical feasibility issues. ■ Due to this, in order to maintain the project capacity, additional land requirement for the projects has been identified. For the Neemuch site, an additional land requirement of 8.24 ha been identified.		April 2020. The optimized project boundaries for Agar and Shajapur are pending.

Next Steps

The following next steps need to be undertaken for the land procurement process, where RUMSL taking final possession of the land required for the Project (government, patta land and private land) after completion of all formalities (including compensation payments) is considered the concluding step

General

- Completion of the project optimization process for Agar and Shajapur solar parks
- Finalization of project boundaries for all three sites, through a discussion between RUMSL, Sgurr and ERM
- Initiation of the RAP primary data collection process based on the final project boundary
- Final hand over of the project land to the concerned developers after the completion of successful bidding process. It is ERM's understanding that RUMSL (as the implementation agency on behalf of NRED) will undertake the entire land procurement process; including the purchase of private and patta land parcels. RUMSL will have a back-to-back sublease agreement with each of the Solar Project developers that are selected as a part of the tender/bidding process. Once the sublease agreement is signed, the Solar Project developers would be responsible for development of solar project as per the agreed terms of the lease, on the allotted land parcels.

Government land

- Initiation of land allotment process for new land parcels identified for maintaining the unit capacities as part of the optimization process (if any). Presently additional land requirement has been identified only for Neemuch Unit 3, as presently there is a shortage of land for approx. 2 MW (approximately 2 ha.). However, based on ERM's discussion with RUMSL, prior to initiating additional land take, RUMSL is attempting to optimize the existing land available, by either (a) reducing the land per MW in keeping with standards followed in other states such as Kerala and Gujarat (b) adjusting the short fall in Unit 3 area with the excess land available in Unit 2;
- As part of the optimized project boundary for Neemuch, a large water body towards the south-east corner was included in the project footprint. While the concerned land parcel (with the water body) has been allotted to the project in totality, RUMSL has reconfirmed with revenue department and clarified that the water body is not included in the area for the solar park. However, data available with Sgurr indicates that water body is included in solar park area. This issue needs to be resolved and records (of Project are and boundary) be updated across all datasets for use in the studies.

- On the issue of encroachments (for agriculture), RUMSL has identified potential limitations with providing any compensation to opportunistic encroachers. According to the discussion with RUMSL, most of the encroachers in the area are opportunistic in nature, and have other land holdings in the village or neighbouring villages. Thus the encroached land is not critical for these encroachers in terms of livelihood or sustenance. One of the key concerns RUMSL had about providing entitlements to these opportunistic encroachers was setting a precedence for other projects in the state. However, RUMSL also acknowledged that there may be certain households who are dependent upon the encroached land for their primary source of livelihood. In such a situation, the entitlements identified in the ESMF and the other applicable regulations will be followed. The profiling on the nature of the encroachments (opportunistic/need based) has been done as part of the RAP survey. The preliminary entitlement matrix prepared by ERM has been revised based on the information collected from RAP surveys.
- Similar to encroachments, from the review of drone imagery and observations during site visits, a number of squatters (structures for residential or agricultural purposes) have been identified within the proposed project boundary. According to the discussion with RUMSL, most of these

structures are likely to be seasonal structures used only during the agricultural season, with the primary residences being located within the main village abadi area. This will be verified during the RAP survey and entitlements will be identified in keeping with the nature of use and dependence. For this purpose, ERM will prepare a preliminary entitlement matrix for RUMSL's consideration. This will be further revised once the RAP surveys are complete

- There may also be situations where excess land has been allotted for a unit (such as in the case of Agar). In such a situation, RUMSL will identify the final land requirement for the project, based on the purchase process of private and patta land. Once the private and patta land purchase process has been completed, if any excess government land remains, the same will be returned to the revenue department following the due process.

Private and Patta Land

- The procurement of the private and patta land is to be done through the provisions of the MP mutual consent policy 2014. This process will be initiated once the project boundary optimization process is complete.
- Based on the discussions with RUMSL, it is understood that they are considering the option of a land swap for Patta land parcels wherever the allottee has not taken possession yet (subject to approval by the DC, consent by the allottee and availability of alternate land for the patta). For other patta land that is being used by the allottee, purchase through the mutual consent policy will be preferred. Though the land swap process is considered a lengthy and potentially complex process the option of providing the patta holders an alternate patta land, within the same khasra number will be explored as a first option.

Furthermore, the option of acquiring the private and patta land parcels will remain, in case the negotiations through the mutual consent policy fail or in case there is any existing litigation or dispute on the land parcel. The land acquisition process will be in keeping with the Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act 2013. The project needs to ascertain the exact steps to be followed for the purchase of private and patta land. Presently there is lack of clarity in terms of whether the first notification under the RFCTLARR 2013 will be issued prior to the negotiations being undertaken with the land owners and patta holders or will the notification be issued only if the negotiations fail. This will also have an impact on the classification of the land transaction in terms of involuntary or voluntary land transaction in keeping with the IFC PS 5.

APPENDIX D ENVIRONMENTAL MONITORING RESULTS

AMBIENT AIR MONITORING

Location : Badi Gav

Sr. No.	Date of Monitoring	Week	Parameters					URL No.	Sample Reference
			PM_{10}	$PM_{2.5}$	SO_2	NO_X	CO		
			($\mu g/m^3$)				(mg/m^3)		
1	19-12-2019	I	72.3	21.3	10.2	24.8	0.84	TC670919000007072P	NIL/AA/12/19/294
2	20-12-2019		68.9	19.1	19.3	26.4	0.59	TC670919000007074P	NIL/AA/12/19/296
CPCB Limits			**100.0**	**60.0**	**80.0**	**80.0**	**2.00**		
Minimum			**68.9**	**19.1**	**10.2**	**24.8**	**0.59**		
Maximum			**72.3**	**21.3**	**19.3**	**26.4**	**0.84**		
Average			**70.60**	**20.20**	**14.75**	**25.60**	**0.72**		
90th Percentile			**71.96**	**21.08**	**18.39**	**26.24**	**0.82**		
95th Percentile			**72.13**	**21.19**	**18.85**	**26.32**	**0.83**		
98th Percentile			**72.23**	**21.26**	**19.12**	**26.37**	**0.84**		

Location : Kawai

Sr. No.	Date of Monitoring	Week	Parameters					URL No.	Sample Reference
			PM_{10}	$PM_{2.5}$	SO_2	NO_X	CO		
			($\mu g/m^3$)				(mg/m^3)		
1	19-12-2019	I	63.8	20.4	13.1	27.7	0.80	TC670919000007073P	NIL/AA/12/19/295
2	20-12-2019		70.1	26.9	9.7	23.7	0.82	TC670919000007075P	NIL/AA/12/19/297
CPCB Limits			**100.0**	**60.0**	**80.0**	**80.0**			
Minimum			**63.8**	**20.4**	**9.7**	**23.7**	**0.80**		
Maximum			**70.1**	**26.9**	**13.1**	**27.7**	**0.82**		
Average			**66.95**	**23.65**	**11.40**	**25.70**	**0.81**		
90th Percentile			**69.47**	**26.25**	**12.76**	**27.30**	**0.82**		
95th Percentile			**69.79**	**26.58**	**12.93**	**27.50**	**0.82**		
98th Percentile			**69.97**	**26.77**	**13.03**	**27.62**	**0.82**		

NOISE MONITORING

Location		Chaksodijar	Badi Gav	Kawai Village	Bardawada	Arniya
Date		19-12-2019	19-12-2019	19-12-2019	19-12-2019	19-12-2019
Hourly L_{eq}	06:00 - 07:00	50.0	52.7	58.4	57.9	44.4
	07:00 - 08:00	50.3	56.0	57.8	60.0	52.5
	08:00 - 09:00	50.5	57.9	58.6	59.2	52.5
	09:00 - 10:00	50.5	56.0	59.6	65.4	56.7
	10:00 - 11:00	50.8	55.7	59.3	62.4	63.3
	11:00 - 12:00	50.8	55.6	57.2	53.1	57.8
	12:00 - 13:00	51.0	59.5	63.8	55.7	39.6
	13:00 - 14:00	50.3	51.5	60.7	59.0	46.5
	14:00 - 15:00	51.3	48.4	57.8	60.3	53.5
	15:00 - 16:00	52.0	50.7	52.8	64.0	51.8
	16:00 - 17:00	52.0	53.8	50.1	64.4	59.7
	17:00 - 18:00	50.2	47.3	54.5	56.3	62.8
	18:00 - 19:00	55.8	52.2	56.1	49.9	56.3
	19:00 - 20:00	53.8	58.0	57.5	51.2	42.0
	20:00 - 21:00	50.7	54.8	57.6	49.3	43.8
	21:00 - 22:00	49.7	52.5	57.8	52.6	37.6
	22:00 - 23:00	48.5	53.4	57.6	50.7	40.9
	23:00 - 00:00	47.8	52.1	57.6	51.4	34.8
	00:00 - 01:00	33.7	51.9	57.6	51.3	38.0
	01:00 - 02:00	40.7	52.0	57.8	50.1	34.6
	02:00 - 03:00	44.5	52.0	57.9	51.1	33.9
	03:00 - 04:00	50.0	53.0	58.0	50.9	35.7
	04:00 - 05:00	50.3	52.1	58.0	51.8	35.2
	05:00 - 06:00	50.3	51.9	58.1	54.2	39.0
L_{min}		**33.7**	**47.3**	**50.1**	**49.3**	**33.9**
L_{max}		**55.8**	**59.5**	**63.8**	**65.4**	**63.3**
L_{90}		**45.49**	**50.94**	**54.98**	**50.28**	**34.92**
L_{eq} Day		**51.56**	**55.05**	**58.45**	**60.08**	**56.61**
L_{eq} Night		**47.85**	**52.33**	**57.83**	**51.61**	**37.20**
L_{DN}		**54.75**	**58.94**	**63.96**	**60.65**	**55.09**

TRAFFIC MONITORING

Location :Chitorgad to Shingoli
Date of monitoring :20/12/2019

TIME	NO. OF VEHICALS IN 24 Hrs, (Hourly Data)				
	TWO WHEELERS	THREE WHEELERS	LCV,S	HCV,S	NON MOTORISED
06:00 - 07:00	7	0	0	5	0
07:00 - 08:00	21	0	3	4	2
08:00 - 09:00	32	0	13	9	0
09:00 - 10:00	37	2	16	13	4
10:00 - 11:00	47	1	22	5	0
11:00 - 12:00	13	0	12	9	3
12:00 - 13:00	68	1	7	17	0
13:00 - 14:00	35	4	19	12	0
14:00 - 15:00	53	0	8	11	0
15:00 - 16:00	40	0	10	19	0
16:00 - 17:00	29	1	16	7	0
17:00 - 18:00	25	0	23	13	2
18:00 - 19:00	36	2	11	11	0
19:00 - 20:00	34	0	5	8	2
20:00 - 21:00	35	2	8	13	1
21:00 - 22:00	15	0	2	8	0
22:00 - 23:00	8	0	2	5	0
23:00 - 00:00	1	0	0	10	0
00:00 - 01:00	0	0	0	3	0
01:00 - 02:00	0	0	0	7	0
02:00 - 03:00	0	0	0	8	0
03:00 - 04:00	0	0	0	12	0
04:00 - 05:00	2	0	0	5	0
05:00 - 06:00	1	0	0	2	0

Location :Shingoli to Chitorgad
Date of monitoring :20/12/2019

TIME	NO. OF VEHICALS IN 24 Hrs, (Hourly Data)				
	TWO WHEELERS	THREE WHEELERS	LCV,S	HCV,S	NON MOTORISED
06:00 - 07:00	10	0	2	7	0
07:00 - 08:00	26	0	5	9	0
08:00 - 09:00	37	2	9	5	7
09:00 - 10:00	46	3	5	13	2
10:00 - 11:00	57	0	14	8	0
11:00 - 12:00	42	2	8	2	0
12:00 - 13:00	89	0	11	15	5
13:00 - 14:00	41	1	9	7	0
14:00 - 15:00	70	0	4	13	0
15:00 - 16:00	55	0	18	18	0
16:00 - 17:00	38	2	26	15	0
17:00 - 18:00	31	0	21	8	2
18:00 - 19:00	52	1	12	12	2
19:00 - 20:00	47	1	3	19	0
20:00 - 21:00	42	3	14	21	0
21:00 - 22:00	44	0	8	14	0
22:00 - 23:00	13	0	6	18	0
23:00 - 00:00	8	0	2	24	0
00:00 - 01:00	0	0	0	7	0
01:00 - 02:00	0	0	2	12	0
02:00 - 03:00	0	0	0	7	0
03:00 - 04:00	0	0	2	11	0
04:00 - 05:00	0	0	1	8	0
05:00 - 06:00	2	0	3	6	2

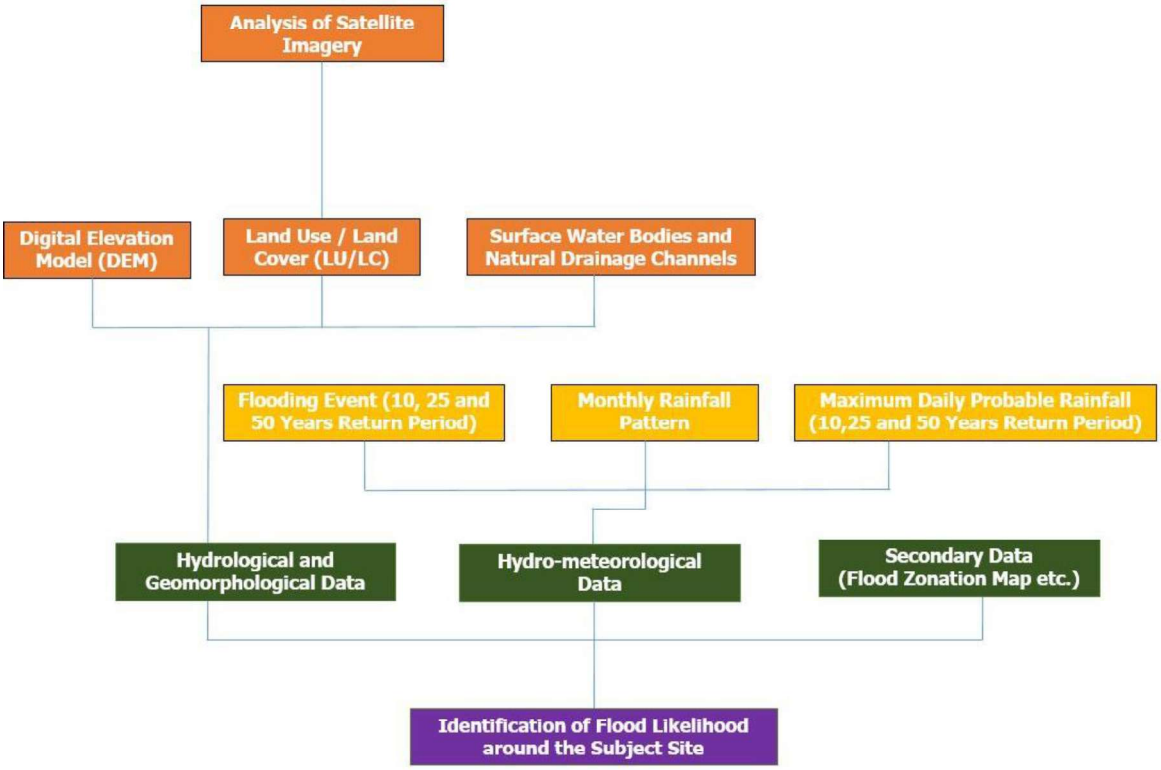
APPENDIX E FLOOD LIKELIHOOD ASSESSMENT

FLOOD LIKELIHOOD ASSESSMENT (FLA)

Approach and Methodology

The study includes a high-level review of the hydrology and flooding characteristics of the Site and the surrounding areas. The assessment was done using Site Level assessment and desktop analysis. The Site level assessment was conducted by reviewing the data collected during the Site visit and community consultation. Desktop analysis include review of satellite data, geospatial data analysis, thematic mapping based on ArcGIS, and review of secondary available in public domain. Based on this review, a flood likelihood matrix will be developed with the various attributes to which the Site and area is likely to be sensitive to inundation and flooding. ***Figure E1*** illustrates the methodology to perform FLA.

Figure E1: Methodology of flood likelihood assessment



Risk Categorization

ERM has adopted a qualitative risk based categorization to identify potential risks and vulnerabilities associated with flooding, inundation and waterlogging. The risks are defined considering the likelihood of their occurrence and potential severity of the impact broadly following the risk matrix presented in the table below.

Risk = Likelihood of an impact occurring x Potential severity of the impact.

		Probability of Occurrence		
		Low	Medium	High
Potential Impact	Low			

		Probability of Occurrence		
		Low	Medium	High
	Medium			
	High			

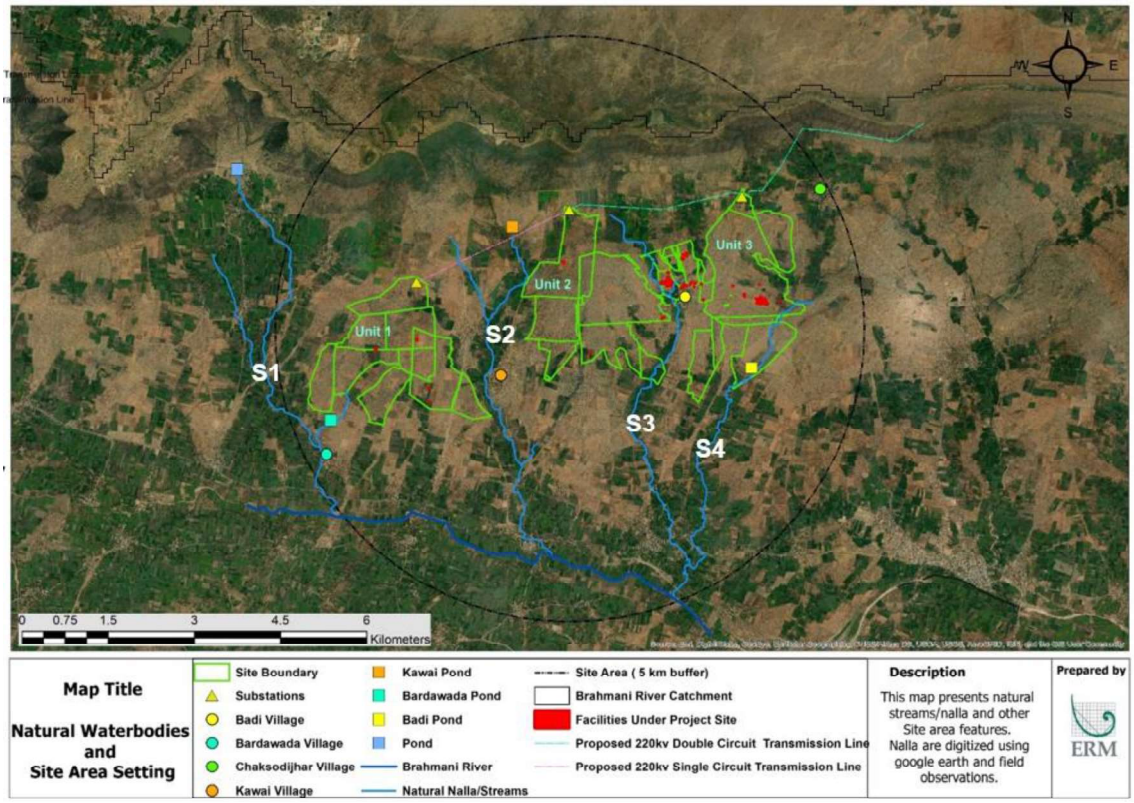
Note: The study was carried out to evaluate and understand the likelihood of flood impact on the Site only. Risk categorization has been adopted merely for providing broad level perspective on the potential for impact from floods / inundation / water logging on the Site and to emphasize specific areas for further evaluation prior to developing Site specific mitigation measures only.

Hydrological Setup

The natural waterbodies and Site area settings is presented in ***Figure E2.*** Some of the salient features of the Site area are described below:

- The core zone (2 km radius) around the Site is largely occupied by scrubland with agricultural land, forest land, scattered residential settlements and river channels of the Brahmani River and its tributaries.
- Brahmani River is located at distances of ~1.6 km, ~3.1 km and ~3.3 km to the South of the Unit 1, Unit 2 and Unit 3 respectively. The River flows in west to east direction.
- S1 flows near the western boundary of Unit-1 (~300 m west of the Unit-1) along the north to south vector through Bardwada village. A minor stream/nalla originates near the southern boundary of Unit-1 and joins S1. A Pond (hereinafter referred to as 'Bardwada Pond') has been developed using an embankment across this minor nalla as part of a rainwater harvesting and groundwater recharge scheme for Bardwada village.
- S2 flows between Unit-1 (~160 m to the east) and Unit-2 (~40 m to the west). S2 originates from Kawai Pond located to the west of Unit-2 and flows along the north to south vector via Kawai village.
- A seasonal stream/nalla S3 flows between Unit 2 and Unit 3. S3 flows along the north to south vector through Badi Village.
- S4 flows originates in the south-eastern portion of Unit 3 and flows along the north-east to south-west vector. An embankment has been built along S4 to create an artificial pond (herein after referred to as Badi Pond) which lies along the south-eastern corner of Unit-3.
- All the seasonal streams/nallas eventually drain into Brahmani River.

Figure E2: Natural Waterbodies and Site area settings



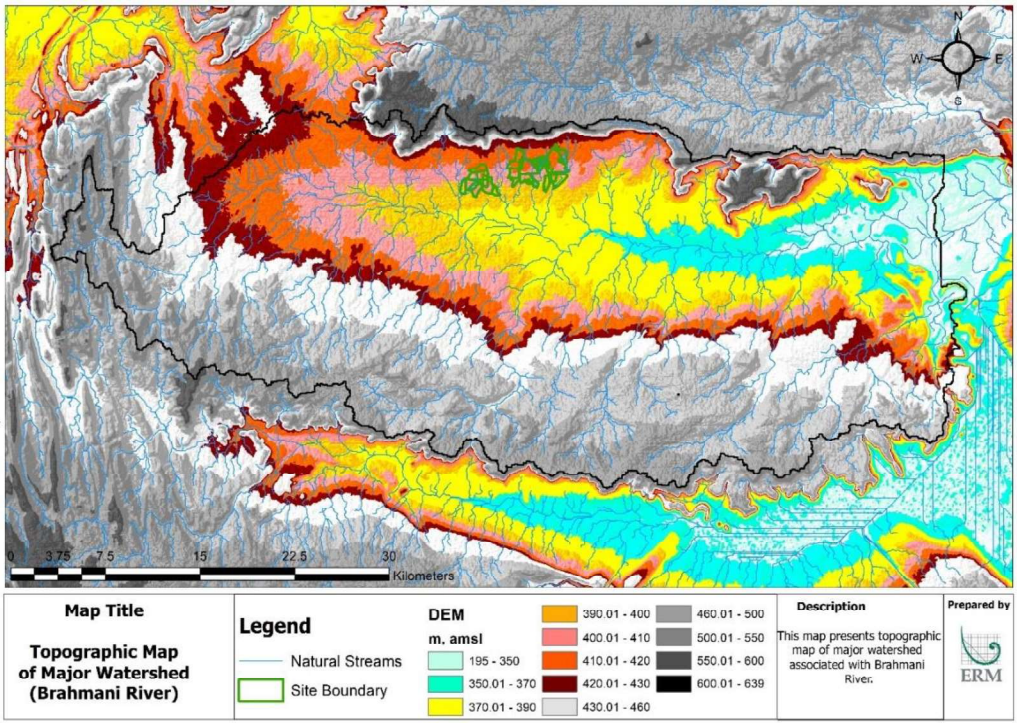
Topography and Drainage of the Watershed/Catchment

Based on the Digital Elevation Model (DEM) developed for the Site from USGS SRTM[1] data set, ERM identified key topographic features in the study area such as topographic highs and lows, natural drainage network and delineated the catchment area of the micro-watershed in which the Site is located. SRTM DEM having a 30 m resolution was used for detailed mapping of the micro watershed in which the Site is located.

Based on the topography and drainage pattern, it was found that the Site lies in Brahmani River Basin admeasuring 1,510.61 km^2, as presented in ***Figure E3***. The drainage pattern in the Brahmani River basin comprises of two (2) dominant directions: north to south flowing tributaries, and south-west to north-east flowing tributaries. The Site is located at the central portion of the basin and ~30 km north-west from the confluence of Brahmani River with Chambal River at Bhainsrorgarh Village, in Rajasthan. The Site is located along the left bank of the Brahmani River and the predominant gradient in the region is along the north to south vector.

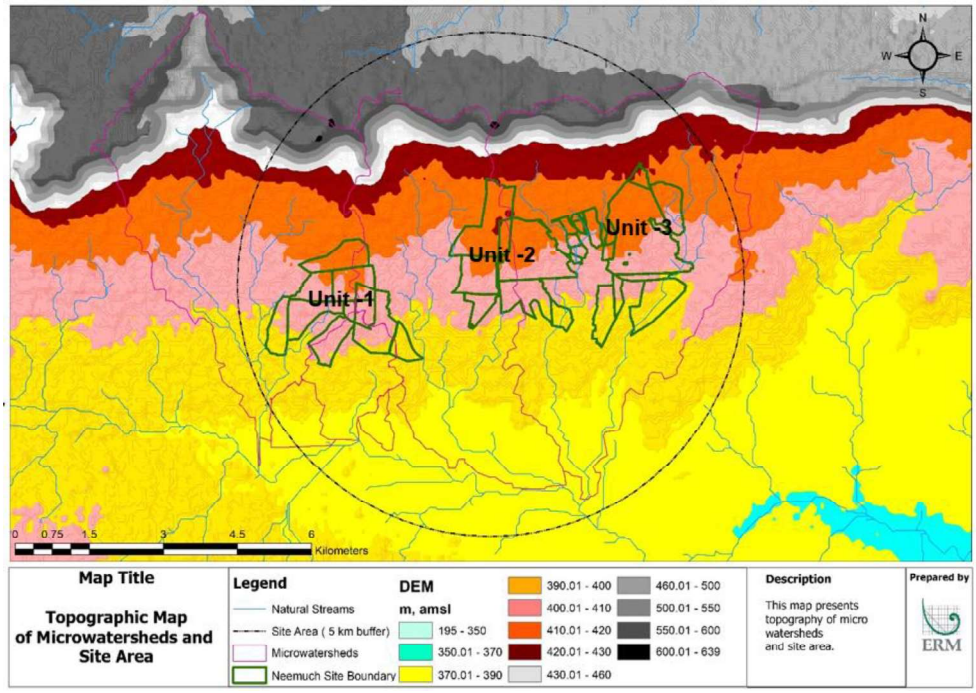
[1] https://earthexplorer.usgs.gov/

Figure E3: River basin within which Site is located



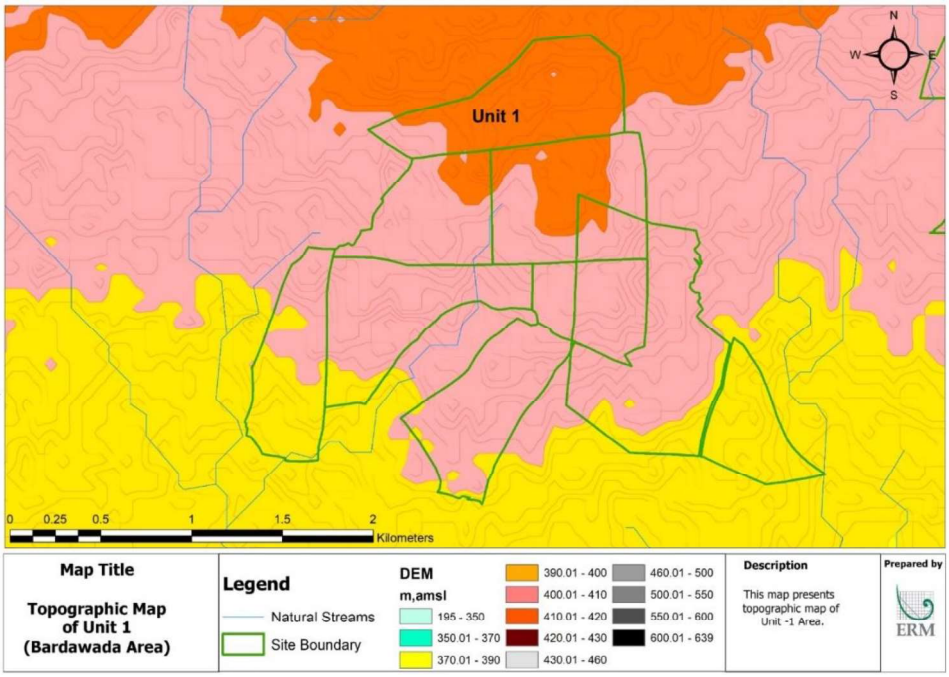
The digital elevation model (DEM) of the study area (5 km buffer around the Site) is presented in ***Figure E4***. The ground elevation was observed to vary from 600 – 639 m amsl in isolated patches, followed by areas with elevation ranging between 430 -600 m amsl in the northern portion, 430-400 m amsl in the central portion, and 370-390 m amsl in the southern portion. Continuous gradient of 6.3 m/km, 7.1 m/km and 7.3 m/km were observed to be along the north to south vector in Unit-1, Unit-2 and Unit-3 respectively.

