Draft Initial Environmental Examination

Project Number: 55182-001
Initial Environmental Social Examination
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India: AJ Solar Power Project
(Part 2 of 3)

Prepared by Arcadis India Private Limited for AEW India West One Private Limited and the Asian Development Bank.

3.7 Survey results

An inventory of avifauna observed through vantage points, point counts, line transects, random car transects and opportunistic sightings as well as other species found in the area through direct sighting was prepared.

3.7.1 Flora

The project area is mostly agricultural fields, very few scattered big trees were present. *Prosopis juliflora* and Acacia sp. were in abundance. Most of the big trees were surrounding the waterbodies, those that are used as perch for birds and for nesting and roosting. Also, few plantation patches of neem and eucalyptus were present in the area. Table 3.27 lists the plants and trees encountered during VPs, LTs, PCs. The list comprises of both native and exotic species and is a combined floral list.

Table 3-27: Flora identified – Season 1

S.N.	Local Name	Common Name	Scientific Name	Family	Type	IUCN status
1	Telakucha	Ivy Gourd	*Coccinia grandis*	Cucurbitaceae	Climber	NA
2	Akanda	Crown Flower	*Calotropis gigantea*	Apocynaceae	Shrub	NA
3	Dholkolmi	Bush Morning Glory	*Ipomoea carnea*	Convolvulaceae	Shrub	NA
4	Kapas Tulo	Cotton	*Gossypium arboreum*	Malvaceae	Shrub	NA
5	Prosopis	Algaroba	*Prosopis juliflora*	Mimosaceae	Small Tree	NA
6	Subabul	White Babool	*Leucaena leucocephala*	Fabaceae	Tree	NA
7	Neem	Neem	*Azadirachta indica*	Meliaceae	Tree	LC
8	Bot	Banyan Tree	*Ficus benghalensis*	Moraceae	Tree	NA
9	Radhachura	Copperpod Tree	*Peltophorum pterocarpum*	Fabaceae	Tree	NA
10	Jaggadumur	Cluster Fig	*Ficus glomerata*	Moraceae	Tree	NA
11	Babul	Gum Arabic Tree	*Vachellia nilotica*	Fabaceae	Tree	LC
12	Khirish	Rain Tree	*Samanea saman*	Fabaceae	Tree	LC
13	Karanja	Pongame Oiltree	*Millettia pinnata*	Fabaceae	Tree	LC
14	Eucaliptus	Eucalyptus	*Eucalyptus* sp.	Myrtaceae	Tree	NA
15	Sisoo	Shisham, North Indian rosewood	*Dalbergia sissoo*	Fabaceae	Tree	LC
16	Aswatha	Sacred Fig	*Ficus religiosa*	Moraceae	Tree	NA
17	Siris	Siris Tree, Woman's Tongue	*Albizia lebbeck*	Mimosaceae	Tree	LC

18	Palash	Flame-of-the-forest	*Butea monosperma*	Fabaceae	Tree	LC

Legend: LC – Least Concern, NA- Not Applicable in IUCN Red List of Threatened Species v.2021-2. R-Resident to the area. I, II, IV, Schedules under WLPA 1972, NM – Not Mentioned in WLPA.

3.7.2 Mammals

Two female Blackbuck (*Antilope cervicapra*) (WLPA Sch I) were sighted foraging in the land (old project land) where the solar power project was proposed. Indian Grey Mongoose and two species of Palm Squirrel were documented from the project site distributed throughout the area, three individuals of Indian Flying Fox were documented in their flight during dusk, no roost was identified in or around the project footprint. As per Indian Wildlife Protection Act (WLPA 1972), Blackbuck is a species which is included under Schedule I and hence is a protected animal. As such, the project is required to ensure that no Blackbuck is harmed during the construction and operation of the project. Mitigation measures will be developed accordingly.

Table 3-28: Mammals identified – Season 1

Common Name	Scientific Name	Migratory Status	IUCN Status	WLPA Status
Blackbuck	*Antilope cervicapra*	R	LC	I
Indian Grey Mongoose	*Herpestes edwardsii*	R	LC	II
Three striped Palm squirrel	*Funambulus palmarum*	R	LC	IV
Five striped Palm Squirrel	*Funambulus pennantii*	R	LC	IV
Indian Flying Fox	*Pteropus giganteus*	R	LC	IV

Legend: LC – Least Concern, NA- Not Applicable in IUCN Red List of Threatened Species v.2021-2. R-Resident to the area. I, II, IV, Schedules under WLPA 1972, NM – Not Mentioned in WLPA.

Table 3-29: Mammals identified – Season 2

Common Name	Scientific Name	Migratory Status	IUCN Status	WLPA Status
Indian Grey Mongoose	*Herpestes edwardsii*	R	LC	II
Three striped Palm squirrel	*Funambulus palmarum*	R	LC	IV
Five striped Palm Squirrel	*Funambulus pennantii*	R	LC	IV
Indian Flying Fox	*Pteropus giganteus*	R	LC	IV

Legend: LC – Least Concern, NA- Not Applicable in IUCN Red List of Threatened Species v.2021-2. R-Resident to the area. I, II, IV, Schedules under WLPA 1972, NM – Not Mentioned in WLPA.

3.7.3 Herpetofauna

Yellow Monitor Lizard *(Varanus flavescens*) (WLPA Sch I) was sighted in three locations, two near Bhalgamda village and one near Mota Timbla village (North of the projected land for the Solar Power Project) and Checkered Keelback (*Xenochrophis piscator*) (WLPA Sch II) was sighted in PC 1 (Nana Kerala village).

Table 3-30: Herpetofauna identified – Season 1

Common Name	Scientific Name	IUCN Status	WLPA Status
Checkered Keelback	*Xenochrophis piscator*	NA	II

Yellow Monitor Lizard	*Varanus flavescens*	NA	I
Fan-throated Lizard	*Sitana ponticeriana*	LC	NM
Oriental Garden Lizard	*Calotes versicolor*	NA	NM
Indian Bullfrog	*Hoplobatrachus tigerinus*	LC	IV

Legend: LC – Least Concern, NA- Not Applicable in IUCN Red List of Threatened Species v.2021-2. R-Resident to the area. I, II, IV, Schedules under WLPA 1972, NM – Not Mentioned in WLPA.

Table 3-31: Herpetofauna identified – Season 2

Common Name	Scientific Name	IUCN Status	WLPA Status
Checkered Keelback	*Xenochrophis piscator*	NA	II
Fan-throated Lizard	*Sitana ponticeriana*	LC	NM
Oriental Garden Lizard	*Calotes versicolor*	NA	NM
Indian Bullfrog	*Hoplobatrachus tigerinus*	LC	IV

3.7.4 Avifauna

Altogether 90 species of Avifauna were recorded from the study area during the on-field survey during season 1. No winter migratory species[i] were encountered during the baseline survey in the study area since the survey was conducted during the pre-monsoon season, with the primary focus being Lesser Florican (migratory in summer only). WLPA Schedule 1 species of avian birds were observed in the study site, namely, Indian Peafowl (*Pavo cristatus*), Eurasian Spoonbill (*Platalea leucorodia*) and White-rumped Vulture (*Gyps bengalensis*). Around 30-40 White-rumped Vultures (*Gyps bengalensis*) (IUCN CR v. 2021-1) were observed in their breeding and nesting site in a small village of Bharad (about 0 KM from the project site).[12]

Thrice, male Lesser Florican (*Sypheotides indicus*) were sighted in Jakhan Village, in the grassland about 50-100 m opposite to the project land for the Solar Power Project (IUCN EN v. 2021-1). Other threatened species within the IUCN Red-list was sighted, other than the Lesser Florican and the White-rumped Vulture, namely, Painted Stork (*Mycteria leucocephala*), Black-headed Ibis (*Threskiornis melanocephalus*), Oriental Darter (Anhinga melanogaster), Alexandrine Parakeet (*Palaeornis eupatria*) (IUCN NT v. 2021-1) and River Tern (*Sterna aurantia*) (IUCN VU v. 2021-1).

Congregation of Little Cormorants (32) and Indian Cormorant (63), Eurasian Spoonbill (21) and Painted Storks (14) were documented during first season survey.

Congregation of Painted Stork (16) Red-wattled Lapwing (40), Wire-tailed Swallow (25), Red-rumped Swallow (30), Dusky Crag Martin (12), Temmnick's Stint (8), Indian Spot-billed Duck (12) and Knob-billed Duck (7) were noted during second season survey amongst the resident birds and Barn Swallow, Yellow Wagtail, Grey Wagtail and River Tern at the waterbodies. These are however not large congregations.

[12] LF had its former distribution across the range, due to habitat degradation it is confined to grassland patches in India and is summer visitor to the region, staying back till monsoon when it breeds.

Table 3-32: Avifauna identified near waterbodies – First Season

Species	Village Waterbodies		
	Kataria	Bhalgamda	Ghagosar
Asian Openbill	√		
Ashy Prinia			
Asian Koel	√	√	
Black Crowned Night Heron	√		
Black-winged Stilt	√	√	√
Baya Weaver		√	√
Blue-cheeked Bee-eater			√
Blue-tailed Bee-eater	√		
Cattle Egret		√	√
Common Babbler	√	√	
Common Kingfisher	√		
Common Moorhen	√		
Eurasian Collared Dove	√	√	√
Eurasian Spoonbill	√		
Green Bee-eater	√	√	
Grey Heron	√		
House Crow	√	√	
Indian Robin	√	√	
House Sparrow	√		√
Indian Pond Heron	√	√	
Indian Silverbill	√	√	
Indian Spot-billed Duck	√	√	
Intermediate Egret	√		
Jacobin Cuckoo	√		
Knob-billed Duck	√		
Laughing Dove	√	√	√
Large Grey Babbler	√		
Little Cormorant	√	√	√
Little Egret	√	√	√
Pied Kingfisher	√	√	
Plain Prinia	√		
Purple Heron	√	√	
Rock Pigeon	√		
Red-rumped Swallow	√	√	
Red-vented Bulbul	√	√	
Red-wattled Lapwing	√	√	
Rose-ringed Parakeet	√	√	
Southern Coucal		√	√
White-eared Bulbul	√		√
White-throated Kingfisher	√	√	

Wire-tailed Swallow	√	√	
Swallow sp.		√	

Table 3-33: Avifauna identified near waterbodies – Second Season

Species	Village Waterbodies		
	Kataria	Bhalgamda	Ghagosar
Asian Openbill	√		
Ashy Prinia			√
Asian Koel	√	√	√
Black Crowned Night Heron	√		
Brown Rockchat			√
Barn Swallow			√
Black-winged Stilt	√	√	
Blue-tailed Bee-eater	√		
Common Babbler			√
Common Kingfisher	√		
Common Myna		√	
Common Moorhen	√		
Common Sandpiper	√		
Common Hoopoe			√
Dusky Crag Martin			√
Eurasian Collared Dove	√	√	√
Eurasian Marsh Harrier	√		
Eurasian Spoonbill	√		
Great Egret			√
Green Bee-eater	√		√
Grey Heron	√	√	
Grey Wagtail	√		
House Crow	√	√	
Indian Peafowl	√	√	
Indian Robin	√		
House Sparrow			√
Indian Pond Heron			√
Indian Silverbill	√		
Indian Spot-billed Duck	√	√	√
Intermediate Egret	√		
Jacobin Cuckoo			√
Knob-billed Duck	√	√	
Large Grey Babbler			√
Lesser Whitethroat			√
Long-tailed Shrike			√

Little Cormorant	√	√	√
Osprey	√		
Painted Stork	√		
Pied Kingfisher	√		√
Plain Prinia			√
Purple Heron	√		√
Purple Swamphen	√		
Rock Pigeon		√	
Red-rumped Swallow	√		
Red-vented Bulbul		√	
Red-wattled Lapwing	√	√	√
River Tern	√		√
Rose-ringed Parakeet	√	√	
Temmnick's Stint	√		
White-eared Bulbul		√	√
Whiskered Tern	√		
White-throated Kingfisher			√
Wire-tailed Swallow	√		
Yellow Wagtail	√		√
Sandpiper sp.			√
Swallow sp.			√
Tree Pipit			√

Table 3-34: Status of Avifauna identified

S.N.	Family	Common Name	Scientific Name	Migratory Status	IUCN Status	WLPA Status
1	Phasianidae	Grey Francolin	*Francolinus pondicerianus*	R	LC	IV
2	Phasianidae	Indian Peafowl	*Pavo cristatus*	R	LC	I
3	Anatidae	Lesser Whistling Duck	*Dendrocygna javanica*	R	LC	IV
4	Anatidae	Knob-billed Duck	*Sarkidiornis melanotos*	R	LC	IV
5	Anatidae	Indian Spot-billed Duck	*Anas poecilorhyncha*	R	LC	IV
6	Podicipedidae	Little Grebe	*Tachybaptus ruficollis*	R	LC	IV
7	Ciconiidae	Painted Stork	*Mycteria leucocephala*	R	NT	IV
8	Ciconiidae	Asian Openbill	*Anastomus oscitans*	R	LC	IV
9	Threskiornithidae	Glossy Ibis	*Plegadis falcinellus*	R	LC	IV
10	Threskiornithidae	Black-headed Ibis	*Threskiornis melanocephalus*	R	NT	IV
11	Threskiornithidae	Red-naped Ibis	*Pseudibis papillosa*	R	LC	IV

12	Threskiornithidae	Eurasian Spoonbill	*Platalea leucorodia*	R	LC	I
13	Ardeidae	Black-crowned Night Heron	*Nycticorax nycticorax*	R	LC	IV
14	Ardeidae	Indian Pond Heron	*Ardeola grayii*	R	LC	IV
15	Ardeidae	Grey Heron	*Ardea cinerea*	R	LC	IV
16	Ardeidae	Purple Heron	*Ardea purpurea*	R	LC	IV
17	Ardeidae	Cattle Egret	*Bubulcus ibis*	R	LC	IV
18	Ardeidae	Great Egret	*Ardea alba*	R	LC	IV
19	Ardeidae	Intermediate Egret	*Ardea intermedia*	R	LC	IV
20	Ardeidae	Little Egret	*Egretta garzetta*	R	LC	IV
21	Phalacrocoracidae	Little Cormorant	*Microcarbo niger*	R	LC	IV
22	Phalacrocoracidae	Indian Cormorant	*Phalacrocorax fuscicollis*	W	LC	IV
23	Falconidae	Common Kestrel	*Falco tinnunculus*	W	LC	IV
24	Accipitridae	Black-shouldered Kite	*Elanus caeruleus*	R	LC	IV
25	Pandionidae	Osprey	*Pandion haliaetus*	W	LC	I
26	Accipitridae	Oriental Honey-buzzard	*Pernis ptilorhynchus*	R	LC	IV
27	Accipitridae	Eurasian Marsh Harrier	*Circus aeruginosus*	W	LC	IV
28	Accipitridae	Hen Harrier	*Circus cyaneus*	W	LC	IV
29	Accipitridae	Montagu's Harrier	*Circus pygargus*	W	LC	IV
30	Accipitridae	Shikra	*Accipiter badius*	R	LC	IV
31	Accipitridae	Indian Spotted Eagle	*Clanga hastata*	R	VU	IV
32	Accipitridae	Booted Eagle	*Hieraaetus pennatus*	W	LC	IV
33	Rallidae	White-breasted Waterhen	*Amaurornis phoenicurus*	R	LC	IV
34	Rallidae	Grey-headed Swamphen	*Porphyrio porphyrio*	R	LC	IV
35	Rallidae	Common Moorhen	*Gallinula chloropus*	R	LC	IV
36	Recurvirostridae	Black-winged Stilt	*Himantopus himantopus*	R	LC	IV
37	Charadriidae	Red-wattled Lapwing	*Vanellus indicus*	R	LC	IV
38	Scolopacidae	Ruff	*Philomachus pugnax*	W	LC	IV
39	Scolopacidae	Black-tailed Godwit	*Limosa limosa*	W	NT	IV