Figure E4: Topographic map of the Site and surrounding area



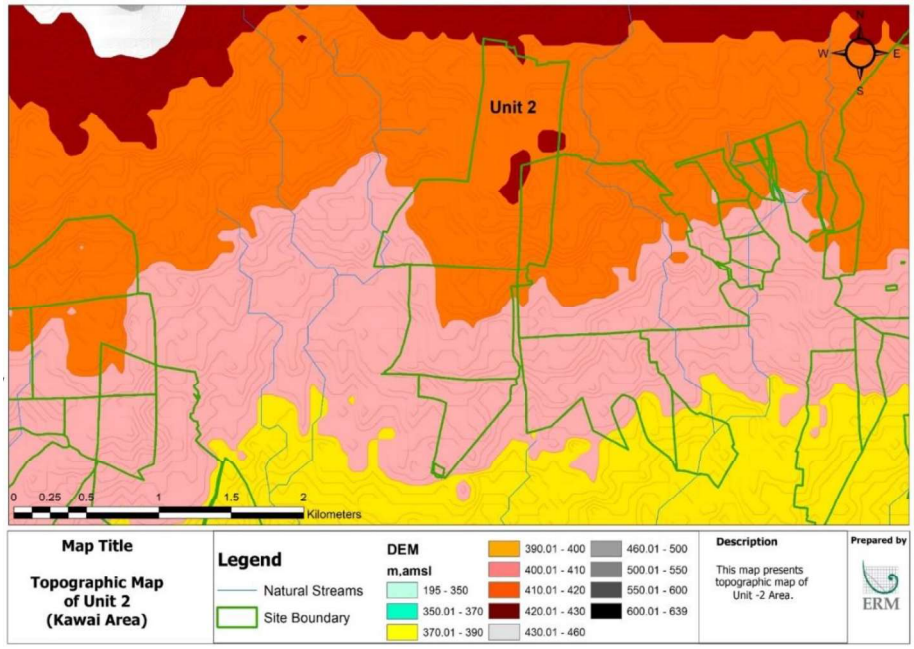
Most of Unit-1 area falls in the elevation range of 390-400 m amsl. South-western and south-eastern portions of the Site lie along Barwada Pond and S2 respectively, and are the lowest points varying between 390-400 m amsl within Unit-1. The topographical map for Unit 1 is shown in ***Figure E5.***

Figure E5: Topographical map of Unit 1



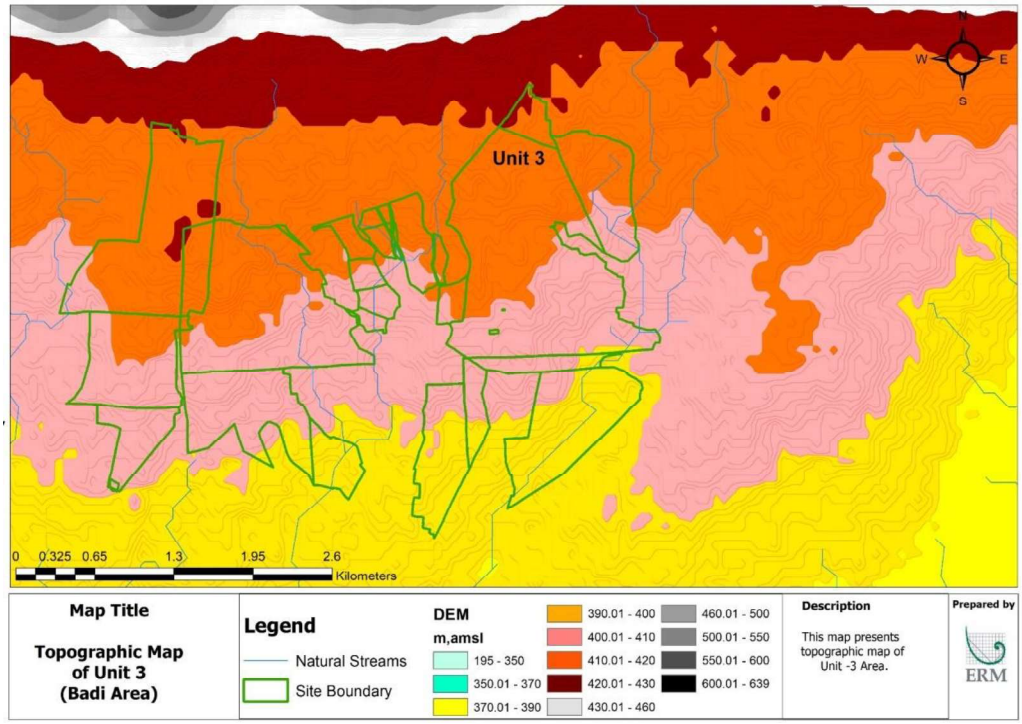
Unit-2 area falls in the elevation range of 390-400 m amsl. South-eastern portion of the Site lies along S3, which is also the lowest point varying between 370-390 m amsl. The topographical map for Unit 2 is shown in ***Figure E6.***

Figure E6: Topographical map of Unit 2



Similarly, Unit-3 area falls in the elevation range of 370-400 m amsl, with south-western portion comprising of areas near S4 and Badi Pond and south-eastern portion were the lowest points varying between 390-400 m amsl within Unit-3. The topographical map for Unit 3 is shown in ***Figure E7.***

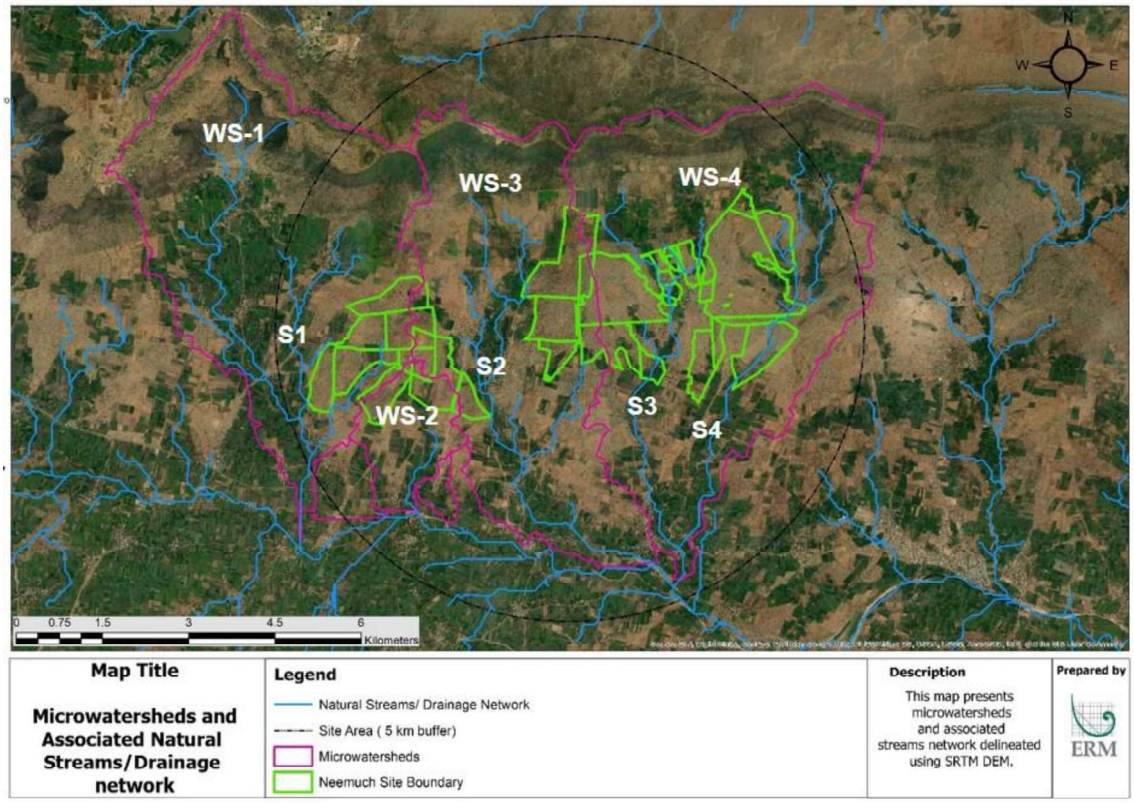
Figure E7: Topographical map of Unit 3



The site-specific micro-watersheds were delineated and are presented in ***Figure E8***. The Site units fall under four (4) distinct micro-watersheds which are described below:

- Unit-1 falls into three (3) micro-watersheds namely WS-1, WS-2 and WS-3, Unit-2 falls into two (2) micro-watersheds namely WS-3 and WS-4, and Unit-3 falls under one (1) micro-watershed namely WS-4;
- WS-1, WS-2, WS-3 and WS-4 admeasures 25.04 km^2, 3.18 km^2, 20.8 km^2 and 28.80 km^2 respectively;
- Several natural nallas/streams were observed to be flowing through the Site Units or its immediate vicinity which intercept most of the runoff from the area; and
- The flow lines show the flow pattern followed by the surface runoff when the watershed receives rainfall.

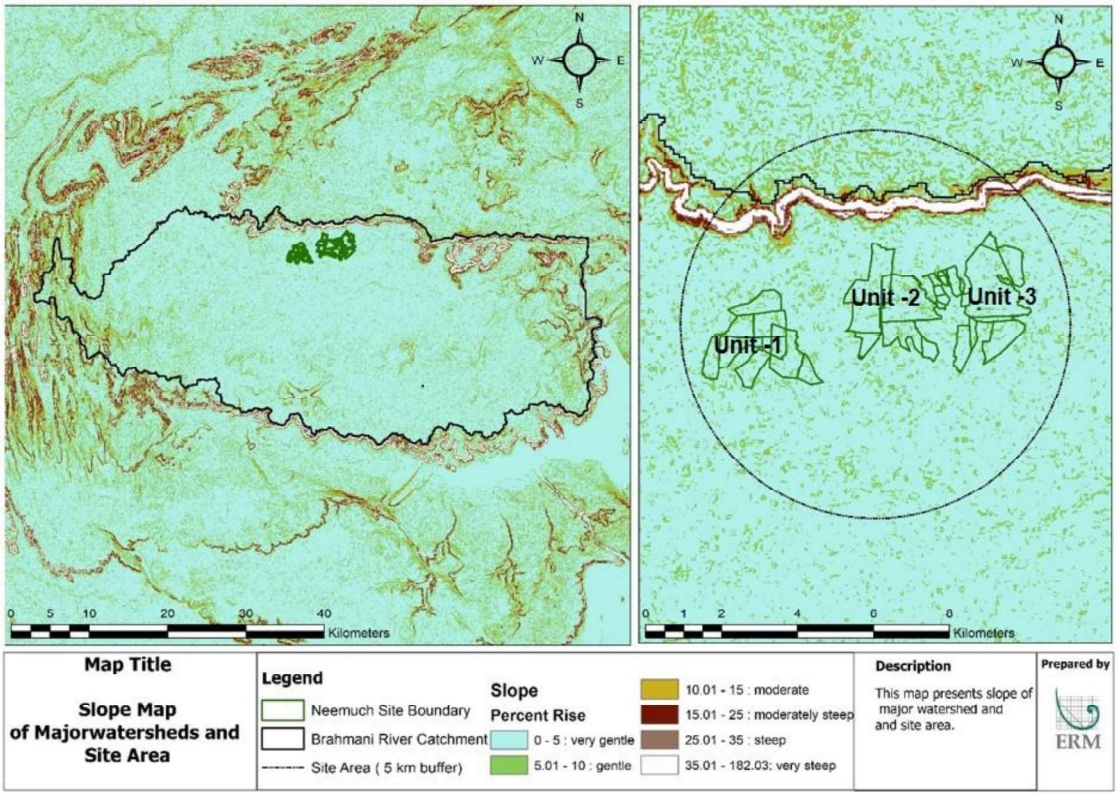
Figure E8: Hydrology map for the micro-watersheds



Slope Map

As per the slope map, the major portion of the study area (5 km buffer around the Site) was observed to be very gently sloping (0 – 5% slope) and scattered pockets of gently sloping (5 - 10 %). Steep and very steep slopes were observed in the northern portion along the ridges which for the northern boundary of the micro-watersheds. The Site and its immediate surroundings were observed to have very flat to gentle slopes with slopes varying between 0 – 10%. Based on the topography and slope maps, the Site area does not appear to have any pockets of 'low lying areas' with potential for water logging and inundation during rainy season which may be attributed to very gentle slopes. The general slope of the study area was observed to be from north to south. The Slope map is presented in ***Figure E9.*** Based on the topography and slope map, most of the areas within the Site appear to be located in a "*Medium*" risk zone.

Figure E9: Slope map of the Site area and the river basin



Analysis of Historical Satellite Imagery

ERM analysed the historical satellite imagery of the Site and its surrounding area to identify any events of flooding or inundations.

For assessing potential for impacts from flood, inundation and waterlogging at Site, ERM reviewed satellite imagery of Site and surrounding area as available from Google Earth Pro from 2009 till present. Review of historical satellite imagery do not indicate any major developmental activity or significant change in land use.

Historical satellite imagery of monsoon season for Unit 1, Unit 2 and Unit 3 are shown between ***Figure E10*** and ***Figure E13.*** In unit- 1, low lying area with stagnant water was observed near proposed sub-station 1. Within Unit-2, low lying area with standing water was observed mainly towards the central portion. Badi Pond and Stream 3 were observed within the Unit 3 area.

Figure E10: Historical satellite imagery for Unit 1

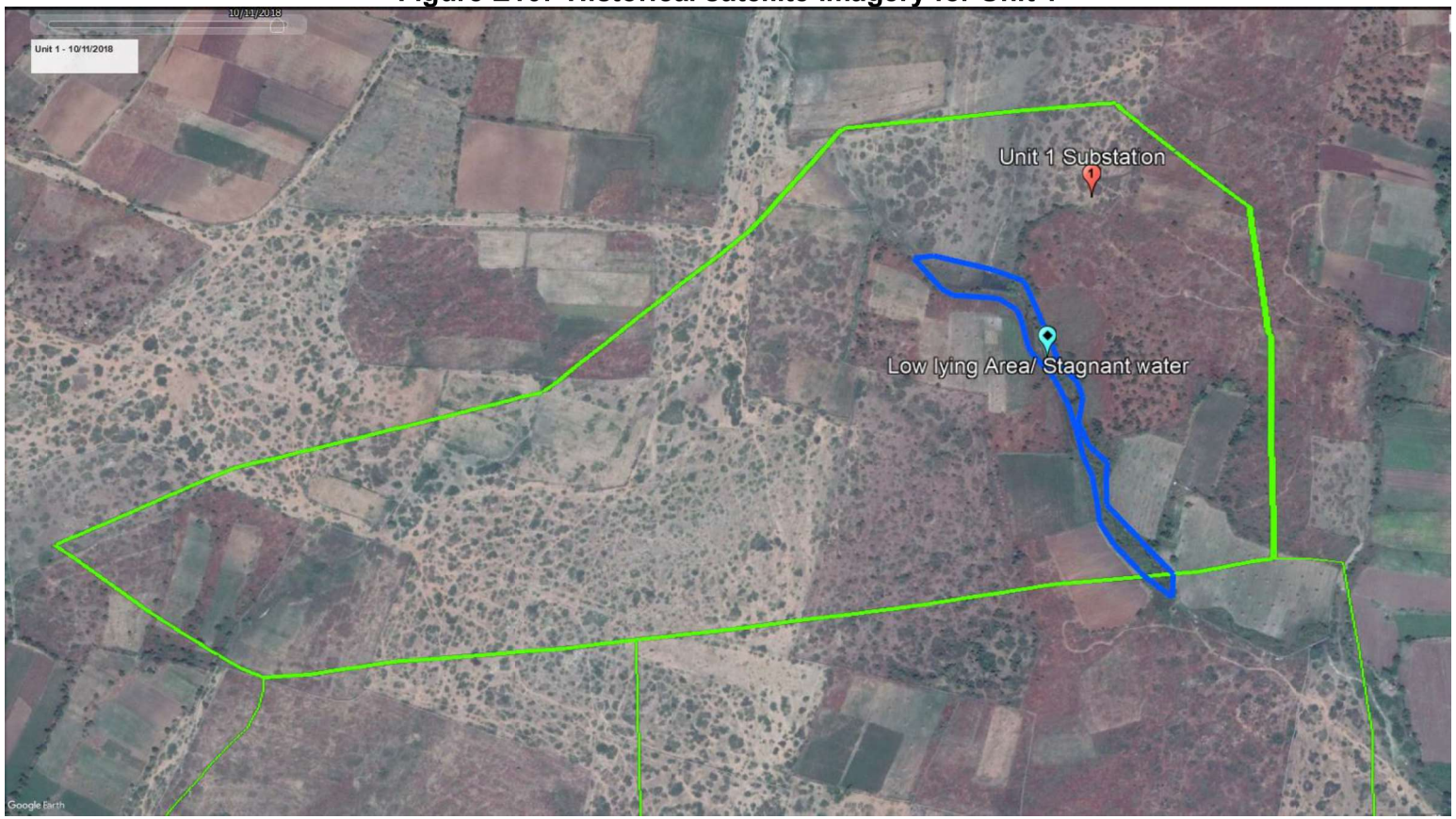


Figure E11: Historical satellite imagery for Unit 2

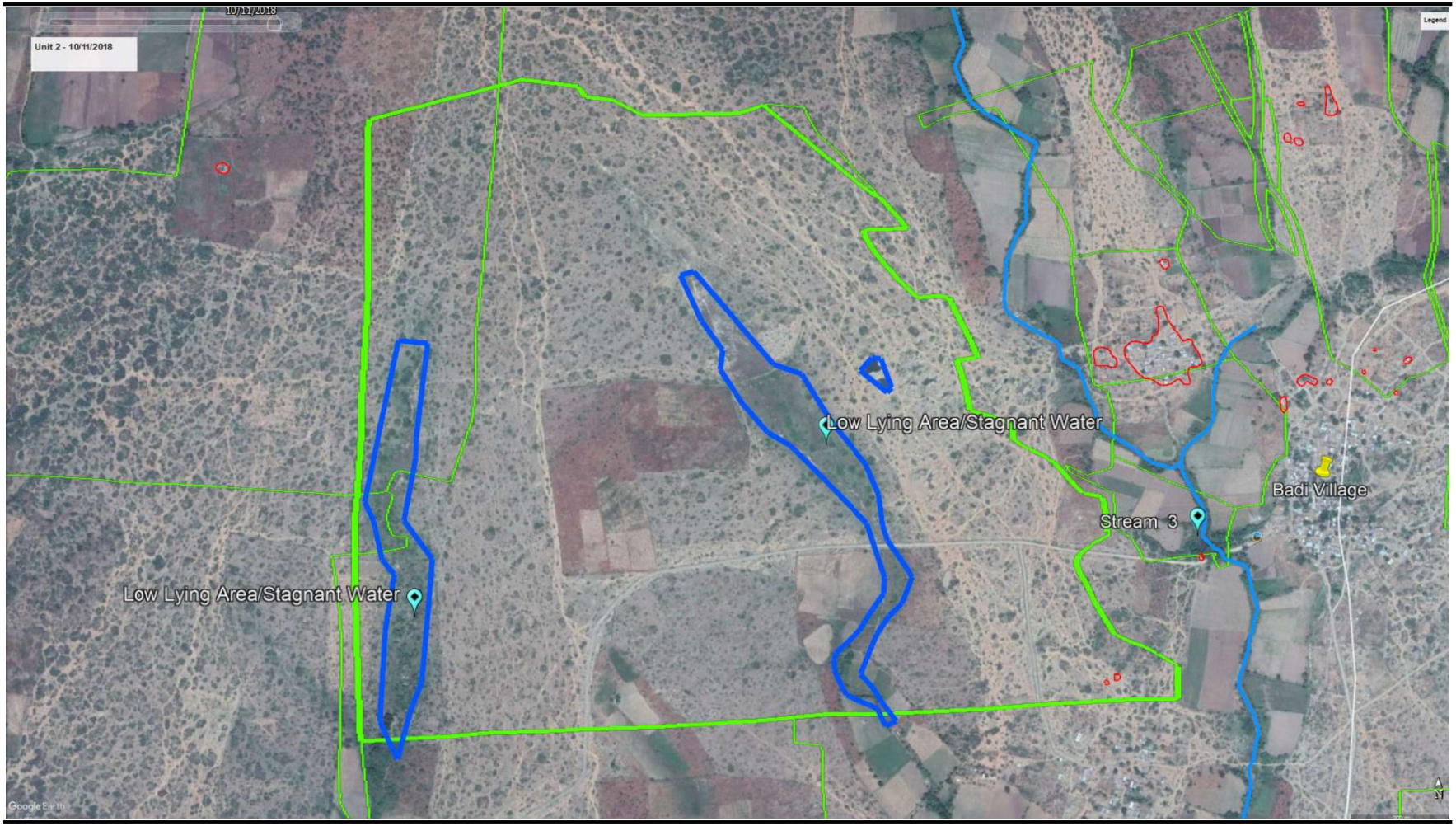


Figure E12: Historical satellite imagery for Unit 3 (Badi Pond)

Figure E13: Historical satellite imagery for Unit 3 (Stream 3)

Hydro-meteorology

Per the Central Ground Water Board (CGWB) Publication[1] (District Brochure, Neemuch District, 2013), the climate of Neemuch district is generally dry, except during the southwest monsoon season. The year can be divided in to four (4) seasons;

- Winter commences from middle of November and lasts till the end of February.
- The period from March to about first week of June is the summer season, with May being the hottest month of the year.
- The southwest monsoon starts from middle of June and lasts till end of September.
- October and middle of November constitute the post monsoon or retreating monsoon season.

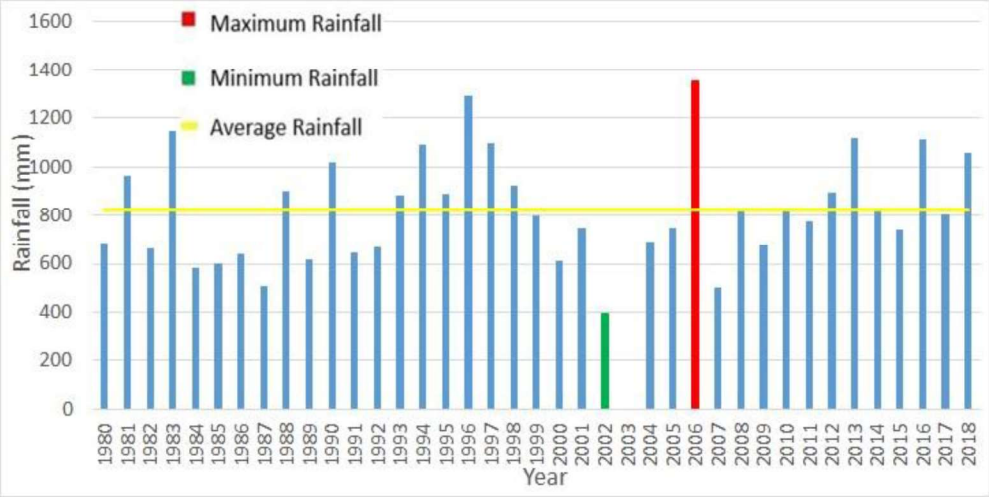
The normal maximum temperature recorded during the month of May is 39.80 °C, while the minimum during the month of January is 9.80 °C. The normal daily mean monthly maximum temperature is reported as 31.60 °C and daily mean minimum temperature is 19 °C. Summer is the driest period of the year. The relative humidity generally exceeds 87% in the month of August.

Annual Rainfall Pattern

Southwest monsoon (i.e. June to September) is considered the most predominant and important climatic feature in Neemuch District and more than 90.5% of the annual rainfall is received during monsoon season. Per CGWB publication, the normal annual rainfall of the District is 797.96 mm.

The long term data for annual rainfall indicates that the annual rainfall in Neemuch District during 1980-2018 was 824 mm. The lowest annual rainfall of 394 mm was received in year 2002 and maximum rainfall of 1,352 mm was received in year 2006. However, as per the community consultations, no flooding was reported in the Site's vicinity in 2006. The annual rainfall pattern at Neemuch District during 1980-2018 was shown in ***Figure E14.***

Figure E14: Annual rainfall at Neemuch district (1980-2018)



Source: India Meteorological Department (IMD)

Monthly Rainfall Pattern

The monthly variation of the rainfall for Neemuch District was studied for the period of 2014-2018 using the India Meteorological Department district-wise average monthly rainfall data. Details are provided in ***Table E1.***

[1] http://cgwb.gov.in/District_Profile/MP/Neemuch.pdf

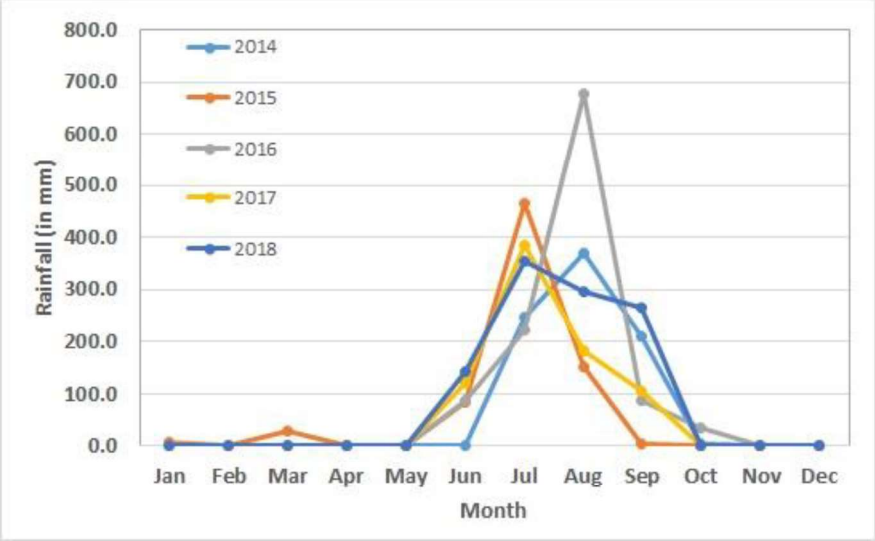
Table E1: Monthly rainfall pattern for the period 2014-2018

Year	Month												Annual
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
2014	1	0	0	0	0	0	248.1	368.3	208.9	4.3	0	0	830.6
2015	8.3	0	29.3	0	0	83.2	465.3	152.8	2.7	0	0	0	741.6
2016	2.3	0	0	0	0	88.1	222.8	678	86	36.1	0	0	1113.3
2017	1.3	0	0.7	0	0	121.8	386.2	182.3	107	0	0	1.7	801
2018	0	0	0	0	0	143.5	355.2	295	264.7	0	0	0.3	1058.7

Source: IMD, All values in mm.