40	Scolopacidae	Common Greenshank	*Tringa nebularia*	W	LC	IV
41	Scolopacidae	Green Sandpiper	*Tringa ochropus*	W	LC	IV
42	Scolopacidae	Wood Sandpiper	*Tringa glareola*	W	LC	IV
43	Scolopacidae	Common Sandpiper	*Actitis hypoleucos*	W	LC	IV
44	Scolopacidae	Red Knot	*Calidris canutus*	W	NT	IV
45	Scolopacidae	Temminck's Stint	*Calidris temminckii*	W	LC	IV
46	Laridae	River Tern	*Sterna aurantia*	R	VU	IV
47	Laridae	Whiskered Tern	*Chlidonias hybrida*	W	LC	IV
48	Pteroclidae	Chestnut-bellied Sandgrouse	*Pterocles indicus*	R	LC	IV
49	Columbidae	Common Pigeon	*Columba livia*	R	LC	IV
50	Columbidae	Eurasian Collared Dove	*Streptopelia decaocto*	R	LC	IV
51	Columbidae	Laughing Dove	*Spilopelia senegalensis*	R	LC	IV
52	Psittacidae	Rose-ringed Parakeet	*Alexandrinus krameri*	R	LC	IV
53	Cuculidae	Jacobin Cuckoo	*Clamator jacobinus*	R	LC	IV
54	Cuculidae	Asian Koel	*Eudynamys scolopaceus*	R	LC	IV
55	Cuculidae	Sirkeer Malkoha	*Taccocua leschenaultii*	R	LC	IV
56	Cuculidae	Southern Coucal	*Centropus sinensis*	R	LC	IV
57	Upupidae	Common Hoopoe	*Upupa epops*	W	LC	IV
58	Coraciidae	Indian Roller	*Coracias benghalensis*	R	LC	IV
59	Coraciidae	Eurasian Roller	*Coracias garrulus*	SM	LC	IV
60	Alcedinidae	White-throated Kingfisher	*Halcyon smyrnensis*	R	LC	IV
61	Alcedinidae	Common Kingfisher	*Alcedo atthis*	R	LC	IV
62	Alcedinidae	Pied Kingfisher	*Ceryle rudis*	R	LC	IV
63	Meropidae	Green Bee-eater	*Merops orientalis*	R	LC	IV
64	Meropidae	Blue-tailed Bee-eater	*Merops philippinus*	SM	LC	IV
65	Megalaimidae	Coppersmith Barbet	*Psilopogon haemacephalus*	R	LC	IV
66	Laniidae	Bay-backed Shrike	*Lanius vittatus*	R	LC	IV
67	Laniidae	Long-tailed Shrike	*Lanius schach*	R	LC	IV
68	Dicruridae	Black Drongo	*Dicrurus macrocercus*	R	LC	IV

69	Corvidae	Rufous Treepie	*Dendrocitta vagabunda*	R	LC	IV
70	Corvidae	House Crow	*Corvus splendens*	R	LC	IV
71	Hirundinidae	Dusky Crag Martin	*Ptyonoprogne concolor*	R	LC	IV
72	Hirundinidae	Wire-tailed Swallow	*Hirundo smithii*	R	LC	IV
73	Hirundinidae	Red-rumped Swallow	*Cecropis daurica*	R	LC	IV
74	Hirundinidae	Barn Swallow	*Hirundo rustica*	W	LC	IV
75	Alaudidae	Rufous-tailed Lark	*Ammomanes phoenicura*	R	LC	IV
76	Alaudidae	Ashy-crowned Sparrow Lark	*Eremopterix griseus*	R	LC	IV
77	Pycnonotidae	White-eared Bulbul	*Pycnonotus leucotis*	R	LC	IV
78	Pycnonotidae	Red-vented Bulbul	*Pycnonotus cafer*	R	LC	IV
79	Cisticolidae	Plain Prinia	*Prinia inornata*	R	LC	IV
80	Cisticolidae	Ashy Prinia	*Prinia socialis*	R	LC	IV
81	Cisticolidae	Zitting Cisticola	*Cisticola juncidis*	R	LC	IV
82	Cisticolidae	Common Tailorbird	*Orthotomus sutorius*	R	LC	IV
83	Serocephalidae	Clamorous Reed Warbler	*Serocephalus stentoreus*	W	LC	IV
84	Sylviidae	Lesser Whitethroat	*Sylvia ceurruca*	W	LC	IV
85	Sylviidae	Orphean Warbler	*Sylvia hortensis*	W	LC	IV
86	Leiotrichidae	Common Babbler	*Argya caudata*	R	LC	IV
87	Leiotrichidae	Large Grey Babbler	*Argya malcolmi*	R	LC	IV
88	Sturnidae	Bank Myna	*Acridotheres ginginianus*	R	LC	IV
89	Sturnidae	Common Myna	*Acridotheres tristis*	R	LC	IV
90	Sturnidae	Brahminy Starling	*Sturnia pagodarum*	R	LC	IV
91	Sturnidae	Rosy Starling	*Pastor roseus*	W	LC	IV
92	Muscicapidae	Oriental Magpie Robin	*Copsychus saularis*	R	LC	IV
93	Muscicapidae	Indian Robin	*Saxicoloides fulicatus*	R	LC	IV
94	Muscicapidae	Common Stonechat	*Saxicola torquatus*	W	LC	IV
95	Muscicapidae	Pied Bushchat	*Saxicola caprata*	W	LC	IV
96	Muscicapidae	Brown Rock Chat	*Cercomela fusca*	R	LC	IV
97	Muscicapidae	Spotted Flycatcher	*Muscicapa striata*	W	LC	IV
98	Nectariniidae	Purple Sunbird	*Cinnyris asiaticus*	R	LC	IV

99	Passeridae	House Sparrow	*Passer domesticus*	R	LC	IV
100	Passeridae	Chestnut-shouldered Petronia	*Gymnoris xanthocollis*	R	LC	IV
101	Ploceidae	Baya Weaver	*Ploceus philippinus*	R	LC	IV
102	Estrildidae	Indian Silverbill	*Euodice malabarica*	R	LC	IV
103	Estrildidae	Red Avadavat	*Amandava amandava*	R	LC	IV
104	Motacillidae	Yellow Wagtail	*Motacilla flava*	W	LC	IV
105	Motacillidae	Grey Wagtail	*Motacilla cinerea*	W	LC	IV
106	Motacillidae	White Wagtail	*Motacilla alba*	W	LC	IV
107	Motacillidae	Tawny Pipit	*Anthus campestris*	W	LC	IV
108	Motacillidae	Tree Pipit	*Anthus trivialis*	W	LC	IV
109	Otididae	Lesser Florican	*Sypheotides indica*	SM	CR	1

Legend: VU- Vulnerable, EN- Endangered, NT- Near Threatened, LC- Least Concern in IUCN Red List; I, II, III IV – Wildlife Protection Act 1972 Schedules; R – Resident, W – Winter migrant, SM – Summer and autumn migrant;

3.7.5 Presence of Target Species

The Lesser Florican is the smallest of the Indian bustards. It is included as one of the priority species for recovery by the Ministry of Environment, Forest and Climate Change (MoEF&CC) in 2009, under the scheme of Integrated Development of Wildlife Habitats. It is also under the Species Recovery Plan (SRP). India has two dedicated Lesser Florican sanctuaries, both in Madhya Pradesh; Sailana Wildlife Sanctuary in Ratlam district (12.96 sq. km, where its Shikarwadi compartment or block comprises 354 ha and Amba component, 1000 ha) and Sardarpur Wildlife Sanctuary in Dhar district (348 sq. km area with 628 ha of grassland; a new plot of 50 ha of grassland has been developed in Panpura).

Lesser Florican comes under the order Gruiformes, family Otididae, genus Sypheotides and species indicus. *Sypheotides indica* was designated by Collar and Andrew (1988). Locally known as Kharmor in Gujarat and Khar titar by Bhills in eastern Rajasthan. The sizes of the male and female are 46 and 52 cm respectively. Breeding male is black and white in colour, with dusky yellow-coloured legs, a horn-like brown coloured upper mandible and a yellow-coloured lower mandible. Females are sandy coloured. While performing its display, the male folds its legs and shoots vertically upwards attaining a height of about 2 to 3 metres.