The monthly rainfall variation observed for Neemuch District for the period (1980-2018) is shown in ***Figure E15***. It is evident that May-September months receive substantial monsoon rains.

Figure E15: Monthly variation of rainfall at Neemuch district (2014-2018)



Source: IMD, All values in mm

Maximum Daily Probable Rainfall (25, 50 and 100 Year Return Period)

As per the Central Water Commission's (CWC) report titled 'Flood Estimation Report for Chambal Sub-Zone -1(b)'[1], maximum daily probable rainfalls for different return periods for the study area are presented in ***Table E2.***

Table E2: Maximum daily probable rainfall at the study area

Return period in years	Maximum daily probable rainfall in mm
25	< 220
50	< 240
100	< 280

Source: CWC (http://cwc.gov.in/sites/default/files/chambal20subzone201b.pdf)

[1] http://cwc.gov.in/sites/default/files/chambal20subzone201b.pdf

Flooding Events

Consultations

Based on consultation with residents of settlements near Site, it was found that:

- Brahmani River breached its banks in the years of 2019, 2016, 2010 and 1994 due to excessive rains causing widespread inundation in settlements along the river and SH 9A which is the primary access to the Site;
- The extent of flooding due to overflow of Brahmani River along its left bank has never exceeded beyond SH 9A. The SH 9A is located ~ 1.3, ~2 km and ~2.5 km south of the unit-1, unit-2 and unit-3;
- During September 2019, Brahmani River overflowed its banks due to backflow associated with high water levels in Chambal River. Therefore, the seasonal streams draining the Site area were not able to quickly discharge into Brahmani River. Minor effects of backflow were reported in the Site area and ponds.
- Typically, the seasonal streams/nallas and embankment ponds (built as part of groundwater recharge scheme) along these nallas are dry throughout the year except during monsoons. No history of widespread flooding/ inundation due to overflow from nallas and/or embankment ponds was reported on-Site. However localized inundation in low-lying areas within Site was reported; and
- The Site and surrounding areas were not reported to be susceptible to flooding due to water levels breaching danger marks in Gandhisagar and Rana Pratap Sagar Dams built across Chambal River. Photographs from Site consultations are shown in ***Figure E16.***

Figure E16: Photographs from Community Consultation

Secondary Data (Flood Zonation and Hazard)

In order to understand the flood likelihood in the study area and its potential impact on operations at the Site, ERM has considered the following potential areas of concern:

- Flooding from seasonal streams flowing through the Site units;
- Flooding from Brahmani River;
- Flooding from Chambal River;
- Flooding from Gandhisagar and Rana Pratap Sagar Reservoirs built across Chambal River; and
- Waterlogging, and inundation at Site and surrounding area; and

In order to evaluate the areas of concern, ERM has reviewed flood likelihood from following perspective:

1. Based on Graphical Models and Maps/Reports from Secondary Sources;
2. 1-D Mapping of Potential Inundation; and
3. Historical Satellite Imagery.

Flood Review based on Secondary Sources

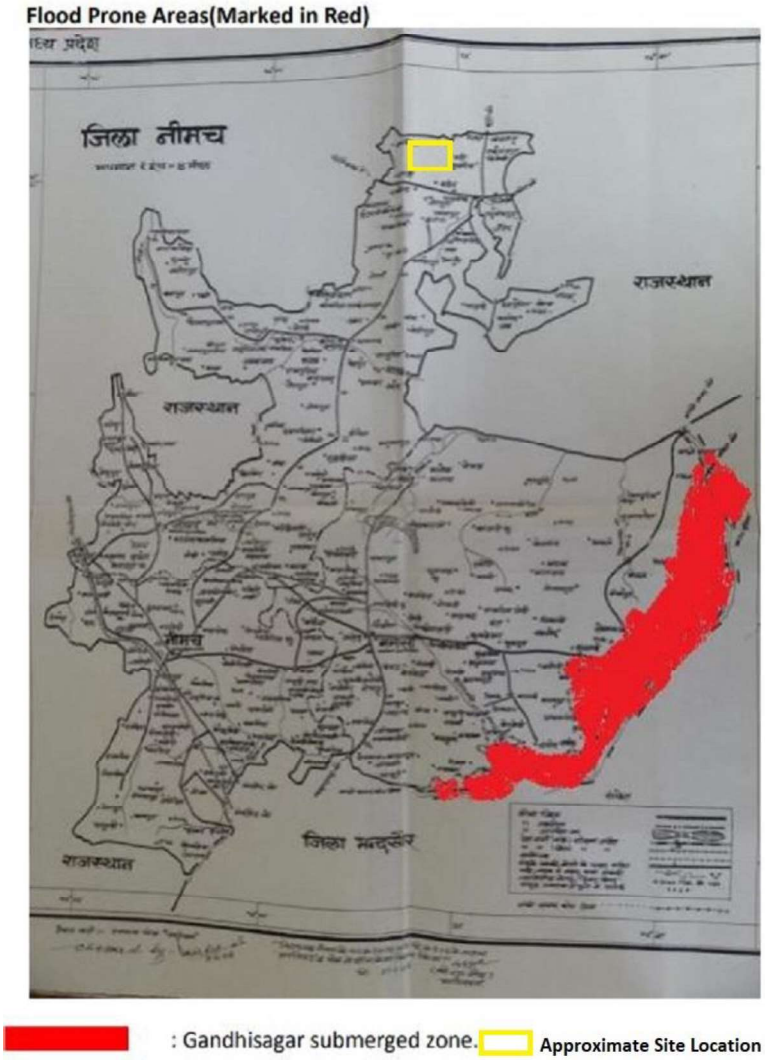
Several secondary data sources and maps were reviewed to understand the vulnerability of the Site to flooding due to various storm events and scenarios. These are presented below:

Secondary Data Analysis of Flood Prone Area Map – District Disaster Management Plan, Neemuch

As part of the assessment, District Disaster Management Plan for Neemuch District[1] report prepared by MP School of Good Governance and Policy Analysis was reviewed. Per the report, floods and droughts are the major natural hazards of the district. Flood prone areas in the district due to overflow from Gandhisagar Dam (40 km south-east of the Site, along Chambal River) have been marked out (in red) as shown in the ***Figure E17.*** Per the map, the Site ***does not fall*** under the flood prone area.

[1] https://cdn.s3waas.gov.in/s334173cb38f07f89ddbebc2ac9128303f/uploads/2019/07/2019070330.pdf

Figure E17: Flood affected area of Neemuch district



Source: District Disaster Management Plan, Neemuch District

Secondary Data Analysis of Flood Risk Map - WRI Aqueduct

As part of the assessment, Aqueduct's riverine flood risk map[1] developed by World Resources Institute (WRI) in collaboration with several research partners[2] was used to ascertain the flooding risk calculated using 50 years of data spanning from 1960 to 2014 for the study region. WRI Aqueduct defines riverine flood risk as the percentage of population expected to be affected by riverine flooding in an average year, accounting for existing flood protection standards. Higher values indicate greater proportion of the population is expected to be impacted by riverine floods. Riverine flood risk are classified into five (5) categories based on probability of flooding as:

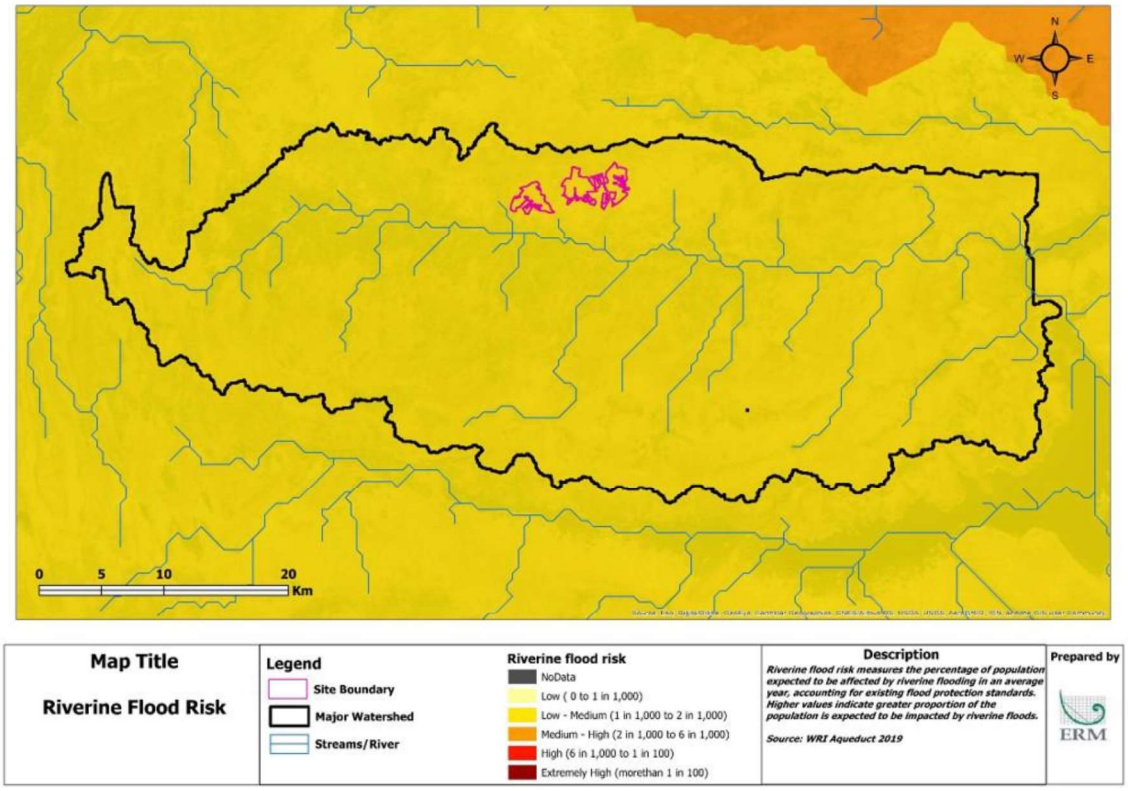
- Low: flooding probability is 0 to 1 in 1000;
- Low-Medium: flooding probability is 1 in 1000 to 2 in 1000;
- Medium-High: flooding probability is 2 in 1000 to 6 in 1000;
- High: flooding probability is 6 in 1000 to 1 in 100; and
- Extremely High: flooding probability is more than 1 in 100.

[1] https://www.wri.org/resources/data-sets/aqueduct-global-maps-30-data

[2] Delft University of Technology, Deltares, Utrecht University, Institute for Environmental Studies (IVM), International Food Policy Research Institute (IFPRI), PBL Netherlands Environmental Agency, and RepRisk.

- ***Figure E18*** presents the Site boundary and Brahmani River Basin superimposed over WRI's Aqueduct's riverine flood risk map. Per the map, the flooding risk at the Site is considered *'**Low to Medium**'*.

Figure E18: Flood hazard map of river basin (WRI Aqueduct)



Source: WRI-Aqueduct Water Risk Atlas 3.0 (https://www.wri.org/resources/data-sets/aqueduct-global-maps-30-data)

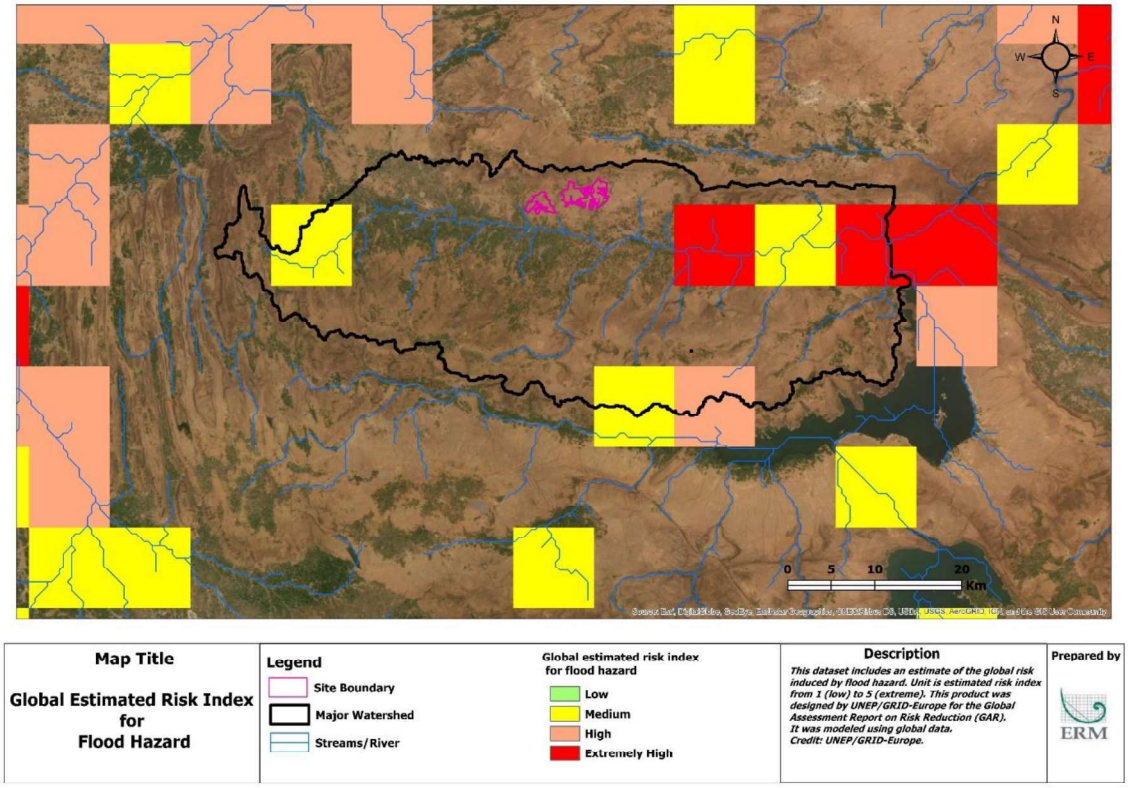
Secondary Data Analysis of Flood Hazard Map - UNEP/GRID-Europe

For the purpose of this assessment, Global estimated risk index for flood hazard dataset[1] developed by United Nations Environmental Programme (UNEP) was reviewed. As the name suggest, this dataset includes an estimate of the global risk induced by flood hazard. Unit is estimated risk index from 1 (low) to 4 (extreme). This product was designed by UNEP/GRID-Europe for the Global Assessment Report on Risk Reduction (GAR). It was modelled using global data.

Figure E19 presents the Site boundary and Brahmani River Basin superimposed over UNEP's flood hazard map. Patches of flood hazard risk ranging from medium to extremely high were observed along the periphery of major watershed particularly in east, west and south. However, within the Site's watershed and particularly within the Site property, no flood hazard risk was reported.

[1] https://preview.grid.unep.ch/index.php?preview=dataandevents=floodsandevcat=5andlang=eng

Figure E19: Global estimated risk index for flood hazard map - UNEP



Source: UNEP/GRID Europe (http://ihp-wins.unesco.org/layers/geonode:fl1010irmt)

Secondary Data Analysis of Flood Hazard Map - FM Global

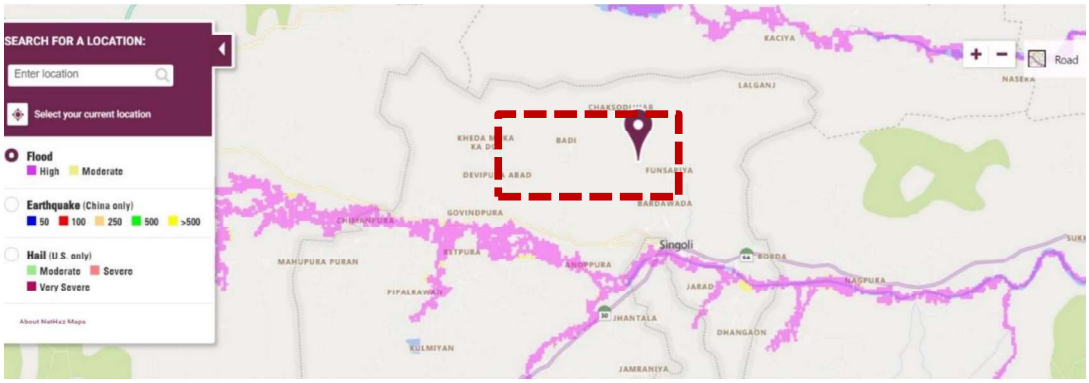
The Global Flood Map is prepared by FM Global[1] using historical data, hydrology and hydraulic scientific data accounting for variable external factors such as rainfall, evaporation, snowmelt and terrain. The Global Flood Map currently displays two (2) hazard flood zones via a 90 x 90 meter grid namely:

- High Hazard (Pink): Locations in a 100-year flood zone have at least a 1 percent chance of experiencing a flood each year; and
- Moderate Hazard (Yellow): Locations in a 500-year flood zone have at least a 0.2 percent chance of experiencing a flood each year.

Figure E20 presents the approximate Site location superimposed over the FM Global's flood hazard map. Per the map, the Site is ***not prone to*** High or Moderate flood risk.

[1] https://www.fmglobal.com/research-and-resources/nathaz-toolkit/about-global-flood-map

Figure E20: Flood hazard map (FM Global)



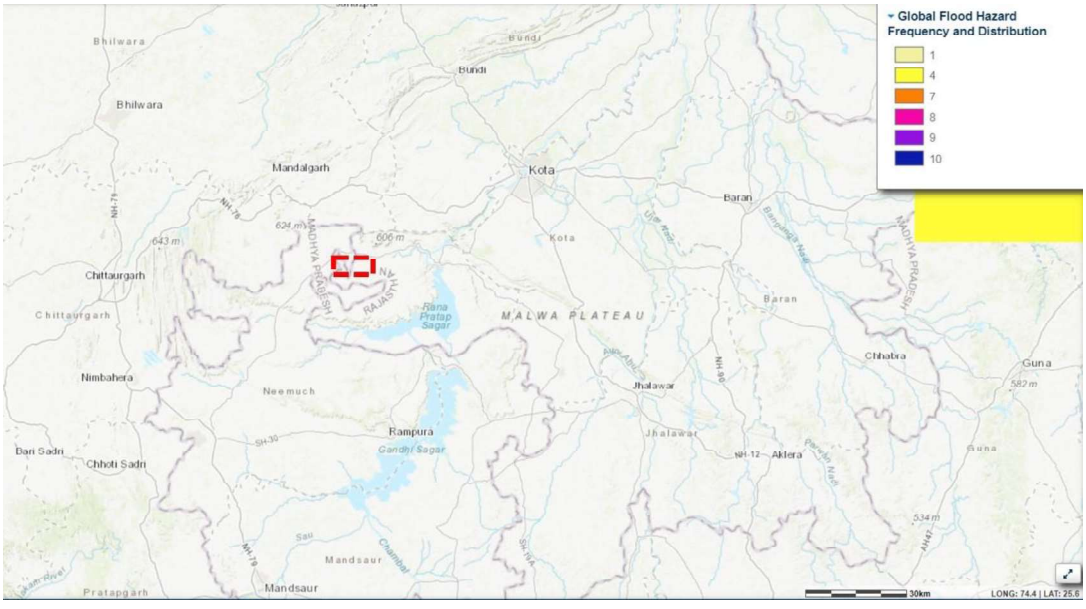
Source: FM-Global Flood Hazard Map (https://www.fmglobal.com/research-and-resources/nathaz-toolkit-and-map/flood-map)

Secondary Data Analysis of Flood Hazard Frequency and Distribution Map – Data Basin

Global Flood Hazard Frequency and Distribution is a 2.5 by 2.5 minute grid derived from a global listing of extreme flood events between 1985 and 2003 (poor or missing data in the early/mid 1990s) compiled by Dartmouth Flood Observatory and georeferenced to the nearest degree. The resultant flood frequency grid was then classified into 10 classes of approximately equal number of grid cells. The greater the grid cell value in the final data set, the higher the relative frequency of flood occurrence.

Figure E21 illustrates the approximate Site location superimposed on the flood hazard frequency and distribution map developed by Data Basin. Per the map, the Site and its surroundings is ***not prone*** to flooding.

Figure E21: Flood hazard frequency and distribution map (Data Basin)



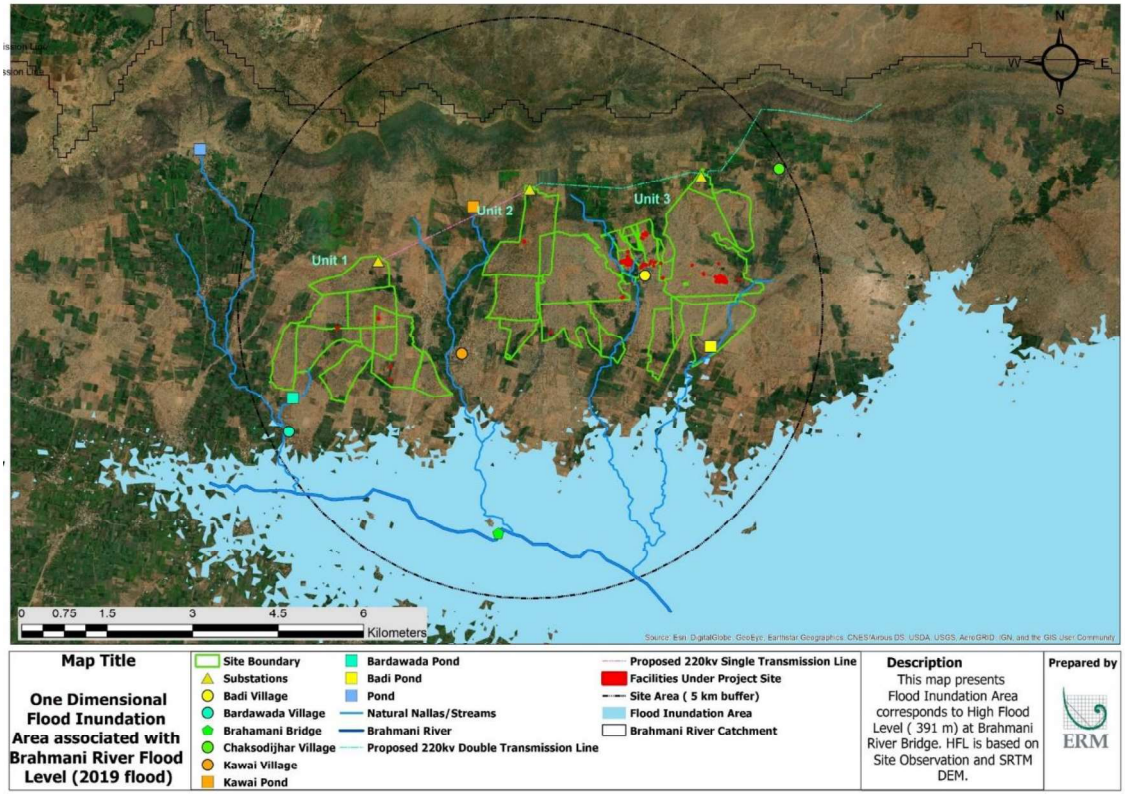
Source: Data Basin Global Flood Hazard Frequency and Distribution (https://databasin.org/datasets/e5190023c8194691b5b233df41955417)

D Mapping of Potential Inundation

In order to simulate the inundation and water logging at the Site, ERM used ArcGIS® to develop 1-D inundation for flood event in Brahmani River that occurred in Aug-Sep 2019 were reported maximum

water levels. Based on community consultation, it was reported that the maximum water/flood level at Brahmani River Bridge (~2.7 km south of the Site Units) for the flood event was **~391 m amsl**. All topographic levels were extracted from SRTM DEM, the flooded areas reported in the map were areas where the terrain levels were below to corresponding water level. No obstructions/barriers were considered for mapping. All levels reported in meters above mean sea level. The modelling outputs of the 1-D mapping of potential inundation is presented in ***Figure E22***.

Figure E22: Inundation map for maximum water/flood levels for flood event in Aug-Sep 2019



Please note that the flood depths and area of inundation are based on secondary data and 1-D mapping, and may not represent the actual figures. Also, the mapping does not consider the inundation due to rainfall – run-off from the upper catchment. These factors are considered to be critical for understanding the risks to the Site due to flooding and the High Flood Levels. Also, the topographic (elevation) data for the mapping was extracted from readily available SRTM, and is of a coarse resolution.

Based on the 1-D mapping, no inundation was observed on any Site Unit. As per the inundation mapping results and secondary data collected, the Site is ***'not susceptible'*** to flooding from Brahmani River.

Likelihood of a Flooding Event

Based on the above-mentioned findings, a likelihood analysis of potential flooding event in and around the Site has been undertaken. The same has been presented in the ***Table E3*** below.

Table E3: Likelihood of flood evaluation

Attributes	Likelihood		
	High	Medium	Low
Site Setting			
■ Unit-1 is in close proximity of S1, S2 and Bardwada Pond, Unit-2 is in close proximity of Kawai Pond, S2 and S3 and Unit-3 is in close proximity of Badi Pond, S3 and S4; ■ The Site Units are located along the left bank of Brahmani River. Brahmani River is located at distances of ~1.6 km, ~3.1 km and ~3.3 km to the South of the Unit 1, Unit 2 and Unit 3 respectively; ■ Site Units are located ~30 km north-west from the confluence of Brahmani River with Chambal River; ■ Two major dams namely Rana Pratap Sagar (~35 km south-west of the Site units) and Gandhi Sagar (~50 km south-west of the Site units) are built across Chambal River at the upstream of the Site.			
Watershed Characteristics			
■ The Site lies within the Brahmani River Basin. The Site is located at the central portion of the basin and ~30 km north-west from the confluence of Brahmani River with Chambal River at Bhainsrorgarh Village, in Rajasthan. ■ The Site is located along the left bank of the Brahmani River and the predominant gradient in the region is along the north to south vector; ■ The Site units is located in a rural setting surrounded primarily by scrub land followed by forest land, agricultural land, residential settlements and water bodies.			
Historical Flooding and Inundation Events			
■ Per community consultation, it was found that Brahmani River breached its banks in the years of 2019, 2016, 2010 and 1994 due to excessive rains causing widespread inundation in settlements along the river and SH 9A which is the primary access to the Site; ■ The extent of flooding due to overflow of Brahmani River along its left bank has never exceeded beyond SH 9A (~ 1.3, ~2 km and ~2.5 km south of the unit-1, unit-2 and unit-3); ■ During September 2019, Brahmani River was overflowing due to backflow associated with high water levels in Chambal River. Therefore, the seasonal streams draining the Site area were not able to quickly discharge into Brahmani River. Minor effects of backflow were observed in the Site area and ponds. ■ Per community consultation, no history of widespread flooding/ inundation due to overflow from Brahmani River, nallas and/or embankment ponds was reported on-Site. However localized inundation in low-lying areas within Site was reported.			
Hydro-meteorological Data			
■ Average annual rainfall for period of 1980-2018 for Neemuch was 824 mm with the highest annual rainfall of 1,352 mm recorded in 2016; ■ Maximum daily probable rainfall for 25, 50, and 100 year return periods in Neemuch District are <220 mm, <240 mm, and <280 mm respectively;			
Hydrological and Geomorphological Data			
Catchment Analysis			

Attributes	Likelihood		
	High	Medium	Low
■ The Site and its immediate surroundings were observed to have very flat to gentle slopes with slopes varying between 0 – 10%. ■ In the Site area, the general slope of the Site area was observed to be from north to south. ■ Continuous gradient of 6.3 m/km, 7.1 m/km and 7.3 m/km were observed to be along the north to south vector in Unit-1, Unit-2 and Unit-3 respectively. ■ Most of Unit-1 area falls in the elevation range of 390-400 m amsl. South-western and south-eastern portions lying near Barwada Pond and S2 respectively were the lowest points varying between 390-400 m amsl within Unit-1. ■ Unit-2 area falls in the elevation range of 390-400 m amsl. South-eastern portion along the S3 were the lowest points varying between 370-390 m amsl. ■ Similarly, Unit-3 area falls in the elevation range of 370-400 m amsl. South-western portion comprising of areas near S4 and Badi Pond and south-eastern portion were the lowest points varying between 390-400 m amsl within Unit-3. ■ Based on the topography and slope maps, the Site area does not appear to have any pockets of 'low lying areas' with potential for water logging and flooding during rainy season which may be attributed to very gentle slopes.			
Secondary Data Review – Flooding and Inundation			
■ Per the District Disaster Management Plan – Neemuch District, the district is prone to floods. It was found the Site is not prone to flooding due to overflow from Gandhisagar Dam (40 km south-east of the Site, along Chambal River). ■ Per the global estimated risk index for flood hazard map developed by UNEP/GRID-Europe, the Site is not prone to flooding; ■ Per the global flood hazard map developed by FM Global, the Site is not prone to high or medium flood risk; ■ Based on Aqueduct's global flood hazard map, the Site and its surroundings fall in the "Low to Medium" river flooding hazard zone; ■ Based on global flood hazard frequency and distribution map developed by Data Basin, the Site and its surroundings is not prone to flooding.			