The Lesser Florican feeds in open grass patches at dawn and the dusk (colder hours of the day) and retires into the thick bushes as the temperature rises (Sankaran 1991). During the non-breeding season, they prefer lightly wooded areas, grazed lands and scrubland that are dominated by bushes like Zizyphus. The Lesser Florican is an omnivore and its diet vary from locusts, caterpillars, flying ants, worms, lizards, frogs to herbs, berries and plant shoots, all of which find mention in literature (Haribal et al. 1986). Typical foraging behaviour is to walk for 5 to 10 metres, and pause to look out for threats, before darting forward to snap up its prey (Haribal et al. 1986). It feasts on caterpillars on Butea bushes (Haribal et al. 1986) and according to Sankaran (1991); orthopteran insects like grasshoppers, locusts and crickets play a crucial role in meeting the food needs of the female and the young ones. During the breeding season in the monsoon, the male is also seen in waterlogged areas.

The Lesser Florican is found in dry grasslands and scrub lands, but also occasionally in cotton and millet crop fields (Sankaran 2000). The grasslands of NW India are dominated by Sehima nervosum and Chrysopogon fulvus. The bird prefers dry ungrazed plains with 0.51-metre-tall grass (Magrath et al. 1985); it is reported to confine mainly to beeds, which are essentially unused private lands or common grazing pastures or grasslands (Sankaran and Rahmani 1986).

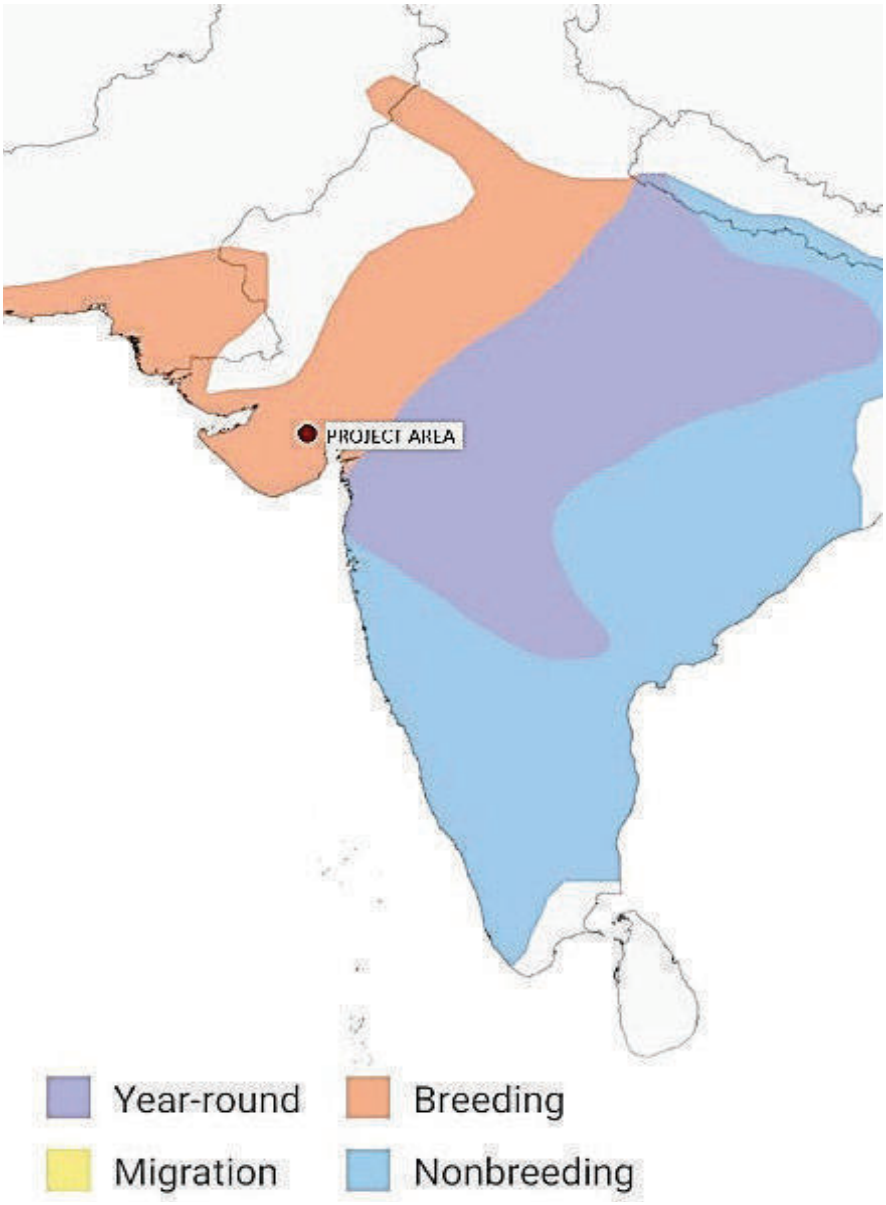
The breeding season starts at the onset of the southwest monsoon, with the males attaining the breeding plumage in the months of June and July (Sankaran and Rahmani 1986). They prefer elevated patches on the ground or small ridges to perform their display (Sankaran 1991, 93, 94); establishing territory mainly depends upon the height of the grass. Males set up territories in one- to two-hectare area, and the territorial boundaries are set up at a distance of 200 to 500 metres distance (Sankaran 1994, 1995). Males display from a particular spot within the territory (Sankaran and Rahmani 1986). At one given time, 3-5 territories were observed within an area of one sq. km (Sankaran 1994). Females nest outside the territorial range of the male.

The bird is an irregular local migrant, behaving nomadic during the SW monsoon. It remains confined to the plains and open areas (Hume and Marshall 1879). Post-breeding period, most of the birds from Rajasthan, Gujarat and Madhya Pradesh migrate to peninsular India (Dharma kumar sinhji 1950).

Currently, Lesser Florican breeding range is restricted to Gujarat, southeast Rajasthan, northwest Maharashtra, Kurnool district of Andhra Pradesh and western Madhya Pradesh (Dutta et al. 2018).

Lesser Florican (*Sypheotides indicus*) is a critically endangered species listed under the IUCN Red List of Threatened Species List (IUCN 2021-1) and Schedule I species under WLPA, 1972. Also, its population and habitat being rapidly decreasing, it is a species of high conservation value. The project area falls under the breeding site of the Lesser Florican shown in the Figure 3.30.

Figure 3-30: Map showing the range of the Lesser Florican (Source: eBird)



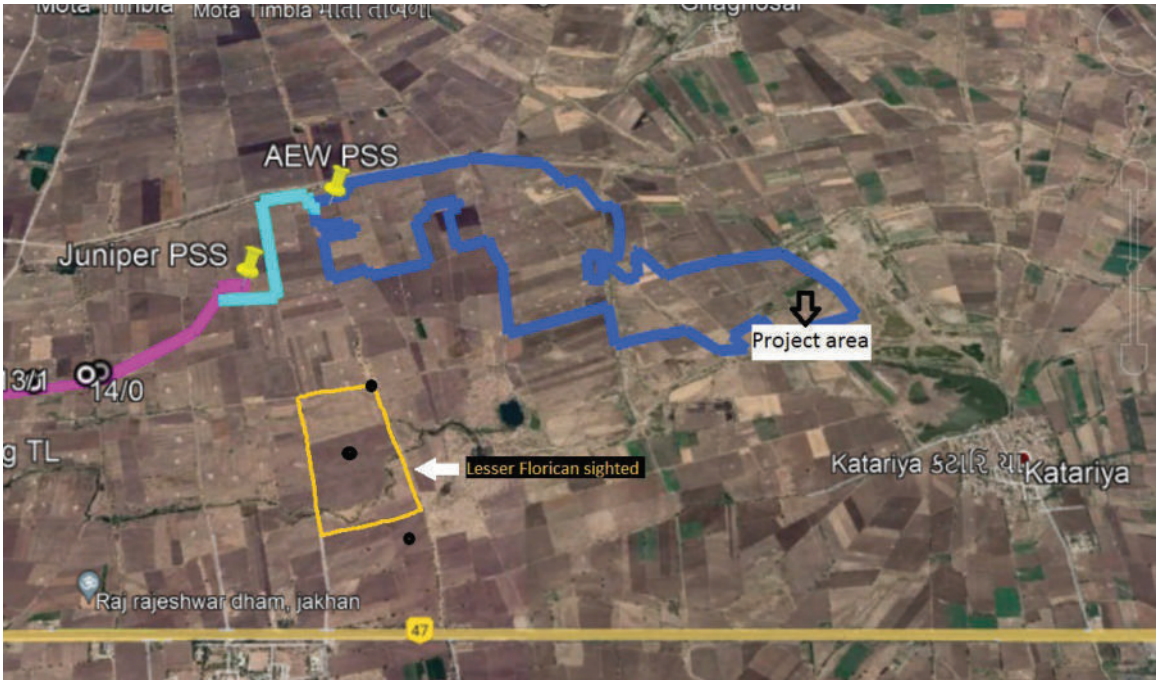
Lesser Florican in the study area

The critical habitat screening assessment has identified the possible trigger of critical habitat due to potential presence of Lesser Florican in the EAAA. Field survey was conducted during the conducive time (pre-monsoon) when the species comes to breed, the grass is not that high (post-monsoon the grass height increases to such an extent that it becomes difficult to spot the illusive and shy species) and it is comparatively easier to spot the male in display.