Based on the observations from the above-mentioned table, it appears that the overall likelihood of flooding event and its impact in and around the Site may be considered as ***'Medium'***.

Conclusions and Recommendations

Conclusions

Based on the observations from the above-mentioned table, it appears that the overall likelihood of flooding event and its impact in and around the Site can be considered to be *'Medium'*. The main high probability attributes are as follows:

- The Site Units are located along the left bank of Brahmani River. Brahmani River is located at distances of ~1.6 km, ~3.1 km and ~3.3 km to the South of the Unit 1, Unit 2 and Unit 3 respectively. The Site Units are located ~30 km north-west from the confluence of Brahmani River with Chambal River;
- Unit-1 is in close proximity of S1, S2 and Bardwada Pond, Unit-2 is in close proximity of Kawai Pond, S2 and S3 and Unit-3 is in close proximity of Badi Pond, S3 and S4;
- Per community consultation, it was found that Brahmani River breached its banks in the years of 2019, 2016, 2010 and 1994 due to excessive rains causing widespread inundation in settlements along the river and SH 9A which is the primary access to the Site;

- The extent of flooding due to overflow of Brahmani River along its left bank has never exceeded beyond SH 9A. The SH 9A is located ~ 1.3, ~2 km and ~2.5 km south of the unit-1, unit-2 and unit-3;
- During September 2019, Brahmani River was overflowing due to backflow associated with high water levels in Chambal River. Therefore, the seasonal streams draining the Site area were not able to quickly discharge into Brahmani River. Minor effects of backflow were observed in the Site area and ponds.
- Per community consultation, no history of widespread flooding/ inundation due to overflow from Brahmani River, nallas and/or embankment ponds was reported on-Site. However localized inundation in low-lying areas within Site was reportedPer community consultation, it was found that Brahmani River breached its banks in the years of 2019, 2016, 2010 and 1994 due to excessive rains causing widespread inundation in settlements along the river and SH 9A which is the primary access to the Site;
- The extent of flooding due to overflow of Brahmani River along its left bank has never exceeded beyond SH 9A (~ 1 km south of the Site);
- During September 2019, Brahmani River was overflowing due to backflow associated with high water levels in Chambal River. Therefore, the seasonal streams draining the Site area were not able to quickly discharge into Brahmani River. Minor effects of backflow were observed in the Site area and ponds.
- Per community consultation, no history of widespread flooding/ inundation due to overflow from Brahmani River, nallas and/or embankment ponds was reported on-Site. However localized inundation in low-lying areas within Site was reported.
- Per the District Disaster Management Plan – Neemuch District, the district is prone to floods. It was found the Site is not prone to flooding due to overflow from Gandhisagar Dam (40 km south-east of the Site, along Chambal River).
- Per the global estimated risk index for flood hazard map developed by UNEP/GRID-Europe, the Site is not prone to flooding;
- Per the global flood hazard map developed by FM Global, the Site is not prone to high or medium flood risk;
- Based on Aqueduct's global flood hazard map, the Site and its surroundings fall in the "Low to Medium" river flooding hazard zone;
- Based on global flood hazard frequency and distribution map developed by Data Basin, the Site and its surroundings is not prone to flooding.
- As per the 1-D mapping where maximum water levels at Brahmani River Bridge corresponding to Aug-Sep 2019 flooding event were mapped over the DEM, it was found that the Site is not prone to flooding from Brahmani River.

Considering the above mentioned attributes, the Site is *moderately susceptible* to flooding.

Recommendations

Based on the broad level assessment, following measures are recommended to protect the assets at Site from identified 'high probability attributes' and to prevent/mitigate their impact on the Site:

- Undertake a flood risk assessment to estimate the High Flood Level (HFL) at the Site. This will help the Client in estimation of the risks of flooding and inundation to the Site. Installation of solar panels and other critical infrastructure above the HFL will greatly reduce disruptions and lossed to the Plant;
- Enhance structural stability of banks of all seasonal streams such as S1, S2, S3 and S4 which are in close vicinity of the Site units and provide robust erosion protection to withstand flood water;

- Storm water drains must be designed in line with the natural topography and eventually drain into the natural seasonal streams in the Site area;
- Ensure that the Site's SWD outfalls are at an elevation higher than the maximum water levels of the natural seasonal streams;
- Provide sluice/ flap gates at the SWD outfall to prevent backflow during a backflow event;
- Make provisions for pumping infrastructure within the Site to ensure rapid evacuation of water in case of high flow/backflow associated with ponds and seasonal streams ;
- Implement an effective flood monitoring and disaster management system in place for effective mitigation of floods at a Site level;
- Coordinate with the district and local disaster management cells to update on flood early warning notifications

APPENDIX F ESMP- MANAGEMENT PLANS

4. Waste Management Plan
5. Water Management Plan
6. Occupational health and Safety Plan
7. Disaster Management and Emergency Response Plan
8. Construction and Labour Management Plan
9. Gender Action Plan
10. Stakeholder Engagement Plan

WASTE MANAGEMENT PLAN

All project generated wastes will need to be managed and disposed of in a manner to prevent potential impacts on the environment and risks to human health. A Waste Management Plan for the proposed Project has been developed. This has to be updated by the Solar Project Developer (SPD)/EPC contractor before start of activity.

Objectives

The construction and operation of the proposed project will generate various type of waste which will need appropriate collection, transportation, primary treatment and disposal. Hence, to serve the purpose, a Waste Management Plan has been formulated to demonstrate:

- Inventorisation of waste in different type of categories like garbage, rubbish, hazardous, waste etc.;
- Maintain the site in a clean and tidy state to reduce the attraction of pest species, impacts on the local environment and negative impacts on visual amenity;
- Suggestion of options for waste handling and disposal during construction and operation phase of the project
- Establish compliance to various national waste management related regulations
- Establish an appropriate training programme for contractors, workers and other stakeholders
- Define the roles and responsibilities for implementing the measures

Scope

This plan shall be applicable to the Solar Project Developers or EPC contractors engaged by RUMSL for the construction and operation and maintenance phase of the proposed project. The elements of the plan will be directly implemented by the Developers and contractors hired by the Developers while overall management and responsibility will lie with RUMSL. The Plan also identifies the individuals currently assigned to the various roles designated in this Plan.

Type of Waste and Source

The table below provides the list of type of waste likely to generate at site during construction and O&M phases.

Table E1 Details of Type of Waste

S. No	Waste Type	Source
Construction Phase		
	Non Hazardous Waste	
1.	Domestic solid waste	Temporary site office, storage area, labour activities
2.	Construction debris	Construction activities within Solar Park including construction of access road, substation, storage yard etc.
3.	Packaging waste containing wood, cardboard and other recyclables.	Packaging material from solar panels, cables and accessories
4.	Sludge from Septic Tank	Site Office and labour camp
5.	All non-recyclables waste	Construction activities
6.	Plastic waste	Packaging material
7.	Biomedical waste	First aid kits kept at construction site and site office

S. No	Waste Type	Source
8.	Broken solar panels and other electronics waste (E waste)	Solar Park, PSS and Site Office
9.	Batteries	Solar Park, PSS and Site Office
	Hazardous Waste	
1.	Used oil/waste oil, lubricants and oil contaminated rags	DG set, construction machinery
2.	Bio medical waste	First aid centre
Operation Phase		
	Non Hazardous Waste	
1.	Domestic solid waste and office waste	Site Office
2.	Metal Scrap	Site Office and PSS
3.	Damaged PPEs	Site Office and PSS
	Hazardous Waste	
1.	Used oil/waste oil, lubricants and oil contaminated rags	Maintenance activities at site
2.	Broken solar panels, batteries (dry type or wet type), electronics	Site office and PSS

Regulatory Context

The regulatory context for waste management in India has been provided in ***Table F2.***

Table F2 National Regulations for Waste management

Waste Stream	Regulation	Requirements for the waste generator(s)- (SPD/EPC Contractor)
Construction and Demolition Waste	Construction and Demolition Waste Rules, 2016	■ Waste generator shall be responsible for collection, segregation of concrete, soil and others and storage of construction and demolition waste generated, as directed or notified by the concerned local authority in consonance with these rules; ■ Waste generator shall ensure that other waste (such as solid waste) does not get mixed with this waste and is stored and disposed separately; ■ Waste generator shall keep the construction and demolition waste within the premise or get the waste deposited at collection centre so made by the local body or handover it to the authorised processing facilities of construction and demolition waste; ■ Waste generator shall ensure that there is no littering or deposition of construction and demolition waste so as to prevent obstruction to the traffic or the public or drains; ■ In case, quantum of C&D waste generating at site is estimated 20 tons or more in one day or 300 tons per project in a month, the Waste Generator shall segregate the waste into four streams such as concrete, soil, steel, wood and plastics, bricks and mortar and shall submit waste management plan and get appropriate approvals from the local authority before starting activities.

Waste Stream	Regulation	Requirements for the waste generator(s)- (SPD/EPC Contractor)
Solid Municipal Waste	Solid Waste Management Rules, 2016, as amended	■ Waste generated at the site should be segregated into biodegradable and non-biodegradable wastes; ■ Horticulture and garden waste generated within site should be stored separately and disposed as per the directions of the local body; and ■ Waste should not be thrown, burned or buried on streets, open spaces, outside the site premises or in drains/water bodies.
Hazardous Waste	Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016, as amended	■ Waste generator should be responsible for safe and environmentally sound management of hazardous waste; ■ Hazardous and other wastes should be sold to an authorised actual user or disposed authorized disposal facility; ■ Waste generator should take steps while managing hazardous and other wastes to contain contaminants, prevent accidents and limit consequences to human beings and the environment; ■ Waste generator should provide persons working in the site with appropriate training, equipment and information necessary to ensure their safety; ■ Waste generator should make an application to the State Pollution Control Board to obtain an authorization for managing hazardous and other wastes; ■ Waste generator should maintain a record of hazardous and other wastes managed by him/her in Form 3 of the HW Rules; ■ An annual return containing the details of the waste generated should be submitted through Form 4 of the HW Rules on or before the 30th day of June following the financial year to which the return related; ■ Waste generator may store the waste for a period not exceeding ninety days; ■ During transportation of hazardous waste, the waste generator should provide the relevant information as shown in Form 9 of the HW rules; ■ If waste has to be transported across state borders for disposal then an NoC is required from both State Pollution Control Boards; ■ The waste generator should prepare copies of the manifest of hazardous and other wastes before transportation and as given in Form 10 and provide a copy to the transporter, State Pollution Control Board and retain a copy; and ■ When an accident occurs at a facility handling hazardous waste, the operator should intimate the State Pollution Control Board through telephone or email about the accident and subsequently send a report.
Electronic Waste	E-waste (Management) Rules, 2016, as amended	■ Bulk consumers of electrical equipment should be channelized through collection centers or dealers of authorized producer or dismantler or recycler or through a designated take back service provider;

Waste Stream	Regulation	Requirements for the waste generator(s)- (SPD/EPC Contractor)
		■ Bulk consumers should maintain records of e-waste generated and make these records available to the State Pollution Control Board; ■ E-waste containing radioactive material should not be mixed; and ■ Bulk consumers should provide annual returns to the State Pollution Control Board before the 30th day of June following the financial year to which the return relates.
Plastic Waste	Plastic Waste Management Rules, 2016, as amended	■ Waste generator should take steps to minimize generation of plastic waste and if generated, then segregate plastic waste from municipal solid waste; and ■ Plastic waste should not be littered and handed over to urban local body or gram panchayat or approved agencies, registered recyclers or waste collection agencies.
Battery Waste	Batteries (Management and Handling) Rules, 2001, as amended	■ Batteries should not be disposed in any manner other than depositing with dealer, manufacturer, importer, assembler, registered recycler, reconditioner or at designated collection centres; and ■ Bulk consumers should file half-year return to the State Pollution Control Board.
Bio-medical waste	Bio-Medical Waste Management Rules, 2016	■ The bio-medical waste shall be segregated into containers or bags at the point of generation in accordance with Schedule I prior to its storage, transportation, treatment and disposal. ■ Obtain (one time) authorisation from the prescribed authority under BMWM Rules, 2016 ■ Maintain record pertains to quantum of category wise bio-medical waste generated and treated

Waste Handling, Management & Disposal

Construction Phase

All wastes produced from the Project activities on site will be temporarily stored in designated waste storage areas. All wastes that cannot be reused or recycled will be collected by approved waste contractors and transferred to an appropriately licensed waste management facility for treatment and disposal. Following steps will be taken to manage the waste generation during construction phase:

- Fuel will be stored on site in temporary aboveground storage tanks and will be stored in a locked container within a fenced and secure temporary staging area;
- Trucks and construction vehicles will be serviced off site;
- All concrete mixing be undertaken on impermeable plastic lining to prevent contamination of the soils and surrounding areas;
- Food waste and other refuse are to be adequately deposited in sealable containers and removed from the kitchen frequently to avoid accumulation;
- The use, storage, transport and disposal of hazardous materials used for the project will be carried out in accordance with all applicable regulations;
- All hazardous waste to be disposed off to MPPCB approved vendors;
- Material Safety Data Sheets (MSDS) for all applicable materials present on site will be readily available to on-site personnel;

- The construction debris will be placed in appropriate on-site storage containers and periodically disposed of by a licensed waste contractor;
- The construction contractor will remove refuse collected from the designated waste storage areas at the site at least once a week; and
- Empty fuel containers will also be stored at a secured area designated for scrap and sold to authorized vendors. All packaging material will also be collected at the storage area and sold to scrap dealers.
- ***Operation Phase***
- Damaged cells would need to be characterized and managed as hazardous waste. Following measures to be taken for management of waste:
- Developers need to have buy back agreements for defunct solar panels;
- A designated area needs to be demarcated within the premises for storage of defunct and broken solar panels with restricted access and on impervious surface;
- MNRE had prepared a concept note for storage and disposal of used solar panels. The recommendations such as recycling of glass, storage of discarded panels in cover shed etc. shall be adopted in the Project; (1);
- All fuel storage should be equipped with secondary containment and spillage trays;
- All used oil is required to send off to MPPCB approved vendors and recyclers; and
- Transportation of defunct solar panels is required to be undertaken as per the procedures specified by the Manufacture of Solar Panels.

Handling of Broken Solar Modules generated due to cleaning and other maintenance activities

Impact	Mitigation Measure
Land Contamination (Soil Quality)	■ Broken or damaged solar panels are required to be shifted to a designated area in scrap yard to avoid any type of land contamination. ■ The designated area should be isolated and to be established on an impervious surface. ■ A photograph is to be taken of the broken panel at the site to cater to Insurance settlement claims
Risk on Health of Workers	■ Proper PPE are provided to the workers handling the broken solar panels. ■ The workers at site are also on regular basis apprised about the potential health risks associated with handling of solar panels.

Roles and Responsibilities

Site Supervisor (SPD/ EPC Contractor)

- Site Supervisor will be responsible for the following activities
- Management of onsite waste generation associated with construction works to help avoid excessive generation where practicable;
- Maintaining all records of waste type which are construction waste and debris, hazardous waste;
- Liaising with Madhya Pradesh Pollution Control Board (MPPCB) approved vendors for disposal of hazardous waste generated;
- Renewal and Management of Buy Back Agreements for defunct solar panels with the Manufacturers;
- ***EHS Manager (SPD/ EPC Contractor)***

(1) http://164.100.94.214/sites/default/files/webform/notices/DraftBluePrintAntimony.pdf

The following responsibilities are entrusted to the EHS Manager:

- Demarcation of area within the module area for keeping of segregated wastes;
- Labelling of the drums containing hazardous wastes like used oil;
- Maintaining of receipts for hazardous waste management records;
- Notifying the Site Supervisor of any activity that may generate a large amount of waste to allow appropriate controls to be put in place to manage waste generated; and
- Ensure safe transportation of defunct solar panels as per specified procedures.

WATER MANGEMENT PLAN

The construction and operation & maintenance activities will require water. A Water Management Plan has been prepared for the Project to support the ESIA process. The Plan was developed to meet the objectives of water management during the construction and operation of the Solar Park. Plan is based on the assessment of impacts on water resources, quality, which would occur during the site preparation and operation phase of the Project.

Objectives

The Water Management Plan aims to ensure that water consumption during the project life cycle do not result in unacceptable impacts on the water resources and surrounding community. It focuses on the strategies to be used to monitor the water quantity, conservation measures, and recycling of water within the Project. The objective of this Water Management Plan (WMP) is

- Monitoring water consumption in the Project during construction and O&M activities;
- Delineate mitigation/management measures to be implemented during construction and O&M phases;
- Establish compliance of National Standard for Discharges
- Establish an appropriate training programme for contractors, workers and other stakeholders
- Define the roles and responsibilities for implementing the measures

Scope

This plan shall be applicable to the Solar Project Developers or EPC contractors engaged by RUMSL for the construction and operation and maintenance phase of the proposed project. The elements of the plan will be directly implemented by the Developers and contractors hired by the Developers while overall management and responsibility will lie with RUMSL. The Plan also identifies the individuals currently assigned to the various roles designated in this Plan.

Water Resources

Surface Water

The study area is drained by Brahmini River and its tributaries. The Project site is devoid of any surface water body such as lake, dam, pond or river. Brahmini River flows about at distances of ~1.6 km, ~3.1 km and ~3.3 km to the South of the Unit 1, Unit 2 and Unit 3 respectively. A water body is located adjacent to Unit 3 in SE direction.

Ground Water

The principal source of water in the study area is groundwater. During community consultations in Project villages, a total of 200- 250 dugwells and 300-400 tubewells were reported in Badi, Kawai and Bardawada villages. General depth of the dugwells was reported in the range of 80-100 feet (24-31 m). General depth of tubewells was reported in the range of 450-800 feet (137- 245 m). Approximately 90 % of the dugwells and tubewells were reported with only seasonal water availability influenced by the rainfall. Only the tubewells located in the proximity of surface water bodies were reported to provide water to the community throughout the year.

Water Requirement

The tables below provides details with respect to water requirement at site during construction and O&M phases.

Table F3 Details of Water Requirement for the Project

S. No	Particulars	Water Requirement
Construction Phase		
1.	Domestic Purposes	80-100 KLD
2.	Construction Activities	250-300 KLD
Operation Phase		
1.	Cleaning of Solar Panels	308 KLD
2.	Domestic Purposes	10 KLD
3.	Landscaping	7 KLD
4.	Firefighting and Miscellaneous	32 KL

The water requirement for the Project will be met through tanker water supply during construction phase. Whereas, during O&M phase, ground water will be used for domestic purposes and solar panel cleaning activities.

Waste water Generation

Wastewater will be generated from the following sources:

- Construction Phase
  - Sewage: site office, labour camp.
  - Surface runoff from site
- Operation Phase
  - Sewage: site office
  - Wastewater from solar panel cleaning activities

The domestic wastewater generated from the site will be collected through septic tank and followed by soak pit.

Regulatory Context

The regulatory context for water management in India has been provided in Table below.

Table F4 National Regulations for Water management

Regulation	Requirements
The Water (Prevention and Control of Pollution) Act, 1974 and its amendment, 1988	■ This Act provides for the prevention and control of water pollution and maintaining or restoring good water quality for any establishment. ■ Any waste water discharge shall be within the discharges limits prescribed by CPCB.

Regulation	Requirements
Guidelines/Criteria for evaluation of proposals/ requests for ground water abstraction by CGWB	■ Permission from CWGB shall be taken prior to any ground water abstraction for construction and O&M activities. ■ The Project site falls under Jawad Block which is categorized as Critical by CGWB. As per guidelines, groundwater withdrawal may be permitted subject to ■ Undertaking of ground water recharge measures. The withdrawal should not exceed 100% of the recharged quantity. ■ The recharge should be implemented within the premises and/or same water shed/assessment unit. Detail project proposal shall be included along with the application for NOC.

Impact Avoidance and Impact Mitigation

Conserving Water Resources

- Construction Phase
  - Optimum use of water during sprinkling on roads for dust settlement, washing of vehicles, concrete mixing for foundation etc.;
  - Regular inspection for identification of water leakages and preventing wastage of water from water supply tankers, camp area.
  - Construction labour deputed onsite to be sensitized about water conservation and encouraged for optimal use of water;
  - Minimum use of water in cleaning/washing of equipment's and vehicles;
- Operation Phase
  - Feasibility of dry cleaning of solar panels shall be examined;
  - Use of water-efficient technologies for cleaning the solar panels and domestic consumption nodes;
  - The surface runoff from during solar panel cleaning shall be diverted to a settlement tank for settlement of suspended solids. The overflow shall be treated in water treatment unit and recycled in the Project.
  - Optimising water usage in the SCADA building by application of water conservation measures such as sensor based taps, low flush urinals etc.;
  - Maintain logbook for water consumption;
  - Use of water from multiple sources to avoid dependency on one particular source (groundwater or surface water). This also includes tapping of rainwater received during the monsoons for the long-term and uninterrupted operations.
- The Project should implement principles of water stewardship to ensure water security not just for the site, but also for other stakeholders within the watershed. Some of the water stewardship frameworks/ standards that can be adopted are UN Global Compact's CEO Water Mandate or AWS Standards.
- Identify stakeholders directly impacted by the groundwater use at the Project site and develop long- term stakeholder engagement plan particularly focused on stakeholders near site to develop positive perception towards Project and its operations.

Rain Water Harvesting

The ground water status in Jawad block has been declared as critical area. In order to comply with CGWB guidelines for ground water abstraction, ground water recharge is mandatory in the Project.

RUMSL shall plan to provide rainwater harvesting provision at site. For this purpose, rainwater harvesting pond shall be provided at site. In addition, groundwater recharge shall be undertaken within the Site to replenish the shallow aquifer zones.

Piezometers to be installed to monitor the groundwater level changes in the aquifer trapped by the abstraction wells at Project site.

Water Quality

- Ensure proper cover and stacking of loose construction material at site to prevent surface runoff and contamination of receiving water body;
- Open defecation and random disposal of sewage will be strictly restricted;
- Planning of toilets, soak pits and septic tanks, waste collection areas away from natural drainage channels;
- Provision of number of toilets across with easily accessible location as the project site is spread across large area of 3 units;
- Use of licensed contractors for management and disposal of waste and sludge;
- Labourers will be given training towards proactive use of designated areas/bins for waste disposal and encouraged for use of toilets;
- Provision for impervious storage area, especially for fuel & lubricant, hazardous waste, etc. will be made onsite; and
- Spill/ leakage clearance plan to be adopted for immediate cleaning of spills and leakages.

Other Management Aspects

Inventory of Water Consumption and Pollution Sources

Preparing an inventory of water consumption during construction and O&M activities and all pollution sources from the Project activities is essentially the first step towards managing the impacts. The Management Plan will involve preparation of an up to date inventory of all areas of water consumption and wastewater discharge sources based on the latest Project activity related information. This inventory will helps in formulating the following management approaches:

- Source reduction
- Resource recovery options
- Recycle options
- Optimal treatment strategies and technologies
- Post-treatment, resource recovery and recycle options
- Ultimate disposal considering the local environmental sensitivities

The inventory database of discharge sources shall be kept as a living document and updated as and when any new sources are cited at any point in time of the Project period. Any intermittent water requirement and discharge sources shall also be identified and included in the inventory.

Responsibilities and Accountabilities

EHS Manager

The EHS Manager of SPD/EPC contractor will be responsible for:

- Implementing the mitigation measures mentioned in this management plan;
- Maintain a database which will record the water consumption quantities and waste water generation at different locations;

- Monthly review of water consumption and waste water generation in the project;
- Conducting regular audits around the Project site to inspect water management practices;
- Conducting regular audits for rainwater harvesting;
- Review conditions of storage location and records related to hazardous wastes as per the conditions of authorization

All employees and sub-contractors will be provided with environmental awareness training through a site induction process. All employees and contractors will have a responsibility to manage operations in an environmentally responsible manner and report any visible emission/ discharge/ accidental spillage. All pollution related environmental incidents will be reported to the EHS manager.

OCCUPATIONAL HEALTH AND SAFETY PLAN

The section below presents an overview of the potential occupational health and safety risks on the proposed project. It defines the various risks involved during the construction and operation phase of the project. The occupational health and safety plan (OHSP) will address the following:

- Evaluation and Identification of hazards;
- Elimination and removal of hazards;
- Control of Hazards which cannot be eliminated; and
- Recovery from accidents.

Purpose and Scope

This plan provides guidance with respect to occupational risks (for both construction and operation stage) and aims to achieve the following:

- Identification of hazards, associated risks and control measures for each activity;
- Defining responsibilities to ensure effective implementation of health and safety (H&S) risk control measures;
- Avoid and/or minimise the impacts on workers and local communities' health due to various project activities;
- Provide and maintain safe working procedures and operations for workers; and
- Reduce human injury and damage to property and environment in case of an emergency.

Definitions

- **Competent Person**: any person having the knowledge, training and experience specific to the work or task being performed.
- **Confined Space**: "Confined space" means a compartment of small size and limited access which by its small size and confined nature can readily create or aggravate a hazardous exposure.
- **Emergency**: An unforeseen occurrence, a sudden and urgent occasion for action
- **First aider**: A person who has received training and who holds a current first aid certificate from an organization or employer whose training and qualification for first aiders are approved by authority.
- **Hazard**: A source, situation or act with a potential for harm in terms of:
- ill Health
- damage to property, plant, ships etc.
- production losses or increased liabilities
- **Hazardous Substance**: The term "hazardous substance" means a substance which by reason of being explosive, flammable, poisonous, corrosive, oxidizing, irritant, or otherwise harmful is likely to cause injury.
- **Health and Safety Plan:** A documented plan which addresses hazards identified and includes safe work procedures to mitigate, reduce or control the hazards identified.
- **Hot Work**: The term "hot work" means riveting, welding, burning or other fire or spark producing operations.
- **Incident:** An event or occurrence occurring at work or arising out of or in connection with the activities of persons at work, or in connection with the use of plant or machinery.
- **Risk**: the probability that injury or damage will occur
- **Safe**: free from any hazard

Roles and Responsibilities

Site Supervisor (SPD/EPC Contractor)

- Following tasks will fall within his/her responsibilities:
- Monitor site activities on weekly basis for compliance;
- Supervise the performance of the work being carried out within the project boundary;
- Conduct internal audits of the construction site against the ESMP;
- Confine the construction site to the demarcated area; and
- Keeping a check on operation and maintenance services of solar project components required during operation phase.

EHS Manager (SPD/EPC Contractor)

- Responsibilities of an EHS Manager shall include the following:
- Ensure that the operations are in compliance with EHS requirements at all times;
- Conducting HS&E Audits on regular basis & advice management for necessary action;
- Maintaining first aid facilities and personal protective equipment as demanded by the nature of the work/Material Safety Data Sheets;
- Review of investigation of all type of accidents & reporting to Site Supervisor;
- Training of workers and ensuring that they are issued with adequate instructions and creating awareness of safe work practice among them;
- Carrying out Job Safety Analysis to determine “Hazards of the operations/activity” and facilitating suitable solutions; and
- Participate in the preparation of, all Safety instructions, procedures and activities.