During the first reconnaissance survey, a male Lesser Florican was identified foraging in a long stretch of grassland (about 600x500 sq. m), 22°35'9.81"N 71°52'25.19"E (Jakhan village), during the dawn time (around 5.00 PM) about 100 m West of the land where the Solar Power Project is proposed to set up. Another encounter of a male Lesser Florican happened during an evening vantage point in the location

(VP 5) at around 4.45 PM, it flew across from the grassland to its East, entering a small stretch of grassland just adjacent to the proposed land for the Solar Power Project. Another encounter of a male Lesser Florican in the next morning (around 10 am), foraging in the cotton field nearby and flew from there into the grassland. No female Lesser Florican was sighted.

Figure 3-31: Locations of Lesser Florican sightings



During the second survey (monsoon survey), the Lesser Florican habitat was surveyed and no encounter of the bird was made. With the grass gaining height, inaccessibility to the area after heavy showers and unprecedented rain, it was difficult to screen the area thoroughly this season and one VP was taken in the location along with two line transects. In consultation with local people and also field observation it was found that the area is predominantly crop field and mostly remains waterlogged during the monsoon. The water level, though low, is not preferred by the Lesser Florican to breed in that waterlogged condition. Also, local people suggested that this year it rained less compared to previous years in this area, previous years water level was higher.

Figure 3-32: Lesser Florican (Male) in its habitat and in flight

Habitat suitability

The grass was mainly 2.5-3 feet in height, the grassland is surrounded by cotton and sorghum fields all around. Another encounter of a male Lesser Florican happened the next morning (around 10 am), foraging in the cotton field nearby and flew from there into the grassland. The grassland is open is nature with few Prosopis trees and no other big trees.

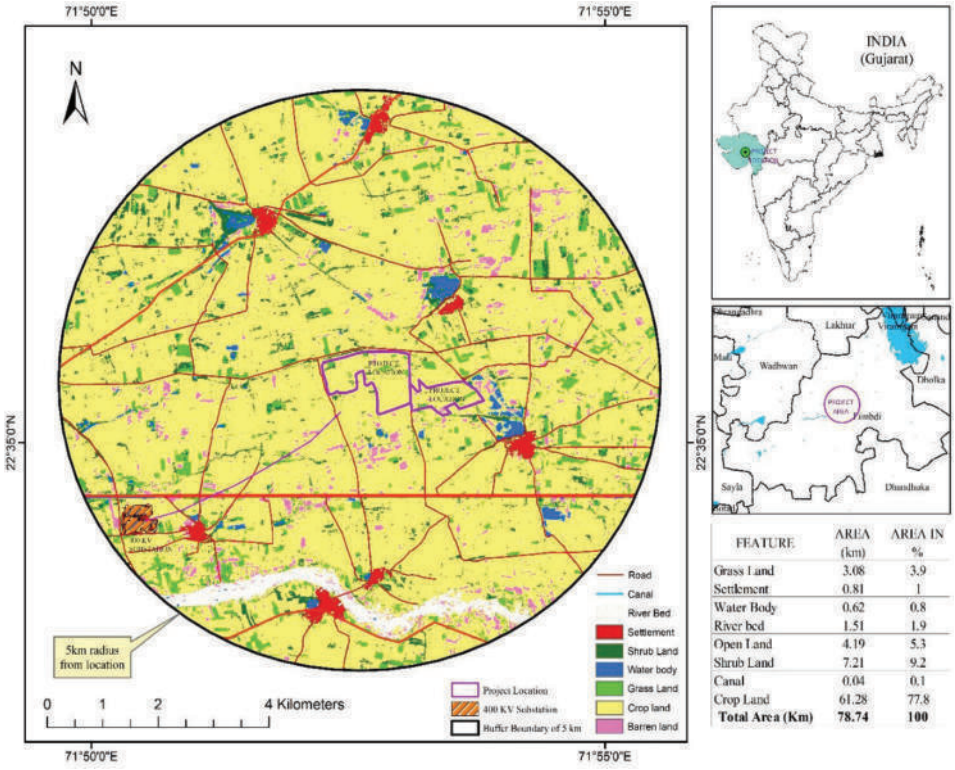
Grass was found in different locations all over the study area, but such a big stretch was not found anywhere else other than the location the Lesser Florican was sighted. Hence the stated grassland is very important in terms of habitat conservation for the Lesser Florican.

In the 5 km radius area studied for landuse/landcover (Figure 3.33 & 3.34), 78.9% of the area is modified habitat (with scattered settlements, canals and predominantly croplands) and only 21.1% of the area is natural habitat (grasslands, scrublands, open lands, water bodies and riverbed).The scrublands in the area are mostly natural and unused lands and the grasslands are temporary and regularly used for agricultural purposes post monsoon season. Project location/footprint area is 1.7% of this area & comprises 91% cropland & 4.35% grassland. Landuse within the project location is as follows:

Table 3-35: Landuse within project footprint

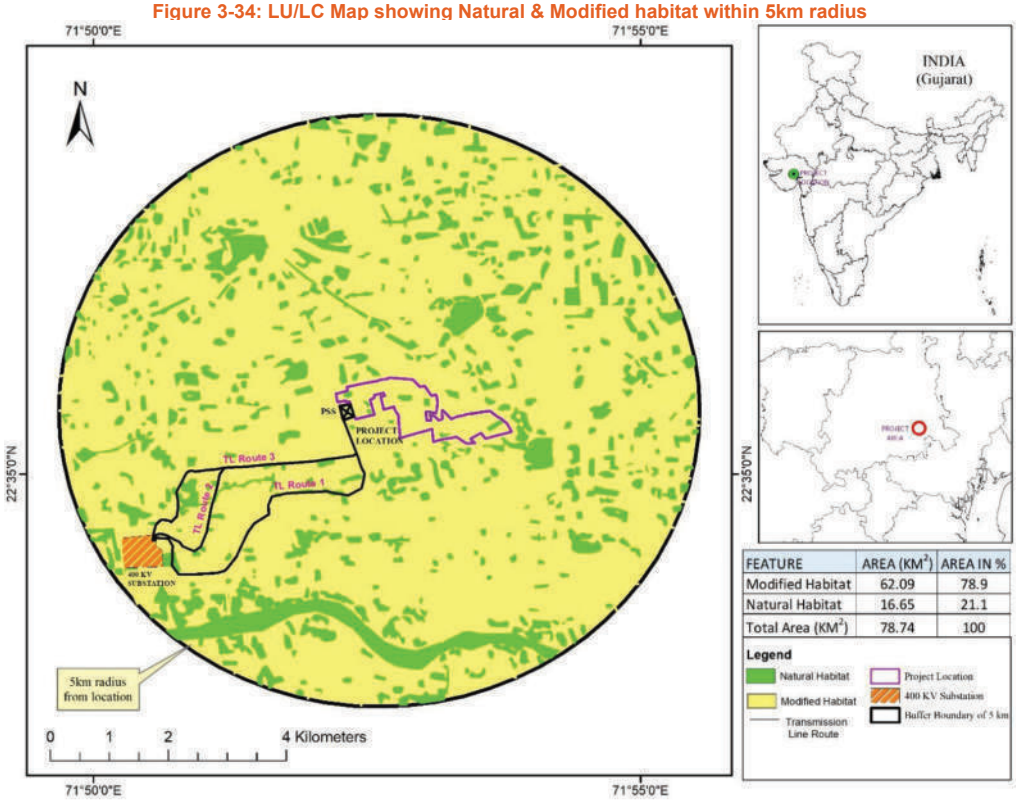
Sl. No.	Feature	Area in sq.m	Percentage
1	Shrub Land	41918.95	2.965894
2	Crop Land	1295087.16	91.63138
3	Grass Land	61500.06	4.3513175
4	Barren Land	11332.74	0.801826
5	Water Body	3527.51	0.2495821
Total Area		1413366.42	100.000000