Safety Officer(s)

- The developer shall ensure appointment of safety officer(s) for employees and workers working at site, to:
- Review the effectiveness of health and safety measures;
- Identify potential hazards and potential major incidents;
- Examine the causes of incidents in collaboration with his employer,;
- Investigate complaints by any employee /workers relating to that their health or safety on the site;
- Inspect the site with a view to, the health and safety of employees, at regular intervals;
- Participate in any internal health or safety audit.

First Aider

- Initial emergency response resuscitation and stabilization of critically ill or injured personnel;
- First Aid of non-emergency medical conditions;
- Implementation of site health plans and preventive medicine activities including first aid training of employees and workers; and
- Undertake regular health and hygiene inspections.

Workers

- Use the correct tools and equipment for the job;
- Use Safety equipment and protective equipment/clothing supplied, e.g. Safety helmets, shoes, harness, goggles, etc.; and
- Report all defects in plant or equipment to health and safety representatives.

Risk Assessment

- Contractor shall before the commencement of any work on site and during construction work, ensure to undertake risk assessment by a competent person. Such an assessment shall as a minimum :
- Identify the risks and hazards to which persons may be exposed to;
- Analyse and evaluate the identified risks and hazards;
- Document a plan of safe work procedures, including the use of any personal protective equipment or clothing and the undertaking of periodic “tool box talks” or inductions before undertaking hazardous work, to mitigate, reduce or control the risks and hazards that have been identified;
- provide a monitoring plan; and
- Provide a review plan.
- Risk assessment is an important step in protecting workers. It helps to focus on the potential risks in a particular workplace. Workers and others have a right to be protected from harm caused by a failure to take reasonable control measures.

Training

- Site Supervisor shall ensure that every employee/worker (direct or contractual) is aware of the EHS risks associated with the work being carried out at the site and is trained and competent in the relevant work practices and maintenance procedures.
- Procedures to identify training needs to be established and adequate safety training to be provided to all the employees/ workers on site. The safety training should provide staff with the knowledge and skills necessary for organising and managing occupational safety and health programmes; team leaders with leadership skills and knowledge to lead, implement and apply occupational safety and health activities; and workers with the knowledge, skills and right attitudes to enable them to work safely.
- HSE trainings proposed for the project to include:
- Induction training on HSE
- Tool Box Training or pre-task briefings, highlighting hazards and the method of dealing with them
- Special Job Hazard Training including entry into confined space and other hazardous environment
- Hot work;
- Working at height;
- Electrical safety;
- Fire Safety
- First Aid
- Emergency Response
- Use of PPEs

Documentation and Record Keeping

Site Supervisor should maintain data and records concerning the identification of hazards, assessment and control of risks of the ongoing activities. The document should establish and maintain procedures for controlling all relevant EHS documents and data. Such documents can include but not limited to:

- Hazard Identification Record;
- Risk Register;
- Legal Register;
- Licenses, Certificates, Permits;
- Control Methods including process control and machine design, safe work procedures, in-house work rules;
- Work Permit System;
- Training Reports;
- Drill Reports;
- MoM of HSE meetings;
- Inspection and Audit Records; and
- Medical and Health Surveillance Records

Communication and Information Dissemination

Supervisor(s) should communicate and inform any persons affected by the risks about:

- The nature of the risks involved; and
- The control measures or safe work procedures to be taken to address the risks involved.

Safe Work Practices

Construction and operation of the Solar Park involves many on job hazards which needs to be identified and eliminated or minimised to an expectable level in order to achieve a safe and healthy work environment. Following safe working practices should be established for site works (not limited to):

- Lockout/Tagout (LOTO)
- Crane and Hoist Safety
- Electrical
- Heat Stress
- Personal Protective Equipment

Lockout/Tagout (LOTO)

LOTO refers to specific practices and procedures to safeguard employees from start-up of machinery and equipment, or the release of hazardous energy during service or maintenance activities. Many workers face the greatest risk of injury if lockout/tagout is not properly implemented. Solar energy equipment can generate electrical energy and may be connected to electrical circuits. Workers may be exposed to electrical hazards from solar panels, PSS/ SCADA inverter room activities and from electrical circuits. LOTO is required to be implemented while working in PSS, SCADA and inverter room. While installing or servicing solar panels, employers should assure that workers cover the solar panels, in addition to protecting workers from electrical circuits. Workers performing servicing or maintenance of solar panels may be exposed to injuries from the unexpected energization or release of stored energy in the equipment.

The following are some of the significant requirements of a Lockout/Tagout procedure required under a Lockout/Tagout program.

- Only authorized employees may lockout or tagout machines or equipment in order to perform servicing or maintenance;
- Lockout devices (locks) and tagout devices (tags) shall not be used for any other purposes and must be used only for controlling energy;
- Lockout and Tagout devices (locks and tags) must identify the name of the worker applying the device;
- All energy sources to equipment must be identified and isolated;
- After the energy is isolated from the machine or equipment, the isolating device(s) must be locked out or tagged out in safe or off position only by the authorized employees;
- Following the application of the lockout or tagout devices to the energy isolating devices, the stored or residual energy must be safely discharged or relieved;
- Prior to starting work on the equipment, the authorized employee shall verify that the equipment is isolated from the energy source, for example, by operating the on/off switch on the machine or equipment;
- Lock and tag should not be removed from the machine until the work is completed; and
- Only the authorized employee who placed the lock and tag must remove his/her lock or tag.

Electrical

Solar energy workers while working in PSS, SCADA and inverter room are exposed to potential electrical hazards present in their work environment, which makes them more vulnerable to the danger of electrocution and arc flash hazards. Workers may be exposed to electric shocks and burns when hooking up the solar panels to an electric circuit.

Workers must pay attention to overhead power lines and stay at least 10 feet away because they carry extremely high voltage. Fatal electrocution is the main hazard, but burns and falls from elevations can occur while installing solar panels. Another hazard is from using tools and equipment that can contact power lines.

Heat Stress

Solar energy workers often work in very hot weather where hazards include dehydration, heat exhaustion, heat stroke, and death. Employers should monitor employees and workers should be trained to identify and report early symptoms of any heat-related illness.

Heat Stroke occurs when the body's system of temperature regulation fails and body temperature becomes abnormally high. If a worker shows signs of possible heat stroke, medical treatment should be obtained immediately.

- Workers suffering from heat exhaustion should be removed from the hot environment and given fluid replacement. They should also be encouraged to get adequate rest.

Personal Protective Equipment (PPE)

Using personal protective equipment is often essential, but it is generally the last line of defence after engineering controls, work practices, and administrative controls. Solar energy employers must assess their workplace to determine if hazards are present that require the use of protective equipment. Solar energy workers can be exposed to many hazards that may require the use of safety glasses, hard hats, gloves, respirators, or other personal protective equipment used to protect against injuries and illnesses. Workers exposed to potential electrical hazards must be provided with appropriate electrical protective equipment, and workers must use them. Electrical protective equipment must be maintained in a safe and reliable condition. They must be periodically inspected or tested for their workability.

General Working Conditions

Housekeeping

- Work areas should be maintained in a neat and orderly condition;
- Scrap material, such as rags, bolts and wedges should not be allowed to accumulate in the site area; Spills of oil, grease, paint and other slippery substances should be cleaned up immediately;
- Walkways should be kept clear of tripping hazards at all times;
- All personal protective equipment required for a procedure must be worn;
- Maintain a free access to all safety equipment including firefighting equipment, electrical panels and boxes, etc.;
- Proper barricades, safety rings and safety wires should be used. Barricades must be properly lighted for visibility;
- Operating equipment, tools or machinery without proper guards and/or signalling devices is prohibited;
- Observe all warning signs in the yard; and
- Before leaving the job, always check the area for any sparks or smouldering materials.

First Aid

- All work areas must be provided with adequate first aid facilities with a trained first aider during working hours; and
- Developer(s) must provide or ensure that there is provision of adequate and appropriate facilities for enabling first aid to be rendered to their employees if they are injured or become ill at work.

EMERGENCY RESPONSE AND DISASTER MANAGEMENT PLAN

The primary objective of formulating Emergency Response and Disaster Management Plan (ERDMP) is to undertake immediate rescue and relief operations and stabilize the mitigation process as quickly as possible. A site specific ERDMP shall be prepared by SPD/EPC Controller for the site.

The basic concept of the plan is to allow for smooth coordination of activities during an emergency. All employees and contractors shall be familiar with the plan. This plan shall be reviewed and amended when needed to ensure that all parties concerned are furnished with up-to-date information. The site supervisor with support of EHS team shall carry out exercises of part of the emergency plan at a regular interval as deemed necessary. The lesson learnt from these exercises shall be documented and used during the updating of this emergency response plan.

Objectives

The key objectives of the Plan are to:

- To localize the emergency and if possible eliminate it;
- To avoid confusion, panic and to handle the emergency with clearly defined actions;
- To reduce the incidence and severity of injury during mining operations;
- Identify the designated personnel and responsibilities for dealing with emergencies on and off-site;
- To take remedial measures in a quickest possible time to contain the incident and control it with minimum damage; and
- To mobilize the internal resources and utilize them in the most effective way.

Identification of Hazards and Emergency Categorization

Identification of all the hazards and risks associated with each activity which may lead to an emergency and anticipate the actions to be taken before or after the emergency arises. This section identifies the hazardous areas and activities in both construction and operation phases. Probable emergencies that might arise due to these hazards for the duration of the project have been listed below.

Hazardous Areas

Following potentially hazardous areas and activities have been identified at the construction site:

- Fuel storage areas
- Kitchen arrangement in labour camps
- Electrical installations – improper laying of cables
- Scaffolds

Emergency Situations

The possible emergency situations identified for the construction and operation phases of the Project are as listed below:

Fire and Explosion

- Leakage of fuel from storage areas; and
- Short-circuit at campsite/Project site.

Mechanical and Electrical Hazards

- Structural Collapse;
- Accidentally dropped object;
- Loss of stability; and

- Electrocution.

Occupational Hazards

- Outbreak of Disease / Illness/injury;
- Handling of chemicals;
- Accidents due to vehicle movement/ vehicle collision; and
- Vandalism.
- **Other emergencies**
- Flooding;
- Earthquake;
- Cultural Conflict;
- Terrorism;
- Bomb Threat.

Categorization of Emergencies

Level 1 (Minor Emergencies)

All events with no escalation potential and which can be controlled and contained by the action of Safety Officer at the site will be considered as Level 1. In such cases of local alert, EHS Manager of RUMSL will be notified. Some typical incidents are:

- Vehicle collision (involving no loss of life);
- Medical Evacuation (not very serious cases);
- Minor localized fires.
- ***Level 2 (Serious Emergencies)***

All events with escalation potential, depending on the effectiveness of the local response will be considered as Level 2. These incidents may impact the entire construction activity/ project operations or have cascading effect. For such type of incidents Site Supervisor will take the lead. Some typical incidents are:

- Substantial security incident / Vandalism;
- Structural collapse;
- Minor Flooding;
- Serious damage to structures;
- Substantial fire; and
- Cultural conflict.

Level 3 (Major Emergency)

The crisis that requires assistance from external resources in order to save lives, minimize damage and to bring the abnormal situation back under control are Level 3 emergencies. These incidents have the potential to impact beyond the project footprints and affect the community. In such cases appropriate government / regulatory authorities will be informed and involved. Some typical Level 3 incidents are:

- Major fire/explosion;
- Fatality;
- Severe flooding;
- Terrorism;

- Bomb Threat
- Personnel on site will know that a Major Emergency has been declared if the site fire alarm siren and /or the local fire alarm systems are activated. The Emergency Siren Modes will be demonstrated and shared with all workers to identify with them.

Level 2 and level 3 will be declared using emergency siren and evacuation shall be done.

Codification of Sirens

Following codes of siren are proposed during emergencies:

- ON SITE EMERGENCY (ALERT) for evacuation - 120 seconds Continuous Whelming Sound
- EMERGENCY CONTROLLED - 30 + 30 + 30 seconds sound with an interval of 5 seconds each

Emergency Facilities

Emergency Control Centre (ECC)

For the purpose of handling emergency, separate emergency control centre should be established. All communications to and from should originate from this control centre. The site office has been identified for establishment of ECC. All the key personnel such as Site Controller/ Incident Controller Officers, Senior Personnel would be located here or have access to the ECC. The ECC will also coordinate with offsite District Emergency Operation Centre (DEOC).

Infrastructure at Emergency Control Centre

Emergency control centre should therefore contain the following:

- A copy of on-site emergency plan;
- A copy of evacuation plan;
- An adequate number of internal and external telephones lines;
- Layout of fire-fighting system including locations of fire extinguishers with their type,
- Location of assembly points;
- Information on additional sources of water;
- List of important telephone numbers such as Police, Fire Brigade, Hospitals, and other outside Emergency Services, etc.;
- List of key Personnel with addresses and telephone numbers;
- List of Personal Protective Equipment;
- First Aid box;
- Alarm Control system.

Assembly Areas and Evacuation Routes

Safe assembly areas shall be identified and marked and employees to be instructed to gather at the assembly area during emergencies. The evacuation routes/plans shall be displayed at all strategic locations across the site.

Emergency Equipment

The following should be implemented to tackle emergency situations:

- Onsite emergency equipment such as first aid boxes, firefighting equipment, PPEs etc. shall be maintained at project site;
- The adequacy and availability of emergency equipment shall be assessed at periodic intervals by the EHS Manager;

- Inventory and locations of respective emergency equipment shall be displayed at project office building, construction areas and other work areas;
- It is to be ensured that the site staff is trained on usage of each type of emergency equipment.

First Aid Boxes

First aid boxes shall be provided at identified locations within the Project premises. A first aid box shall contain, but not limited to the following articles:

- Cotton wool
- Sterile gauze
- Antiseptic lotion
- Box of adhesive dressing (Plasters) for small wounds
- Blunt-ended scissors
- Tweezers for removing splinters
- Triangular bandages (for making a sling or emergency bandage)
- Safety pins
- Sterile eye dressings
- Crepe bandages
- Skin creams for treating burns
- Anti-histamine cream for insect bites and stings

Fire Fighting Equipment

The fire extinguishers and sand buckets will be provided at critical areas such as fuel storage area, waste storage area, labour camps, kitchens, areas with electrical installations and project office.

Other firefighting systems to be installed should include:

- Heavy-duty ABC powder type fire extinguishers kept at important electrical equipment areas;
- Portable CO2 extinguishers provided throughout the plant;

Provision of Personal Protective Equipment (PPE)

Onsite workers and site staff should be provided with adequate number of personal protective equipment (PPEs) to deal with emergency situations. The PPEs shall be stored at the designated Emergency Control Centre (ECC) in the site premises and will be easily accessible during times of emergency. Training of proper use of PPEs shall be provided to all working personnel on periodic basis.

Stretchers, and general first aid materials for dealing with burns, burns, fractures etc. would be maintained in the Medical Centre as well as in the ECC. A range of medicines should be maintained in the ECC/ Medical Centre. Other emergency medical equipment as suggested by local administration for COVID pandemic should be provided and maintained. Apart from first aid facilities, external facilities would be augmented. Checklist of name of medical personnel, medical facilities available in the surrounding area to be prepared and updated.

Incident Management System

Emergency Response Team

The Emergency Response Team (ERT) shall be set up for construction phase and shall be revised for commencement of plant operations.

Each personnel identified as part of the ERT shall be designated specific roles and responsibilities for handling emergency situations.

The ERT at the operating site under its control will have following role:

- Control the emergency and render the facility premises safe by the application of local resources; and
- Support the local response effort by co-ordinating additional equipment, personnel, and other external resources for the direct response effort.

Following Emergency Response Team (ERT) is proposed:

- **Site Controller**: The site supervisor would be designated as site controller during emergency.
- **Incident Controllers/Disaster response coordinator**: Health and safety team responsible for different activities would be designated as incident controller/disaster response coordinator. All incident controllers shall report to site controller.
- **Emergency Coordinators**: Emergency coordinators would be appointed who would undertake the responsibilities like fire fighting, rescue, rehabilitation, transport and support services. For this purposes, security in-charge, personal department, essential services personnel would be engaged.

Site Supervisor

The Site Supervisor or personnel nominated by him shall be the Site Controller and responsible for overall management. The following tasks will fall within his/her responsibilities:

- Assess the magnitude of the situation
- Maintain a continuous review of possible development and assess in consultation with Incident Controller and other Key personnel
- Review monthly and annual incident reporting
- Review disaster response drill outcomes and work with EHS Manager and safety officers to identify necessary improvements
- Appoint a Disaster Response Coordinator tasked with responding to emergencies
- Overall coordination during emergency
- Communication with the District Disaster Management Authority and other external agencies
- Issue authorised statements to news media, and ensure that evidence is preserved for inquiries to be conducted by statutory authorities

EHS Manager

EHS Manager will be part of Incident Controller team. The duties of an EHS Manager shall include the following:

- Direct all operations within the affected areas with the priorities for safety of personnel, minimise damage to the property and loss of materials
- Pending arrival of Site Controller, assume the duties of his post and, in particular
- Direct the shutting down and evacuation of areas likely to be adversely affected by the emergency
- Provide advice and information to the Fire squad & Security Officer and the local fire service as and when they arrive
- Ensure that all non-essential workers/staff of the areas affected are evacuated to the appropriate assembly points, and the areas are searched for casualties
- To set up communication point and establish contact with Emergency Control Centre

- Distribution of the DMP to all parties with responsibilities in implementing the plan (including contractors);
- Review monthly and quarterly reports of accidents/incidents and reviews of contractor practices;
- Training and Planning mock drills;
- Receive all notifications of incidents/accidents and ensure proper response is being followed including reporting and review.
- ***Safety Officer***

Safety officer will be part of Incident Controller team. Responsibility of Safety Officer includes:

- Support the EHS Manager as required in disaster response planning and in development of training and management plans to ensure environmental concerns are addressed;
- Provide regular incident reporting;
- Schedule monthly inspections and audits and resolve issues identified;
- Schedule emergency response training sessions for relevant staff;
- Prepare monthly incident reports.
- ***Emergency Coordinators***
- Ensure they are easily recognizable to their colleagues/visitors and the emergency services during any evacuation;
- Responsible for all occupants' safety during evacuation and to ensure the safety for personnel to re-enter the site;
- Keep an updated list of employees and visitors on site and carry the name list with them during evacuation;
- Ensure all occupants have evacuated the area where the incident has taken place (including people in rest rooms, site office rooms etc.);
- To be fully trained in the provision of first aid.
- ***Employees/Workers***
- All persons employed or under service contract (e.g. contractor, transporter etc.), who witnesses or cause an incident are responsible for immediate reporting of the incident to his/her supervisor.

Emergency Response Procedure

Effective command and control starts with a clear definition of the overall command and control structure, and description of the duties of key personnel with specific responsibilities for emergency response. The control of emergencies will consider the minimum number of persons required to provide an adequate response to emergencies.

All emergencies occurring as a result of project activities shall be managed according to the following order of priorities:

- Preservation of Life (self, team, community);
- Protection of the Environment;
- Protection or Property/assets; and,
- Preservation of Evidence.
- Emergency procedure to be followed in the event of any emergency are provided below:

Emergency	Procedure
Medical Emergencies	■ If a person finds someone injured, he shall immediately tell his shift Incharge about the accident; ■ The shift Incharge shall inform the ECC and First Aid Team about the injury and location of accident. ■ On receiving the information, First Aid Team should go to the accident site immediately; ■ First Aid team shall provide the first aid to the injured person and make necessary arrangements for taking him to the hospital, if required; ■ After this, First Aid Team shall report the ECC and make entries in the register about the incident, it's cause and measures taken ■ Medical emergencies can be classified as life threatening or non-life threatening. If there is any doubt, assume that the emergency is life threatening. ■
Fire	■ The Incident controller must be notified; ■ Personnel in the immediate vicinity of the fire, including the designated Evacuation personnel must be immediately notified; ■ All persons located in the area in which the fire is located must be evacuated. Evacuation must be carried out as per the Evacuation Procedure; ■ The fire must be contained with the correct extinguisher only by those trained to do so; ■ Those requiring assistance must be assisted and first aid must be rendered only by those trained to do so; ■ Those confined to an area where there is smoke, must move under the level of the smoke and cover their nose/mouth.
Building Collapse	■ The Incident Controller must be notified; ■ Personnel in the immediate vicinity of the collapsed building move away from the building to a safe location - there could be a secondary collapse; ■ Enter and rescue others only by those trained to do so; ■ If you know the identity or location of someone who is trapped, notify emergency personnel; ■ All persons located in the area must be evacuated. Evacuation must be carried out as per the Evacuation Procedure.
Earthquake	■ Actions during earthquake ■ Keep self and other calm; ■ Do not rush to doors or exit; ■ Keep away from loose articles/ furniture; and ■ Protect yourself by staying under the rental of an inner door, in the corner of a room, under a table. ■ Action after an earthquake ■ Keep calm; ■ Expect aftershocks; ■ If there is a fire, try to put it out. If required call the fire brigade; ■ If people are seriously injured, do not move them unless they are in danger; ■ Do not enter badly damaged buildings; and ■ Do not go near damaged structures. ■ Further Action ■ All person to assemble at assembly area; ■ Attendance of everyone present including direct and non-direct staff and visitors; ■ Rescue management to be initiated, if required additional help to be sought from authorities; and ■ RUMSL management to be briefed about the situation.
Flooding	■ The Incident Controller must be notified; ■ All personnel onsite, including the designated Evacuation Personnel must be immediately notified;

Emergency	Procedure
	■ All equipment must be safely shutdown and all electrical equipment must be isolated. ■ During monsoon season, all emergency supplies to be kept handy at ECC and assembly point, such as flashlights, portable battery operated radios, extra batteries, emergency food and water, essential medicines, first aid kits etc.; ■ ECC should keep track on rainfall intensity and local weather forecast during the monsoon season; ■ The site controller should get into communication with DEOC and informing about the current situation at the site; ■ The onsite Emergency Response Team to help the Government Relief team in guiding them about the site and rescuing the people in the affected areas
Terrorism	■ Actions to be taken in response to terrorism include: ■ Run to a safe place, if there is nowhere to go; ■ Turn your phone to silent and turn off vibrate. Barricade yourself in if you can ■ Call for police help, when it is safe to do so. ■ Further actions: ■ Help others with first aid, if it is safe to do so; ■ Tell the police what all you saw.
Bomb Threat	■ Actions taken in response to such a threat should be prompt and assure the safety of all. While a bomb threat may be a hoax, all such threats should be treated seriously. Procedure is as follows: ■ Do not touch anything electrical equipment including turning lights on or off. ■ Do not take a phone off the hook or replace it. ■ Do not use radios or cellular telephones. ■ Do not move anything that looks out of place. ■ If a suspected bomb device is found, take note of the location, but do not touch it. Notify the police regarding the whereabouts of suspected bomb device. Once it is determined that a bomb threat has been made, the Safety Office will coordinate evacuation of the area.

Evacuation Procedure

All staff must be aware of the possible escape routes prior to the emergency situation. Always assure safety of the assembly point prior to evacuation. The procedure associated with an evacuation event is detailed below:

- The Disaster Response Coordinator will give instruction or the alarm sound to evacuate specific assembly areas;
- All staff appointed as Evacuation Officers must assist with the evacuation;
- All personnel onsite must follow the instructions of the Evacuation Officer;
- Personnel must follow the directional pointers to the nearest assembly points;
- Evacuation must be undertaken in accordance to the emergency lay out plan;
- Mobile employees must be the first to be evacuated followed by the frail and the injured;
- Evacuation personnel must work in pairs where possible to assist one another lifting injured employee (if any);
- Mobile employees who are struggling or appear unsure must be assisted;
- Personnel must evacuate by walking briskly and must not run;
- Evacuating personnel must stay calm and must not panic. Panic can spread and cause unnecessary chaos;
- Evacuating personnel must always keep left along the evacuation routes;

- In the case where the emergency situation results in fire or smoke, evacuating personnel must consider crawling, as this may be better than walking;
- Visitors that are not familiar with the evacuation procedure must be assisted;
- A daily record of staff and visitors must be kept;
- The task of the professional Emergency Services must not be obstructed;
- If necessary, a search / check for all unaccounted personnel must be undertaken before leaving the area;
- The evacuation officer must be the last one to leave the area;
- All personnel onsite must report directly to the allocated assembly point;
- Personnel must not leave the assembly point until it has been deemed safe to do so.

Post Emergency Analysis and Evaluation

- When the emergency is over, the Emergency Response Team will carry out a detailed analysis of the causes of the accident, evaluate the influence of various factors and minimize them for future. At the same time, the adequacy of the Disaster Preparedness Plan will be evaluated and shortcomings will be rectified for subsequent improvement of the plan.

Reporting and Documentation

The following aspects need to be communicated for the emergency reporting:

- While witnessing or receiving notification of an emergency, as much information as possible should be taken and/or conveyed to the relevant emergency activation authority;
- Where possible, all information should be logged in written form with time and date included and provided to EHS Manager;
- Personnel working on the site may, at any time, be exposed to an emergency which could take many forms, for example (but not limited to):
  - Injuries and/or fatalities
  - Fires and/or explosions
  - Extreme weather
- When an emergency occurs, an appropriate and prompt response is required, providing precise action to control, correct and return the site to a safe condition. Timely action will also be required to protect people, the environment and property from damage;
- All near misses and unsafe acts will be written in logbooks / reported in the ‘near miss, unsafe acts, hazards and sub-standard conditions report’ and verbally communicated to the concerned Site Supervisor within a reasonable time. All accidents and incidents will be immediately reported to the EHS Manager, and requisite forms completed.

Co-ordination with External Agencies

Site Supervisor shall coordinate with the following departments:

- Fire brigade;
- Police department;
- Hospitals/ Ambulance Services;
- Utility departments (electricity and water);
- Technical departments such as Madhya Pradesh State Pollution Control Board, Factory Inspectorate etc.
- Local Authorities and District Administration

- District Disaster Control Room, Neemuch

Training and Education

Major emergency procedure should be laid down clearly and convincingly to everyone on site particularly Key Personnel. For this purpose, on site training and mock drills should be conducted periodically and documented. The duties and responsibilities of each person and the emergency procedure to be followed by him should be very clear.

Procedure for Mock Rehearsal

- Mock drills on Disaster Management shall be conducted twice in a year as preparedness exercise.
- Inform all the employees about mock drill;
- Fix the date for mock drill;
- Observers (senior personnel) will not be involved in the exercise. They will monitor the Mock drill;
- Emergency Siren / alarm will be raised;
- After hearing the Siren /alarm, Emergency procedure will be followed as mentioned in the Onsite Emergency Plan;
- Observer will note down the activities with respect to the time and identify any gap

Verification and Monitoring

The EHS Manager has been tasked with the responsibility for auditing the project and implementation of emergency response procedures associated with all phases of the project.

Reporting and monitoring requirements for the ERDMP will include:

- Monthly inspections and audits;
- Quarterly report of accidents/incidents;
- Reporting at the time of any incidents;
- Bi-annual disaster response drills; and
- Annual reporting on trainings.

Disaster response drills and reporting maintained by the EHS Managers will provide information regarding required revisions to training or the disaster response actions. Each incident reported will be reviewed and investigated upon occurring. Actions will be identified where possible to improve the site's overall response to disasters.

Training

All employees and contractors will be trained in disaster response procedures within one month of their start-date. The EHS Manager shall distribute the ERDMP (together with the associated Evacuation Plan) to all parties in charge of ensuring the plans implementation. All relevant information in the DMP shall be communicated to employees and contractors. This information shall include information on potential emergency risks/threats, appropriate first person response/contact to incidents/emergencies and notification procedures.

All site personnel, including contractors, are to be trained in the appropriate responses for possible disasters. The training is mandatory and is to be conducted on a regular basis. The frequency and timing of training is to take place at least quarterly.

Awareness programs for community should also be arranged to apprise them about the potential emergencies that can arise in construction and operation phase.

Training is to include, but not limited to the following:

- Basic Fire Safety and Rescue;
- Basic Life Safety and First Aid;
- Emergency Evacuation and Response; and
- Medical Emergencies

District Disaster Management Plan

District administration of Neemuch district has developed a Disaster Management Plan providing multi-level planning as advocated by the Madhya Pradesh State Disaster Management Authority (MPSDMA) under DM Act of 2005 to help the District administration for effective response during the disaster (available at https://neemuch.nic.in/en/disaster-management/).