Figure 3-33: LU/LC map (5km buffer area)



FEATURE	AREA (km)	AREA IN %
Grass Land	3.08	3.9
Settlement	0.81	1
Water Body	0.62	0.8
River bed	1.51	1.9
Open Land	4.19	5.3
Shrub Land	7.21	9.2
Canal	0.04	0.1
Crop Land	61.28	77.8
Total Area (Km)	**78.74**	**100**

Figure 3-34: LU/LC Map showing Natural & Modified habitat within 5km radius



Discussion

Lesser florican breeds in rain-fed grasslands (>2 ha in area) with ample ground cover (>55% grass and herb cover), moderately tall grasses (~50 cm) like Sehima, Chrysopogon, Dicanthium and Cymbopogon spp., and scattered shrubs (<50/ha density) like Zizyphus and Acacia spp. (BirdLife International 2009; Sankaran 2000). Use of croplands for breeding is not common but has been recorded in soybean (Glycine max), groundnut (Arachis hypogea), and less frequently in sorghum (Sorghum vulgare), maize (Zea mays), sugarcane (Saccharum), rice (Oryza sativa), mustard (Brassica campestris), and wheat (Triticum vulgare) crops (Sankaran 2000), as well as grasslands within forest plantations. Hilly terrain, wetland, dense forest, and deserts are avoided. Moderately high grassland biomass, an indicator of low grazing pressure, and remoteness from human settlements (>2.6 km away) are additional important predictors of their occurrence (Dutta and Jhala 2014; Sankaran 1997b).

As per Birdlife International (as on 12 August 2021), the total global population estimate of matured Lesser Florican (LF) individuals is 1228 & the Gujarat region records approximately 61 as on 31st Dec 2021(as reported by State government), thus % of occurrence in Gujarat region is 0.049%. Again, the surveys in the EAAA accounted for 3 male LF. So, the EAAA population of LF is 0.002%. Thus, the Criterion 1 threshold for Critical Habitat is not met in the Gujarat region as well as in the EAAA.

Table 3-36: Threshold for Criterion 1

Criterion	Threshold	Threshold met
Criterion 1: Critically Endangered and Endangered Species. Species threatened with global extinction and listed as CR and EN on the IUCN Red List of Threatened Species. Species that are listed nationally/ regionally as CR or EN in countries that have adhered to IUCN guidance in consultation with competent professionals.	1. Areas that support globally important concentrations of an IUCN Red-listed EN or CR species (0.5% of the global population and 5 reproductive units of a CR or EN species); species. 2. Areas that support globally important concentrations of an IUCN Red-listed VU species, the loss of which would result in the change of the IUCN Red List status to EN or CR and meet the thresholds at (a). 3. As appropriate areas containing nationally/regionally important concentrations of an IUCN Red-listed EN or CR	1. No* 2. No 3. No

**Justification provided in Table 3.26*

Figure 3-35: Lesser Florican sighted in the project area

3.7.6 Stakeholder Consultation

Avifauna experts were consulted regarding the presence of target species in the study area. This was to confirm whether survey findings were indicative of annual presence of Lesser Florican over the past decade.

Both one to one consultation was done with forest officials as well as with local people and also focused group discussion with the local people in the study area. Pictures of target species were shown to local people for identification of the species. The discussions were undertaken both over a telephone call as well as face to face discussions.

Table 3-37: Key Stakeholders Consulted, First season

Stakeholder Consulted	Key issues discussed	Outcome
DCF, Surendranagar H.V.Makwana Mode: F2F	Record of Lesser Florican (LF) in the landscape	Referred avifauna expert and wildlife warden for further discussion
	Species mortality with power lines and solar plates	Electrocution of peafowls are mostly recorded
	Mitigation of Power line Mortality	Use of bird diverters
	Solar power projects in the area	Not much solar power projects has been implemented yet but is upcoming and land procuring is undergoing
	Presence of Vultures in the landscape	Bharad, a small village about 20 KM from Surendranagar city is a breeding and nesting ground for White-rumped Vulture.
	The impact of the recent cyclone, Tauktae in the landscape	Not much effect in the district.
	Rainfall pattern of the landscape	The district itself is a drought prone and predominantly black soil area.
FRO, Limbdi D.S.Tadvi Mode: F2F	Record of Lesser Florican in the landscape	No record of LF or vultures from the Limbdi area.
	Presence of Vultures in the landscape	No power line mortality record from Limbdi area.
	Species mortality with power lines and solar plates	
	Forest land or protected land in the area.	One forest land where forest nursery is present in Limbdi.
Honorary Wildlife Warden, Surendranagar Mr. Devvratsinh Mori Mode: Telephone call		Shared his published work on records of LF from Gujarat. There are a good population of LS in Bhavnagar.
	Record of LF in the landscape	Only White-rumped Vulture is found in Bharad village and sometimes seen in Nal Sarovar
	Record of Vultures in the landscape	Migratory avifauna first arrives in Nal Sarovar and few of those avifauna visit Limbdi and Surendranagar.
	Record of migratory avifauna in the area	Nal Sarovar is the nearest IBA and the small and big waterbodies in the district does harbour a decent population of migratory birds.
	Presence of important wetlands and water bodies	Winter is full of migratory raptors and grass birds mainly pipits and larks. Booted and Steppe Eagle both are regular winter visitors.
	Record of raptors and grass birds	
Forest Guard, Limbdi Mr. Nilesh	Record of LF in the landscape	Never heard of or seen
	Record of Vultures in the landscape	No record

Mode: F2F	Record of mammals in the area	Antelopes and Indian Gazelle ventures around, destroying crops. Nilgai not seen very much.
Guide, Nal Sarovar Mr. Ramjan Mode: Telephone call	Record of LF in the area Record of Vultures in the area Migratory onset time Record of mammals in the area	No record Only White-rumped Vulture recorded once from Nal Sarovar Onset of migration starts from mid-September and the population stays in the area till late April. Mid-November to December is the time of migration in full swing. All the mammals found in the area are of high conservation value. The presence of Indian Gazelle and Antelope.
Mr. Gangaram Dabhi Farmer, Jakhan Village Age group: 60s (male) Mode: F2F	Record of LF in the area Crops grown seasonally in the area Type of soil	Never seen Cotton, Sorghum is grown during monsoon Predominantly black soil
Mr. Juhan Tea shop owner, Tokrala village Age group: 40s Mode: F2F	Record of LF in the area Record of Peafowl in the area Record of Cranes in the area	Not known Peafowls are found in abundance in the area Two types of cranes visit during winter, they feed on groundnuts
Focused Group Discussion 3 Farmers and 2 vegetable vendor, Tokrala village Age group: 40s (male) Mode: F2F	Record of LF in the area Crops grown seasonally	Not known Cotton, tomato, sorghum, other leafy vegetables, etc. are grown.
Mr. Ajit Garotra Farmer, Kataria village Age group: 30s (male) Mode: F2F	Record of LF in the area Record of vultures in the area	On showing picture of LF he seems to have seen the species but the description of the habitat it seems either Red-wattled Lapwing or Thick-knee. Vultures used to visit the area before, but not seen now.
Mr. Bhagirath Jhala Farmer, Jakhan village Age group: 50s (male) Mode: F2F	Record of LF in the area Crops grown	Never seen Cotton, Sorghum, Brinjal, Peas, Pulses
Lalubhai Farmer, Choraniya village Age group: 60s (male) Mode: F2F	Record of LS in the area Presence of stretch of grassland Record of vultures in the area	Never seen Very small patches are present Not found in the area
Person 1 Farmer, Bharad village Age group: 40s (male) Mode: F2F	How many Vultures are there in the village and what trees does the vultures nest in? How many species of vultures Since when does the vultures nest in the area What role does the villagers play in their conservation?	Around 60-70 White-rumped Vultures reside in four big neem trees, the trees are around 20 years old. Only one species of vulture seen in the area Since the last 50 years and even before

	Does the forest department play a role in the conservation?	Villagers do not disturb the vultures and help them with food, contact the FD immediately if seen injured. FD reacts promptly when contacted, they cemented the base of 2 of those neem trees.
Person 2 Bharad village Age group: 20s Mode: F2F	Probable time of congregation Any other old trees in the area	Vultures come down in the adjacent riverbed during evening time (5-6 pm) congregating in the nesting trees and riverbed. Many big and old trees are there in the village, like very old Banyan trees

Table 3-38: Key Stakeholders Consulted, Second season

Stakeholder Consulted	Key issues discussed	Outcome
Mr. Chandu Bhai Farmer, Kataria village Age group: 50s (male) Mode: F2F	Record of Lesser Florican (LF) in the area Presence of Vultures in the area	Referred to a black bird seen near waterbodies (either referring to cormorants or waterhen). Not seen in recent times but used to be there 7-10 years back. Could not confirm of the species.
Mr. Ambaram Bhai Farmer, Kataria village Age group: 50s (male) Mode: F2F	Record of Lesser Florican in the landscape Presence of Cranes in the area Presence of Indian Peafowl in the area Crops grown in the area	Never seen. None Yes, forages in agricultural fields. Cotton, Groundnut, Bajra
Mr. Ashok Bahi Farmer and fisherman, Kataria village Age group: 40s (male) Mode: F2F	Record of LF in the area Record of Vultures in the area Fishes cultivated Condition of the area of concern during monsoon and the access to the area	Never seen Not recently seen but used to be present at least 10 years before. Catla, Rui, Pungus, Rupchanda The area is cultivation field and is under water during the monsoon time, no access from any side not even by foot.
Mr. Kamlesh Farmer, Kataria village Age group: 20s (male) Mode: F2F	Record of LF in the area Condition of the area of concern during monsoon and the access to the area	No record The area is under moderate water logging condition due to rain. This year it has rained less compared to previous year and that every year that area is under moderate to high water logging condition.
Mr. Ramesh Bhai Farmer, Jakhan Village Age group: 40s (male) Mode: F2F	Record of LF in the area Presence of mammals in the area Presence of any bird of preys	Never seen Golden Jackal is regularly seen. Once he encountered a small cat (dark in color), swam to catch fish in the canal. Big raptors hunting rats and snakes are often seen.

3.8 Socio-Economic Environment

This section describes the socio-economic condition in the study area and relates the village level socio-economic conditions with taluka and district level. The objective of analysis of information at village, taluka and district level is to identify the existing facilities and gaps at village level which can be considered as need of the study area.

The site for the present solar power project is in Katariya and Jakhan villages in Limbdi taluk of Surendranagar district, Gujarat. Site visit was undertaken along with primary and secondary data collection from various sources. Primary data includes consultation with land aggregator and some land sellers who have sold land or have sale agreement. Interviews were also undertaken with Project Proponent, land aggregator, local villagers and vulnerable communities. Information and documents were collected from AEW, project site and land details as per requirements. The assessment of socio-economic environment was carried out based on the primary survey with the help of framed questionnaire to conduct community consultation (as presented in Appendix G). Secondary data includes Census 2011, information available on the official website of the district of Surendranagar and other available data on official Government websites.

The socio-economic assessment has been done based on the information's provided by AEW like land details etc. and the outcomes of the consultation with the land sellers and other community members conducted onsite.

3.8.1 Objective

The main objective of the consultations was to develop an understating of the community in general of the project affected area. Through the consultative process the areas which the project is impacting the individuals and the community, is also perceived. Along with that, the feasible mitigation measures of the impacts are also identified.

The observations made in this section are intended to capture the status of the project and, therefore, briefly mention the 'way ahead' to successfully complete the ESIA study. The understanding of the project profile was carried out with the project proponent and details of the same will be included in the ESIA report.

3.8.2 Methodology

The social assessment is primarily based on the analysis of the secondary data obtained from the Census of India 2011, district portal website and primary consultation with community & different level stakeholder with the help of framed sample questionnaire for town & village profiling. It was designed to capture occupational patterns, societal set up, access to basic amenities and socio - economic profiling of villages and communities considering the nature of the project operations and understanding of the demographic characteristics of the area from the secondary data. Public consultation is important for understanding the perception of the people about the project, hence discussion was held with the company officials and the locals, as enumerated below. The following methodology was adopted:

- Consultation with local representatives of project proponent.
- Field observation for profiling the study area town.
- Consultation with landowners.
- Consultation with local sub-registrar office.

- Consultation with all level stakeholders in the study area town (e.g. village counsellor, teachers, and villagers, etc).

3.8.3 Demographic Profile of Study Area Town

The socio-economic profile of the study area is discussed below.

Table 3-39: Project Location

S.No.	State	District	Mandal/ Taluka	Gram Panchayat	Village
1	Gujarat	Surendranagar	Limbdi	Jakhan and Katariya	Jakhan and Katariya

Source: (AEW), Primary Consultation and Census 2011

Demographic Profile of the District

In 2011, Surendranagar had population of 17,56,268 of which male and female were 909,917 and 846,351 respectively. In 2001 census, Surendranagar had a population of 15,15,148 of which males were 7,87,650 and remaining 7,27,498 were females.

Table 3-40: Demographic profile of the Surendranagar district

Particulars		Project Influence Area		
General	Area in sq.m	10423		
	No. of Households	342144		
	Sex ratio (Per 1000)	930		
	Child Sex ratio (Per 1000)	896		
	Density/Km2	168		
Population	Particulars	Male	Female	Total
	Rural	649,475	609,877	1,259,352
	Urban	260,442	236,474	496,916
	Total Population	909,917	846,351	1,756,268
	Population Growth Rate %	15.52	16.34	15.91
	Schedule Castes	93,427	86,034	179,461
	Schedule tribes	11,068	10,385	21,453
Literacy Rate	Literacy in No.	643,221	450,405	1,093,626
	Literacy %	82.11	61.45	72.13
Economic Activities	Total Workers %	55.39	25.93	41.20
	Main Workers %	51.66	13.74	33.39
	Marginal Workers %	3.73	12.19	7.81
	Non-Workers %	44.61	74.07	58.80
	Cultivators %	28.32	19.36	25.60

Particulars		Project Influence Area		
Category of Workers	Agriculture Labour %	28.47	58.03	37.44
	Main Household %	1.23	1.52	1.32
	Other workers %	41.98	21.09	35.64

Source: Census of India, 2011

Demographic Profile of the Tehsil/Village in the study area

The socio - economic profile of the tehsil/town is essentially based on the census data and other government records. The present socio-economic description provides an insight of demographic features, population density, work participation rate and the vulnerable population. The demographic profile of the selected town/town surveyed in the study area is depicted in Table 3.41.

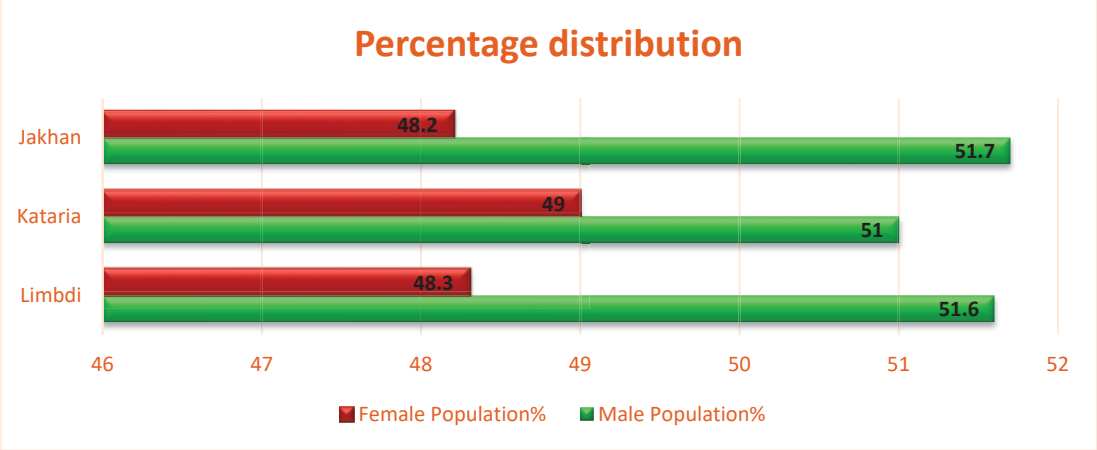
The total population of Limbdi is 1,32,570 of which 68,435 male and 64,135 female population respectively. Total population of village Katariya is 2968 of which male and female constitute 1515 & 1453 respectively. Total population of village Jakhan is 879 of which male and female constitute 455 & 424. Sex ratio of Limbdi is 903 and 959, 931 Katariya & Jakhan village respectively.