District Disaster Management Authority (DDMA)

The District Disaster Management Authority (DDMA) is formed to act as the district planning; coordinating and monitoring body for any disaster. The DDMA comprise of Collector (as Chairperson), Supdt. Of Police, Chief Medical Officer, Superintending engineer (PWD), Chairman Municipal Board, CEO District Panchayat and Chairperson of the Zila Parishad.

Roles and Responsibilities of DDMA

- Make and keep revising the DDMP periodically.
- Coordinate National, State and district disaster Management Plans and ensure its implementation.
- Identify various Disaster prone areas in the district and plan for mitigation and relief for various Disasters.
- Ensure the Mitigation, Prevention and Relief step are being followed by local bodies and provide timely instructions to them to prepare plans of mitigation, prevention and relief.
- Coordinate in various line departments.
- Auditing districts capability of Disaster Management and increase the capacity as and when required.
- Provide training to various officers, employees and volunteers for Disaster Management.
- Increase public awareness towards DM.
- Convey early warning to public and maintain communication infrastructure, maintain it and increase its capability as and when required.
- Ensure that all line departments have a disaster plan.
- Provide consultations and help to all government and nongovernmental organizations that are part of DM.
- Provide technical help to line departments.
- Provide instructions to all concerned parties in case of a disaster or chances of a disaster for immediate mitigation and relief to full capacity.
- Instruct departments to follow standards set for mitigation.
- Identify places that can be used as places for temporary shelters or safe houses in case of a disaster.
- Keep and maintain an inventory for the equipment necessary for relief work.
- Provide training and mock drills to concerned parties and encourage volunteers and NGO‘s for relief work during disasters.
- Except above implement the steps as instructed by SDMA and DDMA. Have meetings as and when required

CONTRACTOR AND LABOUR MANAGEMENT PLAN

Objective

The contractor and labour management plan has been developed with the objective of defining the procedures to manage and regulate the standards of labour and working conditions for the labourers hired through Solar Plant Developer or contractors (and in case they are being hired directly by RUMSL).

The Neemuch Solar Park will be developed by RUMSL and individual Solar Projects within the park will be developed by Independent Solar Project Developers (SPD). These Solar Project Developers will hire contractors and sub-contractors, who will be responsible for all on-ground activities for the project; however Project proponent will monitor the progress of the project on regular basis and will be responsible to oversee that the labour conditions.

In the context of the Project, Neemuch Solar Park requires a management plan that could provide guidance and become monitoring tool to assess and align the labour and working conditions of the contractors with the applicable regulatory as well as World Bank ESS 2 requirements.

Scope

This plan applies to the construction, operational and decommissioning phases of the project. This plan will be applicable for all the contractors and their workers that are going to be engaged in the above mentioned three phases of the project. The scope of the present labour management plan has been broadly categorised into two components:

Aspects for Ensuring Proper Labour Management

There shall be a well-documented set of policies defined for the project and the workforce to be engaged for it. The indicative set of policies to be developed is enlisted below.

- Human resource Policy
- Working Relationship Policy
- Working Conditions & Terms of Employment Policy
- Workers' Organizations
- Non-Discrimination & Equal Opportunity
- Retrenchment
- Grievance Mechanism
- Child Labour
- Forced Labour
- Occupational Health & Safety
- Non-Employee Workers

Setting up and management of Labour Camp

Setting up and management of labour camp has been dealt with separately as they are considered to be an integral part of any construction project involving influx of migrant workers travelling alone or with their families including the children in some of the cases. Following are the major steps in the process:

- Site Selection and construction
- Facilities at the labour camp including safety, amenities etc.

- Usage and maintenance;
- Dismantling and reinstatement of labour camp occupied land.

Applicable Legislations

There is a wide array of central and state level regulations which cover almost every aspect of the labour related issues. These acts are further supplemented by the rules, notifications and standing orders of the respective state governments. Some of the aspects like the minimum wage rates are also updated from time to time and shall need to be tracked for recent and most updated developments. Acts and regulations pertaining to the migrant workers assume much more importance especially in the Indian context, wherein migrant workers (especially from certain states like UP, Bihar, west Bengal & Orissa etc.) constitute a huge section of the building and construction industry, or for that matter any form of labour intensive industry. The plan therefore, captures almost all the existing laws and regulations pertaining to the management of labour issues in the country.

National & State legislations regarding Contractor labour relationship

There are several laws and rules governing labour issues in India. The local legislations likely to get triggered for the contractor labour relationship are

- The contract labour (Regulation and abolition) Act, 1970 and Rules
- The child labour (Prohibition and Regulation) Act, 1986
- The Bonded Labour (Abolition) Act 1976:
- The Trade Union Act, 1926:
- Workmen's Compensation Act 1923.
- Minimum Wages Act, 1948
- The Payment of Wages Act, 1936, amended in 2005.
- The E.P.F. and Miscellaneous Provisions act, 1952
- Public Provident Fund Act, 1968
- Payment of Gratuity Act, 1972
- Employees State Insurance Act, 1948 (ESI)
- Employer's Liability Act, 1938 (as amended).
- The Industrial Employment (Standing Orders) Act, 1946 (as amended).
- The Industrial Disputes Act, 1947 (as amended).
- Payment of Bonus Act, 1965 and Amendment Act No.43 of 1977 and No.48 of 1978 and amendments
- The Personal Injuries (Compensation Insurance) Act, 1963 (as amended).
- Factories Act 1948.
- Shops and Establishment Act
- Interstate Migrant Workers Act 1979
- Maternity Benefit Act 1961
- Equal Remuneration Act 1976
- Building and Other Construction Workers Act 1996

Rules include:

- Industrial Disputes (Central) Rules, 1957

- Minimum Wages (Central) Rules, 1950
- Payment of Bonus Rules, 1975
- The Personal Injuries (Compensation Insurance) Rules, 1972
- Standing Orders Rules 1946.

References and Recommended further reading

For the purpose of detailed reading on best practices related to the labour management, some of the regulations/ guidance notes which can be further referred are:

- The Building and other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996 and Central Rules, 1998 made thereunder stipulates that all establishments employing more than ten (10) workers will have to meet the provisions of the act and rules made thereunder;
- For engaging twenty or more labour on contract on any day the Contractor shall also abide by the provisions laid down in the Contract Labour (Regulation & Abolition) Act, 1970. Under this Act, the Contractor shall secure a license from the Labour Commissioner after certification from the Employer (RUMSL). The contractor shall maintain all wage, attendance, PF, leave registers as applicable under the Act and shall keep them available for any inspection by the Employer;
- Similarly the provisions of Interstate Migrant Workmen Act 1979 shall become applicable in case 5 or more interstate migrant workmen are engaged by the Contractor;
- Child labour prohibition Act shall be universally applicable to the Contractor which prohibits employing of any workmen/labour below the age of 14 years. In addition compliance to labour laws like payment of wages, payment of PF, equal remuneration, hours of work, overtime, weekly holiday etc. shall be observed by the contractor as per applicable laws; and
- Chapter 6 of The Building and other Construction Workers Act and Chapter 28 of Central rules stipulate the basic welfare measures that are to be provided by the employer or establishment. Similarly Chapter 5 of Contract Labour Act stipulates the basic welfare measures. The stipulations shall be reviewed and followed.

Contractor and Labour Management- Specific issues

The challenges that the project is likely to encounter during construction and operational phases regarding the maintenance of labour standards could be:

- Lack of defined terms of employment for some worker or labour by sub-contractors might be possible;
- Likelihood of child labour at varying scale, particularly during development/construction phase on account of migrant labour;
- Discrimination in remuneration between male and female labour or between local & outside labour; and
- Inappropriate living arrangement in labour colony or workers colony;
- Conflict with local population.

The section below describes in detail the challenges as well as the suitable measures to manage these challenges. However, the contractors would not be expected to limit their action plan against the suggestive measures.

Defined Human Resource Policy, working conditions and terms of employment

Management Plan

The contractors will be required to take following mentioned measures to regulate and manage the workforce engaged during construction as well as the operational phase of the project.

- Adequately cover the contract labourers that will be engaged in the construction phase of the project within the HR policy;
- Maintain consistency with the applicable labour laws;
- The Policy should be commensurate with the size and type of workforce;
- Policy should be clear and in a language understandable to workers;
- Procedure to make provisions of the policy very clear to each worker at the outset of joining;
- Working condition(1) and terms of employment(2) should be documented and communicated properly to all workers;
- Wages and benefits must be clearly communicated and understood by the workers;
- Provide all workers with a contract in a language understood by them;
- Routinely provide workers with a clear record of wage calculation and deduction;
- On-going internal verification that all workers are receiving wages and benefits as prescribed by law;
- Ongoing communication and training on legal labor rights and company personnel policies;
- Worker representatives meets regularly with HR and company management;
- Training on minimum legal benefits for all workers, including contractors, and employment agencies;
- Cooperation with local labor ministries.

(1) Working condition is defined as the conditions in the workplace and treatment of workers. Condition in workplace includes the physical environment, health and safety precautions, and access to sanitary facilities. Treatment of workers includes disciplinary practices, reason and process for termination of workers and respect for workers personal dignity.

(2) Terms of employment includes wages and benefits, wage deduction, hours of work, rest days, overtime arrangements, overtime compensation, medical insurance, pension, leave for illness, vacation, maternity and so on.

Table F5 Aspects for Ensuring Proper Contractor and Labour Management

SN.	Guiding Principles	Desired Actions	Special Remarks and Suggestions	Monitoring Indicators
1	**Human resource Policy**			
	■ RUMSL & its contractors will have a documented policy and procedure related to Human resources. ■ RUMSL its contractors will inform workers of their rights under national labour and employment law ■ Policy must be clear and understandable to all workers	■ Centrally organize all policies and procedures; ■ Identify and record responsible person and last date modified; ■ Conduct an annual review of all policies and procedures; ■ Prominently display policies and procedures in all local languages, especially which the staffs and workers understand; ■ Appoint a person responsible for monitoring policies and procedures related to labour law implementation; ■ Implement standardized routine training	■ The contractors will be required to put in place a well-defined and documented Human Resource policy at the outset of the project in order to ensure efficient and fair management of workers engaged in the overall process of work. In case the contractor has existing HR policy, the same can be made applicable for the workers to be engaged for the project. ■	■ Complete review of all policies and procedures ■ Review of management-worker committee meeting minutes ■ Communications (memos, letters, etc.) to workers, suppliers, contractors and multi-stakeholder groups ■ Interviews with management and workers ■ Interviews with external stakeholders ■ Budgets related to implementing labour policy ■ Training curricula and logs
2	**Working Relationship Policy**			
	■ RUMSL & its contractors will document and communicate working conditions and terms of employment to all workers ■ Wages and benefits must be clearly communicated and understood by all workers	■ Provide all workers with a contract in their native language ■ Provide documented training on contracts, wages, benefits and deductions for all workers ■ Routinely provide workers with a clear record of pay	■ The working relationship policy can be a separate document or it can be integrated with the HR policy. The working relationship policy will essentially ensure ■ Coverage of each category of workers including direct workers, contract workers and supply chain workers who will be engaged in operation;	■ Contracts for all workers ■ Policies and procedures related to worker contracts and wages ■ Communication and training on wage calculation, including local laws ■ Payroll records, time sheets

SN.	Guiding Principles	Desired Actions	Special Remarks and Suggestions	Monitoring Indicators
		calculations in the form of wage slips	■ Consistent with regulatory requirements on labour as per the national and state labour regulations:	■ Piece rate or performance pay calculations verified against minimum wage ■ Worker interviews
3	**Working Conditions & Terms of Employment Policy**			
	■ If there is a collective bargaining agreement, RUMSL & its contractors will respect its terms ■ RUMSL & its contractors must provide reasonable working conditions and terms of employment, at a minimum complying with the various local laws as described in this plan	■ On-going internal verification that all workers are receiving wages and benefits as prescribed by law ■ On-going communication and training on legal labour rights and company personnel policies ■ Worker representatives meets regularly with HR and company management ■ Training on minimum legal benefits for all workers, including contractors, and employment agencies	■ Defined Terms of Employment and procedure for sharing the same with each new worker in a transparent manner; and ■ Procedure for establishing and updating records of employment relationship conditions.	■ Collective bargaining agreement (if one exists) ■ Worker contracts ■ Policies and procedures related to wages, benefits, hours and leave ■ Wage calculations as they relate to local laws ■ Worker and external stakeholder interviews ■ National law as it relates to wage and benefit minimums ■ Employment and termination records
4	**Workers' Organizations**			
	■ RUMSL & its contractors will recognizes workers' rights to form and to join workers' organizations ■ RUMSL & its contractors cannot interfere with or discriminate against workers who choose to organize	■ Clear communication to workers on their rights to collective bargaining ■ Allow workers to raise workplace related issues; ■ Regular training on worker-manager communications	■ The purpose of forming a trade union/workers organisation is to create a platform for collective bargaining to protect the interest and rights of the workers with regard to working conditions and the terms of employment. The contractors will have to abide by the Indian regulations on provision for trade union and the workers should not be	■ Documented policy regarding collective bargaining ■ Minutes and records from collective bargaining sessions, reviews or other actions ■ Procedure for workers to select worker representative

SN.	Guiding Principles	Desired Actions	Special Remarks and Suggestions	Monitoring Indicators
	■ Worker representatives must have access to management ■ Worker organizations are expected to fairly represent the workforce	■ Regular meetings of management and worker representatives ■ Periodic documented communication with local unions and NGOs	restricted by the contractors to form trade union, if they wish. ■ The construction phase is likely to engage migrant labour and is expected to be over in one-two years after getting started. During this phase, the labourers should be provided a suitable mechanism to raise their grievances and genuine work related issues, alternatively allow them to create a platform for collective bargaining. ■ During operational phase of the project, contractors will be required to consider following mentioned measures to ensure freedom of association for workers and provide them an alternate grievance mechanism ■ The contractors shall have clear communication with the workers on their right to form trade union and collective bargaining; ■ There will be regular trainings on worker-manager communications ■ There will be regular meetings of the contractor's management and their workers	without management interference ■ Interviews with workers, NGOs and trade unions ■ Collective bargaining agreements ■ Grievance mechanism
5	**Non-Discrimination & Equal Opportunity**			
	■ People should be hired, promoted and compensated solely	■ Clearly define anti-discrimination policy in hiring, training, promotions and compensation	■ The contractors will be required to make employment decisions on the principle of equal opportunity and fair treatment and will not discriminate with respect to	■ Discrimination policy and related employment policies and procedures

SN.	Guiding Principles	Desired Actions	Special Remarks and Suggestions	Monitoring Indicators
	based on their ability to do the job ■ All workers should have equal access to training, tools and opportunities for advancement ■ All workers should be free from harassment by management or other workers ■ Positive discrimination may be allowable in cases where it protects disadvantaged or excluded groups and provides them special opportunities	■ Regularly review worker and manager demographics ■ Develop long term remediation plan to address past discrimination ■ Provide regular training to workers and managers ■ Establish confidential and secure communication channels for workers to reach managers ■ Actively promote a harassment-free workplace	aspect of the employment relationship like recruitment and hiring, compensation, working conditions and terms of employment, promotion etc. ■ Contractors however will have to give preference to the project affected people during the recruitment process as part of the R&R policy which has a provision for employment to one member of each affected family.	■ Company policy and procedure to address and manage discrimination issues when found ■ Comparative demographics of workers and managers ■ Documentation of handled discrimination cases ■ Diversity training curriculum and attendance log ■ Interviews with workers and managers, including those who may be likely to be discriminated against ■ Interviews with local NGOs and trade unions ■ Hiring, promotion and termination records ■ Local laws related to discrimination ■ Hiring of the local residents/ PAFs in the various jobs
6	**Retrenchment**			
	■ RUMSL and its Solar Plant developers will develop and implement a plan to mitigate the adverse impact of retrenchment if it	■ Policy and procedure for workforce reduction, including worker selection ■ Analysis of alternatives to workforce reduction ■ Engage workers in discussions with workers	■ The contractors may be asked to prepare such a lay off plan especially if the local community is engaged as labourers, as most of the migrant labourers are shifted to other sites for work by the contractor itself.	■ Policy and procedure related to workforce reduction, severance and transition ■ Analysis of alternatives employed for workforce reduction.

SN.	Guiding Principles	Desired Actions	Special Remarks and Suggestions	Monitoring Indicators
	anticipates a large number of layoffs ■ The plan will incorporate non-discrimination principles and include the input of workers, their organizations, where appropriate, the government	related to workforce reduction as early as possible ■ Communication to all workers about why and how the reduction will take place ■ Discussions with local NGOs about how the community impact of workforce reduction could be minimized		■ Procedures for selecting workers impacted by workforce reduction ■ Documentation of prior instances of workforce reductions ■ Minutes from management meetings and discussions ■ Communications with workers related to workforce reduction ■ Communications with external stakeholders and community groups
7	**Grievance Mechanism**			
	■ RUMSL & its contractors will establish a transparent process for workers to express concerns and file grievances ■ There will be no retaliation or discrimination against those that express grievances ■ RUMSL & its contractors will treat the grievances seriously and take appropriate action ■ RUMSL & its contractors grievance mechanism does not replace other	■ Establish clear policies and procedures for grievances ■ Communicate the grievance process to all workers in a clear, understandable manner ■ Provide on-going training to all workers ■ Document all grievances and the resulting actions ■ Make worker representatives a key part of the process	■ For a healthy work environment, contractors should create an atmosphere where workers feel safe expressing their concerns and the grievances are settled mostly through informal channel and workers don't feel the need to lodge the complaint. However there should be a formal grievance redress mechanism which is simple and secure; free from fear of retaliation; responsive and fair, and allow workers to file anonymous complaints as well. The grievance mechanism system should not impede the aggrieved to access to court in case he/she is not satisfied with the outcome derived from the formal system.	■ Documented policy and procedure for worker grievances ■ Worker and manager interviews ■ Training curriculum and log on grievance handling ■ Communications to workers, supervisors and managers ■ Records of complaints lodged and actions taken on grievances ■ Employment and termination records

SN.	Guiding Principles	Desired Actions	Special Remarks and Suggestions	Monitoring Indicators
	channels as defined by law or collective bargaining agreements		■ For an effective grievance redress system, the contractors will have to ■ Establish clear policies and procedures for grievances based on above outlined principles; ■ Communicate the grievance process to all workers in a clear, understandable manner; ■ Document all grievances and the resulting actions; and ■ Make worker representatives a key part of the grievance redressal process.	
8	**Child Labour**			
	■ RUMSL & its contractors will not employ workers under the minimum age for employment as defined by national law (.i.e. below 18 years of age) ■ Workers between the minimum age and 18 will not be employed in dangerous work or work that interferes with their education or development ■ The Indian regulation recognises a person as a child who has not completed his/her 14 years of age. The World Bank ESS 2 requirements	■ Write clearly defined policies and procedures for age verification – make them publicly available ■ Develop remediation plan for use in cases where children are unknowingly employed despite RUMSL's Anti Child Labour policies and procedures (ex: child presents false ID) ■ Engage with local stakeholders to develop proactive plans to address child labour issues ■ Communicate child labour policies to RUMSL's suppliers and contractors – and provide	■ The migrant contract labourers may be expected to bring their family along during the construction phase of the project. The family might also accompany the labourer to their workplace thus enhances the possibility of child labour at varying scale. Further during the operational phase of the project, the possibility of adolescent workers (between 14 to 18 years) entering into hazardous working conditions cannot be ruled out. ■ The contractors will need to adopt suitable proactive mechanisms to prevent child labour in any form. Some of the measures in this regard could be as follows;	■ Policies and procedures for age verification in hiring ■ Interviews with workers, local children, trade unions and NGOs ■ Visual observation ■ Pay records, medical records, birth certificates, panchayat certificate

SN.	Guiding Principles	Desired Actions	Special Remarks and Suggestions	Monitoring Indicators
	say that company cannot employ workers under the minimum age (completed 14 years in Indian context) and workers between the prescribed minimum age and 18 years may be employed in non-hazardous working conditions with certain terms and conditions.	them with the training and tools to address the issue	■ Identify the types of activities during the entire project operation that could have a possibility of child labour; ■ Clearly defined policies and procedures for age verification; ■ Visual observation and verification thereupon; ■ Develop remediation plan for use in cases where children are unknowingly employed despite the clear policy and procedure of contractors on no-child labour.	
9	**Forced Labour**			
	■ RUMSL & its contractors will not employ forced labour ■ Workers have the right to retain their personal documents and money ■ Workers are free to leave the workplace after work ■ Workers have the right to resign	■ Clearly define worker's freedom in employment contract ■ Provide employment contracts to all workers in their language - direct or contracted ■ Define and enforce policy regarding use of employment agencies and expectations ■ If employment agencies are used, audit relationship between the agency and the workers ■ Provide training for all workers to explain their rights	■ Any involuntary work which is performed under threat of force or penalty, is considered as forced labour. It can be in form of bonded labour, indentured labour or similar labour arrangement, slavery or slavery like situation. There can be a possibility of forced labor by sub-contractors or petty contractors during the construction or operational phase of the project; however the likelihood of forced labour is expected to be negligible for the regular workers during operational phase in view of hiring system structures in place and an adequate HR management department.	■ Employment contracts in all appropriate languages ■ Contracts with employment or recruitment agencies ■ Payroll records, timesheets and wage deduction calculations ■ List of permanent workers and contracted workers at RUMSL facility ■ Worker IDs ■ Interviews with all workers, employment agencies and external stakeholders ■ Interviews with security guards

SN.	Guiding Principles	Desired Actions	Special Remarks and Suggestions	Monitoring Indicators
		■ Pay all job related training and equipment expenses		
10	**Occupational Health & Safety**			
	■ RUMSL & its contractors will take all reasonable precaution actions to protect the health and safety of workers ■ Ensure that workers are not exposed to unnecessary or unreasonable risks at the workplace, dormitories etc. ■ Implement an OHS management system consistent with international standards such as OHSAS 18001. ■ Systematically assess all of the OHS risks, conducting a comprehensive job safety or job hazard analyses. ■ implement preventive and protective measures according to the order of priority: Eliminating the hazard, Controlling the hazard at its source, Minimizing the hazard, Providing appropriate	■ Structuring an OHS team and an OHS accountability framework (including production area) ■ Conducting a comprehensive job safety or job hazard analyses ■ Developing a Corrective OHS Action Plan based on the likelihood and severity of the consequence of exposure to the identified hazards ■ Proper equipment design, maintenance and procedures, such as: Designing machines and equipment's like stairs, to eliminate trap hazards ■ Turning off, disconnecting, isolating, and de-energizing (Locked Out and Tagged Out) machinery with exposed or guarded moving parts or being serviced ■ Marking and checking all energized electrical devices, cords and lines with warning signs	■ RUMSL and its Solar Plant developers is expected to have its own system. Either the MDO/ contractor will have to completely follow RUMSL's OHS system or in case it has its own, it needs to be reviewed by RUMSL, before the starting of the work during construction or operations. ■ *Some examples of things to be done include:* ■ Integrity of Workplace Structures – reachable, easy to clean, fore resistant, floors ■ Workspace and exits – unobstructed, clearly marked, consider disabilities ■ Fire Precautions ■ Amenities- toilets, potable water, lighting ■ Safe Access –even pathways, falling objects, railings ■ First Aid- training ■ Fresh air supply ■ Physical Hazards- Working at heights, Vibrations, Electrical, Ergonomics, illumination ■ PPEs	■ Visual observation ■ Exposure to hazardous agents monitoring log ■ Manager and worker interviews ■ Accident and medical treatment logs ■ Equipment maintenance logs ■ Fire and safety drill logs ■ Health and safety risk analysis ■ Health and safety inspection logs with test results ■ Government health inspection reports ■ Training curriculum and logs

SN.	Guiding Principles	Desired Actions	Special Remarks and Suggestions	Monitoring Indicators
	personal protective equipment ■ Document, investigate and report all accidents and occupational diseases. ■ Investigate and identify the root causes of all accidents with working time loss, and implement appropriate corrective actions ■ Note: This can be done through the involved contractors also.	■ Implementing proper monitoring systems of hazardous agents and proper control measures (eliminating risk, PPC, PPE)	■ Communication- Induction orientation, training	
11	**Non-Employee Workers of** RUMSL			
	■ RUMSL will extend the previously discussed indicators to contractors hired directly or through employment agencies. ■ RUMSL will not use contracting as a means of circumventing labour rights and laws. ■ Employment and recruitment agencies will be monitored to verify their adherence to labour rights and laws.	■ Provide employment contracts to all workers in their language - direct or contracted ■ If employment agencies are used, audit relationship between the agency and the workers ■ Provide training for all contracted workers to explain their rights ■ Include contracted workers in grievance process access and training		■ Contracted labour contracts in all appropriate languages ■ Contracts with employment or recruitment agencies ■ Payment records, timesheets and wage deduction calculations for contracted workers ■ Listing of direct employees and contracted workers at RUMSL's Solar Park site ■ Interviews with managers, employment agencies and external stakeholders

SN.	Guiding Principles	Desired Actions	Special Remarks and Suggestions	Monitoring Indicators
				■ Interviews with contracted workers - directly contracted and through agencies

Worker's Accommodation

The requirement of workers accommodation stems from the type of workforce that will be required during the construction and operations phase of the project.

RUMSL & its contractors will have to adopt the following approach to handle the issues of workers accommodation and it should be dealt step by step in following manner:

- Assessment of the type and number of workers who will be requiring accommodation facility;
- Impact assessment of workers accommodation on local community and accordingly plan mitigation measures;
- Identify applicable regulatory requirements on establishment of workers colony; and
- Determining the standards to apply to the location of facilities, the construction of housing and provision of facilities
- Managing accommodation.

Apparently local working population of the project area cannot meet total project workforce requirement, therefore it is likely that workers from outside will need to be recruited. Given the remote location of the project, the outside workers will require adequate accommodation arrangements. Types of workers requiring accommodation arrangement can be classified in following categories:

- Migrant labourers during construction phase
- Supervisors and executives of the contractors engaged in construction phase
- Regular workers, supervisors and executives during operational phase.

Housing standards for workers accommodation

Labour Colony:

The contractors would be recommended to prepare temporary accommodation facilities for the construction labourers preferably within the lease boundary, away from existing local community so as to leave minimum possible adverse impact upon local community. The standards that are to be maintained for labour colonies will be:

- Allocation of minimum space per person or per family;
- Supply of safe water in the workers' dwelling in sufficient quantity;
- Adequate sewage and garbage disposal systems;
- Adequate sanitary and washing facilities, ventilation, cooking and storage facilities and natural and artificial lighting;
- If the contractors are required to provide accommodation for single labour or labour separated from their family, following standards should be suitably applied;
- A separate bed for each worker;
- Separate accommodation for families and bachelors;
- Adequate sanitary conveniences;
- Common dining rooms, canteens, rest and recreation rooms and health facilities, where not otherwise available in the community.

Further as per the Building and Other Construction Workers (Regulation of Employment and Conditions of Services) Act 1996, the contractors will have to provide temporary accommodation facilities to the construction laborers free of cost and as soon as construction work is over, the employer at his own cost will remove/destroy the temporary structures and restore ground in good level and clean conditions.

Workers Colony

The contractors will have to abide by all applicable rules and regulations pertaining to the design and construction of the building as well as facilities to be provided therein while planning for the accommodation arrangements for the workers. Further a suggestive guideline for workers accommodation arrangement based on international standards is prescribed below.

Table F6 Standards for Workers Colony

Standards Parameter	Requirements as well as Monitoring indicators
Location	Reasonable distance from Project Site Adequate Transportation arrangement
Drainage	Proper drainage system Avoid accumulation of stagnant water
Ventilation	Adequate ventilation and air conditioning system Natural lighting available Artificial lighting available
Water	Adequate and convenient water supply Drinking water meeting national and WHO standards Regular monitoring of drinking water
Waste water and solid waste	Proper discharge of waste water and sewage Establish Sewage Treatment Plant (STP) if required Solid waste management system Pest control mechanism
Bachelor Accommodation	Separate bed for each worker Minimum space available Storage for personal belongings Separate storage for PPEs
Family Accommodation	Adequate space Other suitable housing facilities described in this table
Toilet facilities	Adequate number of toilets Convenient location Constructed of good materials Easily cleanable Kept in working condition Separate for male and female except for family accommodation
Bathrooms and other sanitary facilities	Made of anti-slip hard washable materials Adequate number of bathroom and hand wash facilities Kept in working condition Convenient location. Separate for male and female except for family accommodation Adequate supply of cold and hot running water

Standards Parameter	Requirements as well as Monitoring indicators
Canteen and cooking arrangement	Adequate space Constructed of good and easy to clean material Option for separate cooking Adequate space for separate cooking Hygiene in canteen/dining halls and cooking facilities Adequate facilities for cleaning, disinfecting and storage of cooking utensils and equipment Adequate food waste disposal
Laundry	Provide laundry facility
Nutrition and food safety	Appropriate level of nutrition value Consideration of religious and cultural background of workers in food selection Workers could have choice of food
Medical facilities	First aid facility Own dispensary
Recreational, social and market facilities	Community centre for social gathering Market complex Provide possible recreational facilities like tennis court, swimming, park etc.

- Considering the current pandemic situation, RUMSL is recommended to follow the SOPs on COVID 19 below. The Site team and EHS personnel shall closely monitor and take the responsibility of proper implementation of the given below SOP.

Box F.1 SOP on CoVID 19 Pandemic

CoVid 19 SOP to be followed in Labour Camps

The speed of CoVid 19's spread, and the nature of virus, has given rise to concerns with respect to safety of workers as well as that of members of the public with whom workers may come into contact.
To better understand physical & economic risks to workers, RUSML should ensure that these considerations are properly integrated into the emergency response plan. A brief and non-exhaustive overview of prevention and response measure has been provided below though the understanding and medical advice is being updated frequently, and the measures must be updated to the most recent advice, including central, state and district level guidelines:

- Providing information about CoVid 19 to engaged staff & workers at site level

This process will include awareness campaigns, training or the establishment of specific communication channels. No practice of discrimination against or stigmatization of person affected, or his family;

- Encourage workers to stay at home, in-case they report symptoms of CoVid 19.
  - In this case, a RUMSL shall ensure a separate accommodation facility for the affected/ or CoVid symptomatic person;
- Awareness about proper cough hygiene should be given, also a proper use of soap, frequent hand wash, sanitizers should be given;
- Staff & workers to strictly follow social distancing at work place;
  - Shall ensure that workers maintain a safe distance of 2 meters at workplace, limit gatherings and work in shifts, up to large extent;
- Cleaning and dis-infecting protocols should be extended to food preparation facilities, kitchen staff should be strictly prohibited if they discover any symptoms of CoVid;
  - Shall improve ventilation or air- filtration, when not in open space. The accommodation facilities provided, should be ensured to have proper ventilation and air-filtration facility;
- Usage of PPEs at workplace;
  - This involves usage of gloves, mask, facemask etc. at workplace. Especially when they are working in a large number during construction phase. Proper disposal of PPE kits at daily basis should be monitored;

Responsibilities and Accountabilities

The overall responsibility of the aligning the contractor labour relationship as well as maintaining labour standards as per the regulatory and international standards would be vested with the Human

Resource department of the key contractors. These key contractors would also be held responsible for regulating labour issues of their sub-contractors or petty contractors.

The role of RUMSL will be limited to periodic monitoring and provide direction in case of any deviation from the standards. RUMSL will also be empowered to take strict steps against contractors in case any serious violation of labour issues like child labour, bonded labour and so on is observed in monitoring process.

However, the overall responsibility of ensuring the compliance to the standards rests with RUMSL, and to ensure that contractors are abiding by the same.

RUMSL will therefore need to put especially some staffs dedicated to the labour management and OHS issues:

1. Supervisor (S&C);
2. EHS specialist
3. EHS supervisors

Contractors of RUMSL will put in similar corresponding staff for the direct implementation of the labour management plan:

1. Dedicated Health & Safety supervisors
2. Dedicated labour officer
3. Dedicated supervisor for HR, HR policy and working conditions, wages & labour related issues.

Contractor's responsibility

Within 30 days from the appointed date, the Contractor shall prepare and submit 4 hard copies and 1 soft copy of Labour Influx and Worker's Camp Management Plan to the concerned PEA that addresses specific activities that will be undertaken to minimize the impact on the local community, including elements such as worker codes of conduct, training programs on HIV/AIDS, etc. A Workers' Camp Management Plan addresses specific aspects of the establishment and operation of workers' camps. This Labour Influx and Worker's Camp Management Plan will include:

- mandatory and repeated training and awareness raising for the workforce about refraining from unacceptable conduct toward local community members, specifically women;
- informing workers about national laws that make sexual harassment and gender-based violence a punishable offence which is prosecuted;
- introducing a Worker Code of Conduct as part of the employment contract and including sanctions for non-compliance (e.g., termination), manual scavenging, engagement with local residents, child labour, non-discrimination, harassment of co-workers including women and those belonging to SC and STs and other minority social groups;
- contractors adopting a policy to cooperate with law enforcement agencies in investigating complaints about gender-based violence;
- training programs on HIV/AIDS and other communicable diseases;
- workers' Camp Management Plan addressing specific aspects of the establishment and operation of workers' camps provided the Local Body/ Executing Agency is unable to cater to the demand for affordable housing for this additional workforce in terms of rentals, hostels, apartments, etc.; and
- complaint handling Mechanism at the project level.

Monitoring and Evaluation

RUMSL will put in place a robust mechanism for the purpose of monitoring and evaluation of the Labour management practices for its project. The monitoring would not only help keeping track of labour related management practices on ground, but also to improve the existing identified gaps which will require to be addressed while meeting the need to comply with the regulatory and International standards. RUMSL will ensure setting up of both internal and external monitoring systems to assess the progress and evaluate the performance on the labour management practices.

Internal Monitoring

Internal monitoring of the labour management implementation will be done by the Social and Community Supervisor of RUMSL in case the labour officer is not appointed; however preferably a labour officer will be appointed. The labour officer will coordinate with the EHS officer and representatives from the sub coordinator part to conduct internal monitoring from time to time. Internal monitoring will also be done through regular submission of the reports from the sub-contractor side on various monitoring indicators as mentioned in tables above.

Apart from daily or weekly reporting, monitoring will also be carried out on quarterly basis to assess the performance on the various labour related issues. The findings of these internal monitoring and will be documented and brought before the advisory committee for review and guidance.

External Monitoring/Evaluation

External monitoring of the labour management practices being carried out under the project will be done independently by a third party at the end of each financial year to monitor the labour management practices. External monitoring will also be based on various monitoring indicators as mentioned earlier.

Allocation of finances

The sub-contractor will be responsible for the financial allocation of resources to implement the contractor and labour management plan. Sub-contractors for the various aspects of the project will be responsible for incorporating the cost of implementing the construction and labour management plan at the bidding stages itself. RUMSL and is contractors in their quotation request from the contractors will be responsible for putting up the requirements from its contractor regarding the labour management plan. The cost of the labour management plan will therefore be already included in the bidding document, especially with regard to provision of the health and safety PPEs, safety managers and construction of the labour camp as required.

GENDER IMPACT ASSESSMENT AND ACTION PLAN

Background

This gender assessment intends to outline the gender situation in the Study Area and specifically in the Project villages. It also aims to identify the socio-cultural factors contributing to the gender issues that are relevant to the project, to analyze and evaluate the potential gender mainstreaming opportunities that can be adopted by the project during the course of its operation. This gender assessment is largely based upon the stakeholder consultations conducted by ERM during site visit in the month of November 2019, supported by Census 2011, which assists in presenting the current social context in the area.

There are various constitutional and legal provisions for gender equality and women's empowerment that the Government of India has charted. Some of the key such initiatives are enlisted below.

- Principles of Gender Equality are enshrined in the Indian Constitution;
- The Indian Constitution not only grants equality to women but also empowers the State to adopt positive discrimination in favour of women;
- In terms of Legal Provisions, the crimes directed specifically against women are characterised as Crimes against women and identified under Indian Penal Code.

Legal Regulations supporting Gender Mainstreaming

There are various Gender focussed legal regulations in India and the same are presented below.

- **Equal Remuneration Act, 1973** provides for payment of equal remuneration to men and women workers for the same work of similar nature without any discrimination. In order to ensure social security to the workers including women in the unorganised sector, the Government has enacted the Unorganised Workers' Social Security Act 2008.
- **The Maternity Benefit Act, 1961** and **The Maternity Benefit** (**Amendment**) **Act**, **2017** regulate employment of women in certain establishments for a certain period (26 weeks) before and after childbirth and provides for maternity and other benefits.
- **The Sexual Harassment of Women at Workplace (Prevention, Prohibition and Redressal) Act (POSH), 2013** has been enacted, which covers all women, irrespective of their age or employment status and protect them against sexual harassment at all workplaces both in public and private sector, whether organised or unorganised.
- Additionally, India has also ratified various international conventions and human rights instruments committing to secure equal rights of women. Key among them is the ratification of the Convention on Elimination of All Forms of Discrimination against Women (CEDAW) in 1993.

Understanding Gender role in Society

Gender roles in household activities

The consultations suggest that in a household, women from most social and caste groups, take equal ownership and responsibilities of working on agricultural fields owned by the household, taking care of domestic chores of cooking, cleaning, fetching water from community water points to their respective houses, caretaking of children and elderly as well as tending to livestock owned by the family. Men are largely responsible for management of financial resources, sale and purchase of goods, etc. and their contribution to domestic chores of cleaning, cooking, caretaking is limited.

Gender roles in Livelihoods and Economic activities

The occupational profile of the community is detailed in ***Section 4.4.7***, where men's employment options comprise working as cultivators, agricultural labours, construction labours, etc. The men are also understood to migrate for employment to nearby cities and town for work, either alone or with families. There have not been any cases reported for women working as construction labourers or in any enterprise outside their respective villages and are largely engaged as agricultural labourers in the fields owned by their families (unpaid labour work) and in agricultural fields of other against payment of daily wages. The women from Rajput community are a little different from the rest, as they are only responsible for household chores and have restrictions on their movement outside the house.

On the agricultural fields, women are involved in cutting, sowing, threshing, watering, and collecting fuel wood. The women engaged as agricultural laborers are paid an amount of INR 100-200 per day where as men are paid INR 200-300. The tasks that are taken care of by men include sale and purchase of agricultural inputs, sale of crops in markets and Mandis and other farm based activities.

Gender roles in livestock management

Women take care of domestic activities linked to livestock management, comprising stall feeding of livestock, cleaning of livestock and their sheds, preparation of dung cakes, milking, etc.; but are not responsible for grazing of livestock outside the household premises. Male members of the household are responsible for livestock grazing near the villages, sale and purchase of livestock, livestock feed and by products.

Gender profile in Asset ownership

The exposure of women outside the realms of their villages is understood to be limited in general. There are no women Self Help Groups reported to be active in the project villages, in the village consultations. The ownership of land and assets by women is also understood to be minimal and in cases where women own land legally, the management of the same in terms of sale, purchase or usage is largely decided by men, with limited or no consultations with women. The proceeds from sale of land and its usage is also usually discussed within households but the final decision on usage of money is taken by male members of the household.

The men have more social exposure, access to cash and linkage to banking services, understanding of financial and legal instruments, etc. which makes them the natural decision making authority in a household on aspects linked to assets or financial matters. Women are restricted in their movement outside villages due to socio-cultural practices and safety issues and in spite of being equal contributors to the household and agricultural fields (which largely forms unpaid work); have less access to cash and resources for discretionary spending. The societal norms also play a role in this scenario where education of male child is given importance over female, thereby limiting their exposure and their role to caregivers and in charge of domestic responsibilities.

Women Headed Household

There are certain women headed households in the project villages; however in most cases these Women Headed families are provided financial support and security by other members of the family, as part of the prevalent joint family and living systems. However, certain independent women headed households have to fend for themselves, by working as labourers on agricultural fields.

These Women headed households (both joint as well as independent) face additional risks of not being included in negotiations, or other key meetings due to prevailing cultural norms and may not therefore receive the benefits and advantages compared to those who do participate. Thus they

become a little more vulnerable in cases of sale of land for the project, where there is a chance that the proceeds from sale of land do not reach them.

Role in decision making

The men lead in the decision making process at the household and community level, although the participation of women is understood to be crucial, especially at the household level. According to the consultations undertaken, the women are reported to have limited say in the financial decision making or land transactions; however, in aspects such as agricultural activity and the education of the children, women are reported to take more decisions than men.
Women of most caste groups do not actively participate in community and village level meetings, which are primarily led by men. Even in the case of Badi, where the Sarpanch was a woman, (as the seat of the Sarpanch (village head) was reserved for a woman), all key activities were undertaken by her husband, known as the Sarpanch-pati.

Gender Lensing of Socio-economic impacts of the project

The detailed social baseline for the project is presented in ***Section 4.4*** of ESIA and the understanding of the same in project's context has led to assessment of potential impacts of the project. As per the land data provided by RUMSL, there are 6 female private land owners and 12 female Patta land owners out of 48 private land owners and 73 Patta land holders linked to the land identified for the project. Out of the private and patta land identified for the project, the combined ownership by women (Private +Patta land) is 5.2% in Badi village, while 26.4% in Kawai and 14.2% Bardawada villages.

The potential social impacts that can be caused by the project on the receptors can be broadly categorized as the following.

- Reduction of Land-holdings and loss of agricultural income to the Private and Patta Land Holders, agricultural labourers, etc.
- Reduced availability of Government land that is currently being used by the community as Common resources like grazing land for livestock, collection of firewood by women, for access and easements to their assets, religious trees or structures, etc.
- Reduction in/absence of income from the Government land that is encroached/ squatted upon by local residents for agriculture, fodder lots, etc.
- Community Health and Safety related impacts;
- Impacts on Community Resources like Water, Roads, Forests and temporary use of land during construction phase; and
- Positive Impact due to short term availability of Employment Opportunities (largely during construction stage) and some new employment creation during Operations phase.
- The receptors of these socio-economic impacts comprise both of male and female residents in the project area, whereas in the general nature of operations, the mitigations are implemented in a gender-agnostic manner.
- In cases where the land from Women Headed households are procured, there is a chance that the household is rendered landless and thus special assessment of the situation needs to be done. The impact on Women due to project activities is detailed in ***Section 6.4.8,*** which comprises the mitigation measures as well as assesses the Impact significance.

The detailed Gender Action Plan has been devised for implementation of the action items identified, which is presented in Table below.

The mitigation measures that will be derived on Gender aspects during RAP and LRP surveys, shall also be guided by this Gender Action Plan.

Table F7 Gender Action Plan

Action Items	Timeline	Responsibility	Means of Verification for achievement of Targets	Potential Risk in achievement of Targets	Risk Mitigating Measures
Loss of Land Related Impacts					
Ensure that the land sellers inform and disclose the sale of land parcels for the project to their household, including women	Ongoing till completion of land procurement	RUMSL along with Tehsil Administration	Review of Sale Deed	NA	Public disclosure of the timelines, with a focussed women's meeting at the village level to disclose land procurement activities and time lines
It is recommended that the proceeds from the sale of land should get deposited in a joint bank account with the spouse, if feasible	Ongoing till completion of land procurement	RUMSL along with Tehsil Administration	Review of Bank account ownership documents prior to release of payments	There might be an existing bank account with single user's name and the key member of the family will be reluctant to make the changes	■ Put across this requirement during the initial stages of land related discussion. ■ Require the presence of the spouse at the time of hand-over of the cheque or sale agreement papers.
If the land is purchased from a Woman Headed household, then special provision for confirming the bank account use (by the women and not other family member) needs to be done to ensure against fraud	Within 6 months of initiation of construction	RUMSL	Review of Sale Deeds and bank account name and access by actual holder.	NA	Liaise with the bank branch to ensure against misuse. Financial literacy training programs should be conducted for women in the project area and specifically for the ones belonging to PAHs.
As part of the livelihoods restoration plan, development of a fodder intensification program and creation of fodder lot for ease of access and availability of fooder and firewood near project villages	Within 6 months of initiation of construction	RUMSL	Allocation of grazing land parcels and providing demarcated access routes to	Lack of use due to distance issue of the parcel and power relations in the village	Assist in creation of a village level committee with representation from project, for smooth functioning and

Action Items	Timeline	Responsibility	Means of Verification for achievement of Targets	Potential Risk in achievement of Targets	Risk Mitigating Measures
			the same; disclosure of the same to women groups	may prevent women from "lower" castes in accessing such land	decision making over access and control of such collective/common resources
Employment related impacts					
■ During planning and construction phases, all community consultations shall have a target of at least 50% female participation, or, women only consultations in all the Project Villages of Bardawada, Kawai and Badi to ensure that women are not only involved and aware but also have the opportunity to participate in decision-making. ■ Organize separate women consultations or FGD with women's groups to understand their perspective, if the women do not express opinions as part of larger groups	Ongoing till construction phase	RUMSL, EPC contractor representative (during the construction phase) Project operator (operations phase)	■ Sex disaggregated data of attendees shall be documented in records of Stakeholder Consultations; ■ Photo documentation and signatures of attendees	■ Reduced participation of women due to socio cultural norms; ■ Silent presence of women during consultations due to cultural norms of women not speaking up in a village gathering in front of men. ■	Organize separate women consultations or FGD with women's groups to understand their perspective and provide project updates Require sign-off on key information disclosure, and community decisions through the construction phase
■ Ensure that the contract agreements with contractors contains clauses on requirement for contractors to hire at least 20% women as staff and workers for the	Within 3 months from Plan implementation, upto completion of construction related activities	RUMSL	■ Review of sex disaggregated pay sheet records of each month;	Contractor considers it is hard to source women	■ Advertisements for job vacancies for women should be posted at key locations near the project area, comprising bus stops, Government

Action Items	Timeline	Responsibility	Means of Verification for achievement of Targets	Potential Risk in achievement of Targets	Risk Mitigating Measures
project and ensure equal pay for women for same nature of work as added as clauses in the contract agreements for the contractors.			■ Cross verification of the select workers on periodic basis.		schools, Government hospitals, dispensaries, etc.; ■ Talk about the potential job opportunities for women during community consultations and get a feedback on the women with required key skills that are interested.
■ Undertake a profiling of the various social groups in the Study Area, to understand the individual needs and concerns of the various women belonging to different social groups and design community development, community investment and CSR programmes in light of the same, to ensure that benefits also target women	Within 6 months of initiation of construction related activities	RUMSL along with SPDs	■ Need Assessment Report; ■ Monitoring of progress of action plan	Sustainability of the CSR programs might be an issue, in terms of long term benefits	■ Clear communication on objective and duration of CSR programs; ■ Selection of Implementation partners that can provide linkages to livelihood programs that are sustainable.
Contractor shall provide safety gear and protective equipment to keep both men and women workers safe on the job	Ongoing upto completion of construction activities	RUMSL along with Contractors	Visual observations/ audits	Contractor may site financial constraints	■ Include these provisions as part of contract agreements with contractors to set expectations initially

Action Items	Timeline	Responsibility	Means of Verification for achievement of Targets	Potential Risk in achievement of Targets	Risk Mitigating Measures
Provide segregated toilet and sanitation facilities for men and women with reliable water supply, proper lock and lighting.	Ongoing	RUMSL along with Contractors	Site visits and site maps should include separate male and female toilets	Contractor may site financial or logistical constraints	■ Include these provisions as part of contract agreements with contractors to set expectations initially
Ensure that a crèche is established if the women engaged at the project are 50 or more, as per provisions of Maternity Benefit (Amendment) Act, 2017	Prior to commencement of construction activities and ongoing till completion of construction	RUMSL along with Contractors	Physical verification	Contractor may site financial or logistical constraints	■ Include these provisions as part of contract agreements with contractors to set expectations initially
The staff and workers recruited for the project, including the EPC and O&M contractors and their sub-contractors shall undergo periodic trainings on Prevention of Sexual Harassment as per the corporate POSH policy of the project (developed by RUMSL), which will be applicable for the project. Additionally train the staff and workers on provisions of GRM that are applicable for them and ways to use the GRM for the project	Start of Construction phase activities and ongoing on monthly basis	RUMSL	■ Records of Trainings in terms of number of staff and workers trained in each session; ■ Photo documentation of training session	None foreseen	NA

STAKEHOLDER ENGAGEMENT PLAN

Background

Rewa Ultra Mega Solar Limited (RUMSL) is a Public Undertaking Company incorporated on 10 July 2015 as a 50:50 joint venture (JV) company between Solar Energy Corporation of India Limited (SECI) and Madhya Pradesh Urja Vikas Nigam Limited (MPUVNL). Its primary objective is to develop and facilitate development of large scale solar power projects in the state of Madhya Pradesh.

RUMSL is planning to develop three Solar Parks in Madhya Pradesh and their associated internal evacuation infrastructure and Transmission Lines. This Stakeholder engagement plan is developed as part of the Environmental and Social Impact Assessment report for proposed 500 MW Neemuch Solar Park.

The proposed 500 MW Solar Park is proposed to be developed on allotted 1092.7 Ha of land area spread across three villages namely, Badi, Kawai and Bardawada of Singoli Tehsil of Neemuch District in the state of Madhya Pradesh. The Solar Park is divided into three units (Unit 1, Unit 2 and Unit 3) and lies between 24°59'39.78"N and 25° 0'38.51"N latitude and 75°13'26.82"E and 75°14'48.53"E longitude.

An ESIA has been prepared for this site (Units 1, 2 and 3) and this document, is a management plan for stakeholder engagement activities.

Objective and Scope of Stakeholder Engagement Plan

This document presents the Stakeholder Engagement Plan (SEP), which is applicable all activities proposed to be undertaken for the Neemuch Solar Park, as well as other stakeholder engagement that is conducted by the Solar Power Park Developer (RUMSL), the private Solar Project Developers (SPD) or other parties contracted by RUMSL, that engage with the key stakeholders identified as part of this Plan.

The main objective of this document is to guide stakeholder consultations across various stages of the project, while meeting the requirements of the applicable reference framework for the Project. Overall, this SEP will enable stakeholder engagement to be undertaken in a systematic and meaningful manner, where the various stakeholder groups are able to express their individual views, opinions and concerns, while allowing the Project to appropriately respond to them.

The objective of the Stakeholder Engagement Plan are as follows:

- Identification of the stakeholder groups in the project location and analysis of their profiles, interests, issues/impacts and concerns relevant to the project;
- Identification of specific measures to allow meaningful engagement with different stakeholder groups identified in a manner that is transparent and accessible and using culturally appropriate communication methods with a specific focus on the stakeholders with high influence/impact ;
- Facilitate adequate and timely dissemination of information to the stakeholder groups in a culturally appropriate manner;
- Provide systems for prior disclosure/dissemination of information and consultation including seeking inputs from affected persons, incorporation of inputs, as applicable, providing feedback to affected persons/groups on whether and how the input has been incorporated; and
- Providing a mechanism for documentation of the activities undertaken and the reporting and monitoring of the same.

Scope

The Stakeholder Engagement Plan document applies to the entire project lifecycle (planning or pre-construction, construction and operations phases) and shall be considered as a live document that shall be updated regularly, as required. This stakeholder engagement plan (SEP) will be used and updated by the

project proponents and its various teams (internal as well as contracted), performing various tasks linked to the project, comprising ESIA, RAP and FPIC processes, through interactions with various stakeholder groups like Tehsil level officials, Revenue Inspector, Patwari, officials from RUMSL, etc.

Methodology

The stakeholder engagement plan is guided by the Stakeholder Engagement strategy developed for internal use at ERM, to ensure consistency in the message and communication being undertaken with the identified stakeholders, by all teams that are involved in ESIA, RAP and FPIC/IPP preparation.

During the environmental and social impact assessment consultations process, ERM conducted various activities as part of the development of the public consultation program to determine the relevant stakeholders. From the ESIA field-consultations, ERM has identified approximately key stakeholders groups and categorised them as Primary and Secondary stakeholders, based on the nature and extent of impact of project and influence of stakeholders on the project, as presented in Table F8.

There may be cases where additional stakeholder categories are identified during the RAP-LRP and FPIC/IPP survey processes, and/ or the profile of these stakeholder groups (Primary or Secondary) altered based on detailed assessment from impacted entities by the project.

The details of these engagement activities and key points of discussion are captured in **Appendix B** of the document.

Furthermore, the surveys for the Resettlement Action Plan and Livelihoods Restoration Plan (RAP-LRP) and FPIC/IPP preparation are planned July 2020 onwards in the project villages of Bardawada, Kawai and Badi, which will primarily comprise the following stakeholder categories. Separate meetings with women and men may be help, as required:

- Private Land Owners;
- Patta Holders;
- Users of the affected land categories, including agricultural labour, encroachers etc.;
- Indigenous Groups present in the Project villages;
- Other groups or institutional entities that are identified at the time of detailed RAP surveys.

Applicable Reference Framework

This Stakeholder Engagement Plan is prepared as per the requirements of the following regulations and standards:

- Relevant environmental, land labour and other relevant policies, laws, regulations and rules of the state of MP, and the Government of India;
- World Bank Environmental and Social Management Framework for Solar PV Park, February 2017; and
- IFC Performance Standards, 2012

Stakeholder Mapping

Stakeholder Identification and Categorisation

A stakeholder is defined as "any identifiable group or individual who can affect the achievement of an organization's objectives or who is affected by the achievement of an organization's objectives". Stakeholders thus vary in terms of degree of interest, influence and control they have over the project. While those stakeholders who have a direct impact on or are directly impacted by the project are known as **Primary Stakeholders,** those who have an indirect impact or are indirectly impacted are known as **Secondary Stakeholders**.

During the ESIA process, a stakeholder identification and prioritization was conducted for identifying the key stakeholders of the project, while keeping in mind the nature of the project and its setting. Furthermore, consultations were conducted with these identified stakeholders through a participatory approach. The table below presents the key stakeholders of the project.

Table F8 Stakeholder Group Categorisation

Stakeholder Groups	Primary Stakeholders	Secondary Stakeholders
Community	■ Private Land Owners from Bardawada, Kawai, Badi villages ■ Patta Holders from Bardawada, Kawai, Badi villages ■ Patta holders who have 'sold' their land based on verbal agreements without due paperwork ■ Squatters and Encroachers ■ Agricultural Labourers ■ Graziers ■ Vulnerable Social Groups in other villages in the vicinity ■ Contractors ■ Potential unskilled labourers to be engaged for the construction phase of the project ■ Owners of land required for temporary occupation or use ■ Local Community from Project villages.	■ Fence Line Communities from other villages in the vicinity ■ Non-recognised 'patta owners' who have procured the patta based on a verbal agreement with the original (and registered) patta holders.
Institutional Stakeholders	■ Gram Panchayats of Dhardi (for Bardawada village) and Badi (for Kawai and Badi villages); ■ Singoli Tehsil officials	■ Local Political Groups ■ Civil Society/ Local NGOs
Government Bodies/Regulatory Authorities	■ Regulatory Authorities comprising the following: – MP Pollution Control Board; – Central Pollution Control Board (CPCB) – Ministry of Environment Forest and Climate Change (MoEFCC) – Local Fire Authority; – Ministry of Road Transport and Highways – State Transport Authority; – District Collector and Revenue Department; – Central Electrical Authority through C.E(P&D) Jabalpur; – Department of Telegraph – Communication, Govt. of Madhya Pradesh;	

Stakeholder Groups	Primary Stakeholders	Secondary Stakeholders
	– Department of Panchayati Raj, Madhya Pradesh; – Labour Department; – Wildlife Warden, State Forest Department; – District and State Forest Department, MoEFCC. ■ District Administration	

Stakeholder Analysis

The significance of a stakeholder group is categorized considering the magnitude of impact (type, extent, duration, scale and frequency) or degree of influence (power and proximity) of stakeholder group and urgency/likelihood of the impact associated with the particular stakeholder group in the project context.

The magnitude of stakeholder impact/influence is assessed taking the power/responsibility and proximity of the stakeholder group and the group is consequently categorized as negligible, small, medium or large. The urgency or likelihood of the impact on/influence by the stakeholder is assessed on a scale of low, medium and high. The overall significance of the stakeholder group is assessed as per the matrix provided in table below.

Table F9 Stakeholder Significance and Engagement Requirement

		Likelihood of Influence on/ by Stakeholder		
		Low	Medium	High
Magnitude of Influence/ Impact	Negligible	Negligible	Negligible	Negligible
	Small	Negligible	Minor	Moderate
	Medium	Minor	Moderate	Urgent
	Large	Moderate	Urgent	Urgent

The coverage of stakeholders as stated above includes any person, group, institution or organization that is likely to be impacted (directly or indirectly) or may have interest/influence over project. Keeping this wide scope of inclusion in stakeholder category and the long life of project, it is difficult to identify all potential stakeholders and gauge their level of influence over project at the outset of the project. Therefore the project proponent is advised to consider this stakeholder mapping as a live document which should be revised in a timely manner so as to make it comprehensive for any given period of time.

Table F10 Stakeholder Analysis

Relevant Stakeholders	Profile/ Status	Impact/Influence of the project on this Stakeholder Group	Impact/Influence of the Stakeholder Group on the project	Expectations, Opinions Key Concerns of Stakeholders	Overall Rating of Stakeholder Influence
Primary Stakeholder					
Private Land Owners and Patta Holders from Bardawada, Kawai, Badi villages	■ Private Land Owners comprise of those households, whose land parcels are falling within land footprint of the solar park. ■ Patta holders comprises of households that were assigned land (Patta), by dint of their landlessness (or other vulnerabilities), in 1950s- 60s to 80s, under various schemes. ■ The criteria and terms for allotting Patta land were different as this was done at different times, for different purposes. The Tehsil office reported that these documents were lost over time and are not available; ■ This group is dependent on their land parcels for their livelihood needs; ■ This includes the land owners in the RoW of the Transmission Line routes for the project. ■ The exact number of land owners for the project is not currently known.	■ The project will be set up on 35.488 ha. of private land and 87.734 ha Patta land parcels across the three villages; ■ The dependence on land for agriculture and livestock in the area is high, as depicted in the Census data and reported during consultation; ■ The purchase of land for the project development activities will affect this stakeholder group leading to reduced land holdings; ■ Additionally, if this stakeholder group is provided with an alternate land parcel, the quality of alternate land parcels and the effort and investment required to make it fit for cultivation, is also of key concern, as there are certain rocky patches of land existing in and around the project area.	■ The stakeholder groups' influence on the project is pertinent to smooth land availability and its support is key for the smooth functioning of the project related activities in the area.	■ Concerns regarding land being procured by the Project, because there has been significant cost and effort expended in the preparation of the land for making it cultivable; ■ Adequate payment for the land being procured for the project activities, including for those without any formal recognized ownership documents, who may have 'bought' patta land based on a verbal agreement; ■ Minimal disturbance to the community with regards to access issues, pollution, health and safety risks and influx of migrant workers ■ This Stakeholder group may expect income generating activities or employment as construction labourers, masons, drivers, etc. during the construction phase of the Project.	High

Relevant Stakeholders	Profile/ Status	Impact/Influence of the project on this Stakeholder Group	Impact/Influence of the Stakeholder Group on the project	Expectations, Opinions Key Concerns of Stakeholders	Overall Rating of Stakeholder Influence
Encroachers/ occupiers/ squatters (for agriculture)	■ This stakeholder group comprises of households that have illegally encroached/occupied Government Land, which was lying unused, in the project area and around. ■ Encroachment of Government land is a general practice in the area, where certain households start using Government land for agriculture, even without any legal ownership of the land parcel. ■ It has been reported that the practice of encroachment is usually undertaken by the relatively well-off households, that already own land; ■ When the encroachment related practices are identified by the Government officials, this group is willing to pay fines against the use of Government land; however, in such scenario, the Encroachers do not disclose the exact encroachment and only declare a fraction of the actual encroached land to, in tier understanding, get some sort of sanction to continue to informally occupy and use the land.	■ This stakeholder group has been using the land for livelihood activities; though does not have legitimate claims or ownership of the land. In fact, they are well aware of their illegal status; ■ The project would be set up on the encroached land and would lead to disruption of economic activities and incomes to these households, and those employed by them on these lands (usually seasonally).	The influence of this stakeholder group on the project is moderate, considering they do not have legal rights on the land; however there have influence in the village by virtue of their economic power (they are all land owners and employers of agricultural labour). They have previously held agitations and protests as they do not want to part with their encroached land parcels, given that they have made several improvements to it and made this land productive.	■ The key concern of this stakeholder group is of losing the land parcels which they have been using for agriculture; ■ This group reports that they have spent considerable amount of effort and money to make the land cultivable and all this effort will be wasted after the project comes on this land; ■ Additionally, their concern is for the proportion of land parcels under their possession which are undeclared; ■ The Revenue inspector and his team, which undertook the land mapping exercise did not note the encroached land parcels and thus this stakeholder group is concerned that they may not receive any compensation; ■ This Stakeholder group may expect income generating activities or employment as construction labourers, masons, drivers, etc. during the construction phase of the Project.	Medium

Relevant Stakeholders	Profile/ Status	Impact/Influence of the project on this Stakeholder Group	Impact/Influence of the Stakeholder Group on the project	Expectations, Opinions Key Concerns of Stakeholders	Overall Rating of Stakeholder Influence
	■ This practice helps them to make official records of their dependence on the land, simultaneously saving the fines for the actually encroached land, which would be significantly higher. ■ To make it productive, most occupiers have made improvements to the land, including installing bore wells and improving the soli quality through use of manure and repeated cultivation and tilling.				
Agricultural Labourers	■ This stakeholder group comprises of those households that have marginal or limited land holdings and members of their families work as Agricultural labourers in the land parcels falling in the area identified for project across all three categories- private land, patta land (that is being cultivated), and encroached land under agriculture	■ The land procurement for the project will be impacting their income sources, thereby leading to a deterioration of the household income.	■ The influence of this group on the project is limited, given that they do not have any legal claims on the land; ■ This group can be used during the construction phase of the project as unskilled labour with priority hiring and may additionally be included in Livelihood Restoration initiatives;	■ This Stakeholder group may expect employment as construction labourers, masons, drivers, etc. during the construction phase of the Project.	Low

Relevant Stakeholders	Profile/ Status	Impact/Influence of the project on this Stakeholder Group	Impact/Influence of the Stakeholder Group on the project	Expectations, Opinions Key Concerns of Stakeholders	Overall Rating of Stakeholder Influence
Graziers – people from the Project villages who use the government land as open grazing area for their livestock	■ The Government land in the Project Footprint is reported to be used by the community for grazing of livestock of nearby villages. There are approx. 2200 livestock (comprising cows, buffaloes, sheep and goats) in the three project villages. ■ The livestock ownership in the Project villages is higher amongst Gurjar community (cows and buffaloes), while Bhil community is reported to possess a higher number of sheep and goats. ■ The local community has also done boundary marking on government land, to demarcate grazing areas for an individual household or a group of households, by creating 'fodder lots', where livestock from the village is fed commercially, by charging INR 1000 per livestock per year.	■ The procurement of Government land that is being used shall reduce the amount of land available for grazing near the project villages; ■ This land procurement may also lead to impact on easement or access to other areas available for livestock grazing.	■ The influence of this group on the project is limited, given that they do not have any legal claims on the land; ■ Livestock forms an important part of the villages' nutritional and energy source and may impact availability of food (milk, meat, etc.) during construction phase, to some extent is affected badly.	■ The key expectations of this stakeholder group is to allow for provision of 2% grazing land in the project area for livestock grazing; ■ Easements shall be provided through project design elements to have minimal impact on this stakeholder groups' ease of activities.	Lows
Vulnerable social groups such as women headed households, BPL and Landless households	■ This stakeholder group is comprised of groups/households that are considered to be vulnerable due to their social, political or economic status in the society. ■ For the project, the vulnerable groups are identified as women & women headed households,	■ The influence of project on this group is similar in nature as the entire fence line community, as it is a subset of the same.	■ The involvement of this stakeholder group is expected to be as part of the larger local community; ■ This stakeholder group should be specifically consulted to	■ Priority in economic benefits and development opportunities created by the project; ■ Minimal disturbance to the community in regards to access issues, grazing land, pollution and influx of migrant workers. ■ Provisions for women, in order to ensure equivalent	Medium

Relevant Stakeholders	Profile/ Status	Impact/Influence of the project on this Stakeholder Group	Impact/Influence of the Stakeholder Group on the project	Expectations, Opinions Key Concerns of Stakeholders	Overall Rating of Stakeholder Influence
	elderly, physically handicapped, landless and those with less than 1 ha of land and families in the Below the Poverty Line Category; ■ The impacts on this stakeholder group will be similar to other groups, due to land take, Health and safety, etc.; just that they may get impacted more due to their vulnerabilities, the traditional practices of non-participation in meetings along with men, limited involvement in negotiation process for land sale, etc.		ensure adequate provisions in the RAP and LRP for the differential impacts expected on this group	benefits to both genders, to the extent possible	
Indigenous People	■ While the project is not located in a scheduled V area, the local community is comprised of ST population. ■ The largest proportion of ST population is in the Project Villages of the Neemuch solar park. ■ The assessment of impacts on the ST population due to the project related land procurements will be assessed in detail during surveys to be undertaken for preparation of IPP	■ The influence of project on this group is similar in nature as the entire fence line community, as it is a subset of the same.	■ The involvement of this stakeholder group is expected to be as part of the larger local community; ■ In keeping with the requirements of the IFC PS 7, the project will require to obtain Free Prior Informed Consent from this stakeholder group prior to the initiation of project activities.	■ Priority in economic benefits and development opportunities created by the project; ■ Minimal disturbance to the community in regards to access issues, grazing land, pollution and influx of migrant workers.	High

Relevant Stakeholders	Profile/ Status	Impact/Influence of the project on this Stakeholder Group	Impact/Influence of the Stakeholder Group on the project	Expectations, Opinions Key Concerns of Stakeholders	Overall Rating of Stakeholder Influence
EPC/ Construction Contractors, sub-contractors	■ This stakeholder group comprises of the EPC contractors and other contractors/ sub-contractors involved in the Project for various tasks, like access roads construction, laying down of Transmission Line towers, civil and electric works for the power plant, etc.	■ The project provides this group contractor-ship opportunities and steady flow of income.	■ This stakeholder group is critical for the smooth functioning and timely implementation of the Project; ■ This group may also play an important role in the formation of public opinion towards the project	■ Continued economic opportunities and work generation; ■ Clarity in terms of scope of work, expectations, key performance indicators, responsibilities and timelines for the project; ■ Timely and adequate disclosure of information to allow the project activities to be carried out; ■ Fair business opportunities and contract closure; ■ Undertake project activities in keeping with the contractual agreements and applicable regulations in place.	High
Unskilled labourers to be engaged for the construction phase of the project	■ This group is comprised of skilled and semi-skilled workers, who will be involved in the project on a contractual basis. ■ Labour may be local, regional or migrant (from other regions) and is likely to be comprised of skilled worker and any number of semi-skilled or unskilled workers This decision will be the contractors', depending on their requirements.	■ If local labour is used, it will help create goodwill locally and the project related opportunities would be shared with the local population..	■ This stakeholder group will be critical for the smooth functioning and timely implementation of the project; ■ This group may also play an important role in the formation of public opinion towards the project.	■ Concerns pertaining to wages, benefits, working hours and working conditions, etc.; ■ Health and safety involved with the construction phase ■ Working hours at the construction site ■ Timely disbursement of wages; ■ Access to the GRM established for the project	Low

Relevant Stakeholders	Profile/ Status	Impact/Influence of the project on this Stakeholder Group	Impact/Influence of the Stakeholder Group on the project	Expectations, Opinions Key Concerns of Stakeholders	Overall Rating of Stakeholder Influence
Owners of land required for temporary occupation or use	■ Some of the project components would require short term leasing of land available, largely from Private and/ or Patta land owners; ■ This requirement would be better understood during the time of initiation of construction activity.	■ The short term leasing of land by the project may bring in additional income from lease, if the land is not being used for any other commercial purposes; ■ The project related activities on these land parcels may be for purposes of storage, set up of labour camps, etc. and may result in change in land use due to construction or storage activities, contamination issues, etc.	■ This stakeholder group is critical for availability of land parcels that are conveniently located from the project footprint (based on the needs) and are available without disturbances or issues during the lease period.	■ The expectations of this stakeholder group is clear communication of lease terms and amount and timely payments, as necessary; ■ Restoration of land to its original state, or better, at the time of handing it back to the owners.	Medium
Gram Panchayats (GPs) of Dhardi (for Bardawada village) and Badi (for Kawai and Badi villages)	■ This stakeholder group is comprised of Sarpanch, ward member and Gram Sewak of Panchayats of Dhardi (for Bardawada village) and Badi (for Kawai and Badi villages).	■ The influence of project on this stakeholder group is minimal due to limited control that the project can exert on the functioning of this group.	■ This group has the ability to influence the perception of the community in regards to the Project and its activities	■ Involvement of this group in decision making process for the project, especially related to the land taking process ■ Involvement in the formulation and implementation of the community development activities for the project; ■ Adequate communication of project information, in terms of timelines of key activities and their potential impacts.	Low
Singoli Tehsil/ Neemuch district officials (District Collector's office)	■ This group is comprised of the regulatory authorities at the tehsil and district level that are responsible for land demarcation, allotment of patta land, for the project and for various permits and licenses pertaining to the project. ■ The decisions regarding whether to provide alternate patta land, register 'verbal	■ The project should be in compliance with the requirements stated and the processes governed by this stakeholder group. ■ Their involvement for resolution of patta land related issues will be essential ■ They will be required to provide support for law and order for the smooth and	■ This stakeholder group is high in priority as this group provides the land demarcation and permits and licenses essential for the functioning of the project;	■ Developmental activities in the project area; ■ Smooth operations of the project related activities by causing minimal impacts on the community; ■ Adherence to regulations and maintenance of law and order	High

Relevant Stakeholders	Profile/ Status	Impact/Influence of the project on this Stakeholder Group	Impact/Influence of the Stakeholder Group on the project	Expectations, Opinions Key Concerns of Stakeholders	Overall Rating of Stakeholder Influence
	transactions' of patta land sale, and how other matters pertaining to patta land may be resolved also require their participation and final decision.	peaceable functioning, of construction activities, and to resolve grievance that may be escalated to them.	■ Noncompliance to conditions laid down in permits issued by this group stakeholders group can result in penalties and fines being levied on the Project.		
Regulatory Authorities at state and central levels	■ This stakeholder group is comprised of the central, state and district level regulatory authorities; ■ These authorities influence the project in terms of establishing policy, granting permits and approvals for the project, monitoring and enforcing compliance with the applicable rules and regulations. ■	■ The main concerns of the Regulatory Authorities from the Project Proponents is abidance to all applicable guidelines, policies and laws.	■ The ability of the project to comply with the various applicable rules and regulations may play a role in the timely implementation of the project.	■ Project's compliance to the regulatory requirements; ■ Timely disclosure of information and provisioning of updated through the life of the project ■ This stakeholder group is also critical for various permits/clearances required for the commissioning of the project	
Secondary Stakeholders					
Fence Line Community	■ This stakeholder group is comprised of the local population in the three villages, coming under the project boundaries that are not directly impacted by the Project activities as well as population residing in other villages in the Study area of the project;	■ The project will use land which is currently being used by this stakeholder group in accessing their farms, lakes and other common areas, grazing their livestock, etc.; ■ Some of the community members also use this land for cultivation (through encroachments) or work on	■ This stakeholder group shall play a critical role in the smooth functioning of the Project.	■ Adequate provisions of easements while designing various project features in order to ensure minimal access restriction for this group; ■ Minimal disturbance to this group due to various activities of construction, operation and decommissioning phases, including plying of vehicles	High

Relevant Stakeholders	Profile/ Status	Impact/Influence of the project on this Stakeholder Group	Impact/Influence of the Stakeholder Group on the project	Expectations, Opinions Key Concerns of Stakeholders	Overall Rating of Stakeholder Influence
		the farm lands as agricultural labourers, etc. These activities will be disrupted after the project related activities commence on the identified land		for transportation purposes, using the roads near these villages.	
Local Political Groups	■ This stakeholder group is comprised of the political parties and local politicians active in the region; ■ This group might be active in the area and may play an important role in the polarisation of public opinion towards the Project.	■ The project will have minimal or no influence on this stakeholder group	■ This stakeholder group is expected to play a critical role in the development of the public opinion towards the project, especially in light of the current political environment in the country.	■ The main expectation and concern of the stakeholder group from the project includes the project's role in the development of the area in keeping with the broader agenda of the projects and keeping the constituents and loyalists of the parties at the forefront.	Low
Civil Society/Local NGOs	This stakeholder group comprises of NGOs and Civil Society Organizations of a national, state and local level who may be active in the area. Most of the NGOs and CSOs working in the region are state level NGOs, involved in literacy, water management, WASH and gender equality some of the key NGOs and CSOs working in the region include the following: ■ Water Aid ■ Neemuch Gabli Educational & Social Welfare Society ■ Seema Mahila Mandal, Neemuch	The level of influence of project on this stakeholder group is limited as it does not affect the functioning of this group.	■ The stakeholder group may play an important role in the development of public opinion for the project; ■ This stakeholder group may also be involved in the implementation of the community development plans	■ The main expectations and concerns of the stakeholder group from the project is likely to include the development of the project, in keeping with the applicable regulations and with minimal impacts on the local population, while contributing towards the overall development of the area ■ The interest of this stakeholder group primarily pertains to the roles of the project in implementing community development activities in the area; ■ Involvement in the formulation and implementation of the	Medium

Relevant Stakeholders	Profile/ Status	Impact/Influence of the project on this Stakeholder Group	Impact/Influence of the Stakeholder Group on the project	Expectations, Opinions Key Concerns of Stakeholders	Overall Rating of Stakeholder Influence
	■ Gramya Evam Bal Utthan Samiti ■ Grask Gramin Rojgar Evam Samaj Kalyan Samiti Samiti Dewas ■ Guru Shaheb Public Education Society ■ Gurudev Samaj Kalyan Samiti Ashoknagar ■ Gyanmanu Mahila Mandal			community development activities for the project; and ■ Timely disclosure of information pertaining to the project.	

Detailed Stakeholder Engagement Plan

Some of the most common tools of engagement are discussions, consultations and meetings. These modes of engagement can be undertaken in the forms of groups or at individual levels. These serve the purpose of allowing the project proponents to gain an understanding of the viewpoint of the other stakeholders involved in regards to the functioning of the Unit/project, the implementation of various provisions in the Project.

Based on the stakeholder identification and analysis undertaken, a detailed plan is prepared that guides the engagement process with each stakeholder group, as identified in Table below. The Social and Community Supervisor shall be responsible for maintenance of the records of along with the members that engage with stakeholders during construction and operations phase, along with addition of addition of any new categories identified.

Table F11 Stakeholder Engagement Plan

Stakeholder Group	Objective	Method/time of Engagement	Teams
Planning Phase			
Private Land Owners	■ Information sharing regarding the project, including the background of the project and capacity of the project; ■ To understand the key concerns related to the projects; ■ Understand the socio-economic profile of land owners and the details of income generated through agricultural activities in order to arrive at details for compensation for crop damage, etc. ■ Effort required by the land owners to make the land cultivable; and ■ Understanding expectation from the project.	■ Face to face discussion and/or Focus Group Discussion; ■ RAP-LRP surveys and consultations	■ ESIA ■ RAP ■ RUMSL ■ FPIC/IPP
Squatters and Encroachers	■ Understanding the extent of land encroached and legally possessed by the group; ■ Understanding other sources of livelihoods of the household, and dependence of their households and others; ■ Understand the duration that the land is encroached for and improvements made to it; ■ Understanding expectation from the project.	■ Face to face discussion and/or Focus Group Discussion during RAP-LRP and FPIC consultations	■ ESIA ■ RAP ■ FPIC/IPP
Patta Holders along Patta holders who have sold their land based on verbal agreement	■ Information sharing regarding the project, including the background of the project and capacity of the project; ■ To understand the key concerns related to the projects; ■ Understand the socio-economic profile of Patta land holders, any alternate land parcels or alternate occupational profile of household and the details of income generated through agricultural activities in order to arrive at details for compensation for crop damage, etc. ■ Effort required by the Patta land holders to make the land cultivable; ■ Any informal land transaction executed on the Patta land identified for project; and ■ Understanding expectation from the project	■ Face to face discussion and/or Focus Group Discussion ■ RAP-LRP surveys and consultations	■ ESIA ■ RAP ■ RUMSL ■ FPIC/IPP

Stakeholder Group	Objective	Method/time of Engagement	Teams
Indigenous Groups – ST community	■ To understand existing rights, dependence and use ■ To understand the nature and extent of impacts; ■ To ascertain if FPIC is required ■ If FPIC is requires, the process to be followed will be contained in the FPIC document and must be applied;	■ Face to face discussion and/or Focus Group Discussions ■ Separate discussions with women, if required	■ RAP ■ FPIC/IPP ■ RUMSL
Agricultural Labourers and Graziers	■ Understanding the dependence on identified private, patta and Government land parcels for labour work and livestock grazing activities; ■ Evaluation of alternate grazing land – proximity and adequacy ■ Access routes and easements ■ Other sources of livelihoods, if any; ■ Engagement in community development activities; ■ Understanding of expectations from the project.	■ Open Meetings; ■ Separate discussions with women, if required	■ RAP; ■ FPIC/IPP ■ RUMSL and Solar Power Developers
Gram Panchayat	■ Discussion on the Bhil community, regarding the socio-economic status, legal documents of the community, migration of the community, encroachment on the nearby land done by the community and the voting rights of the community; ■ Information given regarding the project, including the background of the project and capacity of the project; ■ To understand the key concerns related to the projects; ■ Understand the socio-economic profile of land owners ■ Understanding the potential impact of the project on the stakeholder; and ■ Expectation from the project.	■ Consultations, meetings (FGD and individual interview) and Discussions; ■ Sharing of documents as part of the disclosure mechanism; ■ Grievances Redressal Mechanism (GRM); ■ For issues concerning Grievances Redressal Mechanism (GRM)	■ ESIA; ■ RAP; ■ RUMSL;

Stakeholder Group	Objective	Method/time of Engagement	Teams
Local Community from project villages	■ Information given regarding the project, including the background of the project and capacity of the project; ■ To understand the key concerns related to the projects; ■ Understanding the potential impact of the project on the stakeholder; and ■ Expectation from the project; ■ Engagement in developmental activities	■ Focus Group Discussion and/or Open Public Meetings	■ ESIA; ■ RAP; ■ FPIC/IPP ■ RUMSL/SPD along with EPC contractors and subcontractors
Tehsil Officials (Revenue Inspectors and Tehsildar)	■ Understand the working of revenue department; ■ The process adopted for demarcation of land; ■ The land transfer process from Revenue department to RUMSL; ■ Discussion over the Patta Land and the ownership of Patta land; and ■ Different type of land present which are coming under the project footprint. ■ Minimum Support Price for the crops given to the land owners and to the encroachers ■ Encroachment in the area	■ Face to face discussion	■ ESIA; ■ RAP; ■ IPP ■ RUMSL along with EPC contractors and subcontractors
Regulatory Authorities	■ On land allocation for Government land by RUMSL; ■ On understanding of land procurement process followed, by ERM ESIA Team; ■ On maintaining compliance to regulatory requirements;	■ Face to face discussion; ■ Through applications, letters, etc.	■ RUMSL along with EPC contractors and subcontractors; ■ SPD
Construction Phase			
Contractors	■ Information dissemination, including information regarding labour laws, local employment opportunities, safety measures and discussion on grievances; ■ For negotiation on contract clauses as per requirements stated in ESIA and Management plans for the project;	■ Signed contracts with requirement to implement the ESMP	■ RUMSL

Stakeholder Group	Objective	Method/time of Engagement	Teams
	■ EHSS Audits by project proponents	■ Meetings and monthly reporting in the operations phase; ■ Documentation as agreed in the contract	
Potential unskilled labour to be used for construction phase of the project	■ Advertising of job vacancies for the project at village level; ■ During screening of applicants by contractors of RUMSL, in coordination with RUMSL on list of project affected households; ■ Induction on Code of Conduct and Grievances Redressal Mechanism (GRM)	■ Through face to face discussion at the time of hiring for construction phase	■ RUMSL oversight ■ SPD and their contractors and subcontractors
Local Community from project villages	■ To identify labour class in the village and site area; ■ To identify their skill set and adequacy for engaging them in the on-going construction activity, i.e. as construction worker, security guard, cook, technician etc.; ■ To understand more about their expectation from project;	■ Focus Group Discussion and/or Open Public Meetings	■ RUMSL and ■ EPC contractor and other Sub-contractors engaged for construction phase
Gram Panchayat	■ To seek permission for labour camps and carry out construction activities; ■ To understand their expectation from then ongoing construction activity; ■ To identify and document, if there is any grievance, query or recommendation of Gram Panchayat or local community	■ Individual/ Group consultations with Gram Panchayat members	■ RUMSL ■ EPC Contractor
Operations Phase			
Gram Panchayat (for Community Development Activities and other	■ Discussion with Gram Panchayat regarding community development activities; ■ Engagement of Gram Panchayat & local community in identifying the much needed skills to be developed in youth and local community;	■ Consultations, meetings with Gram Panchayat members and local community,	■ RUMSL; ■ SPDs; ■ O&M Contractor

Stakeholder Group	Objective	Method/time of Engagement	Teams
Project related Grievances)	■ To identify the vulnerable community/ family and synchronizing their demand and need with project activities; ■ To seek cooperation of local community and Gram Panchayat members for smooth and timely execution of development activities; ■ Also, to liasion with Gram Panchayat regarding any query, grievance from then ongoing project activities and staff/ security guards.	individual meeting/ discussion; ■ Sharing of documents, ideas pertaining to development activities; ■ Grievances Redressal Mechanism (GRM); ■ For issues concerning Grievances Redressal Mechanism (GRM)	■
Local community & Youth	■ To identify the occupational pattern of the village; ■ Understand the role and engagement of women in the workforce; ■ Understanding the livelihood/ employment opportunities at village level; ■ To understand, if there is any need based demand from youth especially women/ girls, regarding skill development, typology of skill development etc.	■ Consultation with local community especially youth; ■ Separate consultations with school and college going girls and adult women regarding skill development demand.	■ RUMSL; ■ SPDs; ■ O&M Contractor ■

There is a Grievance Redresaal Mechanism that is developed to receive, record, resolve and track grievances raised by both internal and external stakeholders, as part of the ESIA report (**Section 9**). The provision of SEP and GRM are also referenced as mitigation measures in the relevant sections of the Environmental and Social Management Plan.

Implementation Arrangements

Monitoring and Evaluation

Like the other project components, the SEP shall be regularly monitored to ensure that the engagement with various stakeholders are getting properly documented, in order to ensure transparency in communication and decision making processes, wherever applicable.

A Social and Community Supervisor shall be appointed by RUMSL, who will be responsible for implementation of the SEP, along with other related plans like Gender Action Plan, Grievance Redressal Mechanism of the project, and identified roles in monitoring of labourers during construction and operations phases of the project. The S&C Supervisor shall play a key role in implementation of the SEP and other plans in construction and operations phases of the project.

The S&C Supervisor shall coordinate with other relevant team members of RUMSL and its contractors, SPDs, etc., on maintaining and update of documentation of stakeholder engagement details, across the construction and operations phases.

The S&C Supervisor shall additionally be responsible for identifying and tracking training needs, maintenance and update of documentation, reporting and monitoring requirements for the effective implementation of SEP.

Budgeting

RUMSL shall ensure that proper budgetary allocations are made for the activities related to stakeholder engagement, like meetings, trainings, addressal of needs identified and found reasonable through the stakeholder engagement process.

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