Table 3-41: Population within the Project Study Area

Particular	No. of Household	Population	Male Population	Female Population	Male %	Female %	Sex Ratio
Limbdi	25,708 1	1,32,570	68,435	64,135	51.6	48.3	903
Katariya	521	2,968	1,515	1,453	51	49	959
Jakhan	171	879	455	424	51.7	48.2	931

Source: Census of India 2011

Figure 3-36: Population distribution in the study area



Source: Census of India

3.8.4 Schedule Caste (SC) & Scheduled Tribe (ST)

The socially marginalized and economically poor sections constitute the vulnerable groups. Often their means of livelihood are dependent upon locally available resources. It is important to make proper estimations of the marginalized groups to ensure that their assets and socio-economic conditions are properly assessed.

As per 2011 census, 10.9% percent of the population belonged to Scheduled Castes (SC) and 13.2 percent to the Scheduled Tribes (ST) in Limbdi. In village Katariya, SCs constitute 27.7% of the total population and there is no ST population as per the census 2011. In village Jakhan, SCs constitute 27.3% of the total population and there is no ST population as per the census 2011. Table 3.42 depicts SC & ST Population in Project Study Area

Table 3-42: Distribution of scheduled Castes & Tribes

Block/Village Name	Scheduled Caste Population	Scheduled Caste Population %	Scheduled Castes Male	Scheduled Castes Female	Scheduled Tribes Population	Scheduled Tribes Male	Scheduled Tribes Female
Limbdi	14,567	11	7,618	6,949	17,542	9,012	8,530
Katariya	825	27.8	423	402	0	0	0
Jakhan	240	27.3	122	118	0	0	0

Source: Census of India 2011

Figure 3-37: Schedule Caste and Schedule Tribe Population in the study area

Source: Census of India 2011

3.8.5 Literacy

Literacy is one of the most significant indicators of human and social development. This not only reflects on the educational attainment of the population but also reflects on the status of women, caste equation and economic condition of an area.

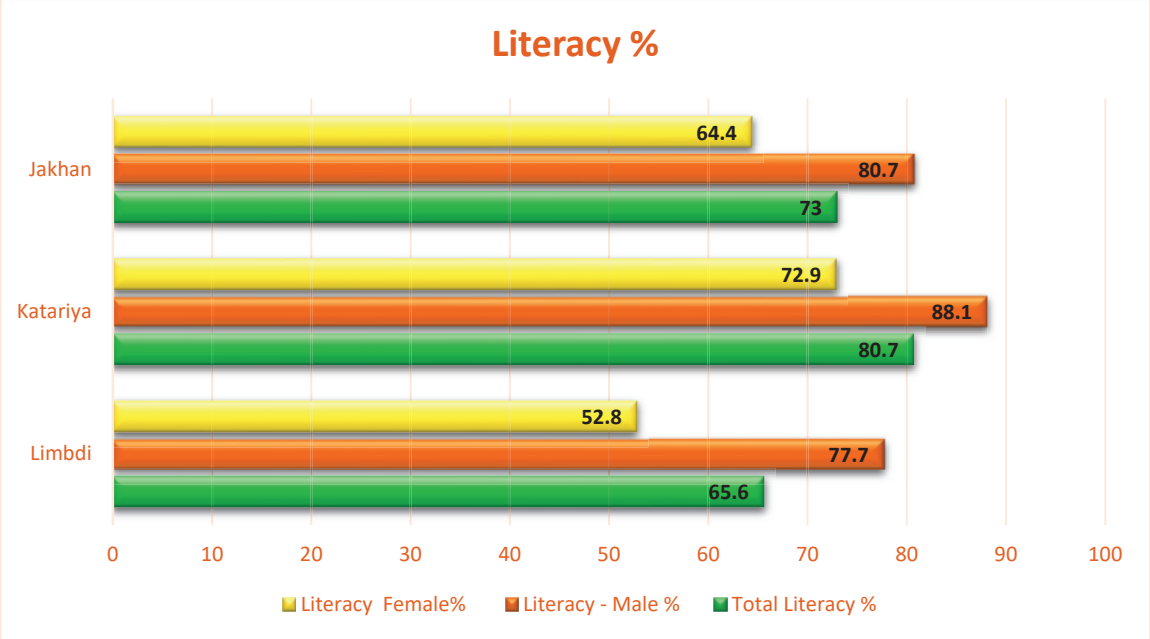
As per census 2011, average literacy rate in Limbdi tehshil is 65.6 percent. The literacy rate of Katariya village is 80.7 percent of which male and female literacy is 88.1 percent and 72.9 percent respectively. In Jakhan the literacy rate is 73 percent of which 80.7 percent male and 64.4 percent female respectively.

Table 3-43: Literacy Rate in Project Study Area

Block/Village Name	Total Population Literacy	Total Population Literacy %	Literacy Male (no.)	Literacy Male %	Literacy Female (no.)	Literacy Female %
Limbdi Tehshil	74,489	65.6	45,406	77.7	29,083	52.8
Katariya Village	2,144	80.7	1,198	88.1	946	72.9
Jakhan Village	561	73.0	326	80.7	235	64.4

Source: Census of India 2011

Figure 3-38: Literacy Rate in Study Area



Source: Census of India 2011

3.8.6 Workers and Occupation

Workers were mainly classified as ***main and marginal workers*** based on their work. Those workers who had worked six months (183 days) or more are main workers. Those who had worked for less than 6 months or less than 183 days in a year) were termed as marginal workers.

A person was considered working as ***cultivator*** if he or she was engaged either as employer, single worker or family worker in the cultivation of land owned or held from Government or from private person or institution for payment in money, or in kind or on the basis of sharing of crops. Cultivation also included supervision or direction of cultivation.

A person who worked on another person's land for wages in money, kind or share of crop was regarded as an '***agricultural labourer'.***

Household Industry was defined as an industry conducted by the head of the household himself or herself and/or by the members of the household at home or within the village in rural areas

Other workers (OW) are those type of workers who work in any field of economic activity, other than cultivation, agriculture labour or household industry, were covered in this category. OW come under the category included factory workers, plantation workers, those in trade, commerce, business, transport, mining, construction, political or social work, all government servants, municipal employees, teachers, priests, entertainment artists, etc. In fact, all persons who work in any field of economic activity, other than cultivation, agriculture labour or household industry, were covered in this category.

The predominant economic activity in the study area is agriculture and allied activities. This section will highlight the classification of workers in the study area. Out of the total workers in the Katariya village, 73 percent are main workers and rest 27 percent is marginal workers. In Jakhan village, 67.4 percent are main workers and 32.6 percent is marginal worker. From the total working population in Katariya and Jakhan village, cultivators constitute 29.1 percent and 16.04 percent, agriculture labour are 52.5 percent and 65.4 percent, and household industries are 8.7 percent & 3.2 percent and other workers are 59.6 percent & 15 percent respectively in study area village. Table 3.44 gives of categorization of workers. Classification and categorization of workers in the study area is shown in Table 3.45 & 3.46.

Table 3-44: Category of Workers in the Study Area

Block/ Village Name	Total worker	Total worker Male	Total worker Female	Total Main worker	Main worker Male	Main worker Female	Total Marginal Worker	Marginal Worker Male	Marginal Worker Female
Limbdi Tehshil	58,676	37,452	21,224	44,553	34,127	10,426	14,123	3,325	10,798
Katariya Village	1,350	754	596	986	732	254	364	22	342
Jakhan Village	408	274	134	275	260	15	133	14	119

Source: Census of India 2011

Table 3-45: Sex Segregated Classification of Workers in the Study Area

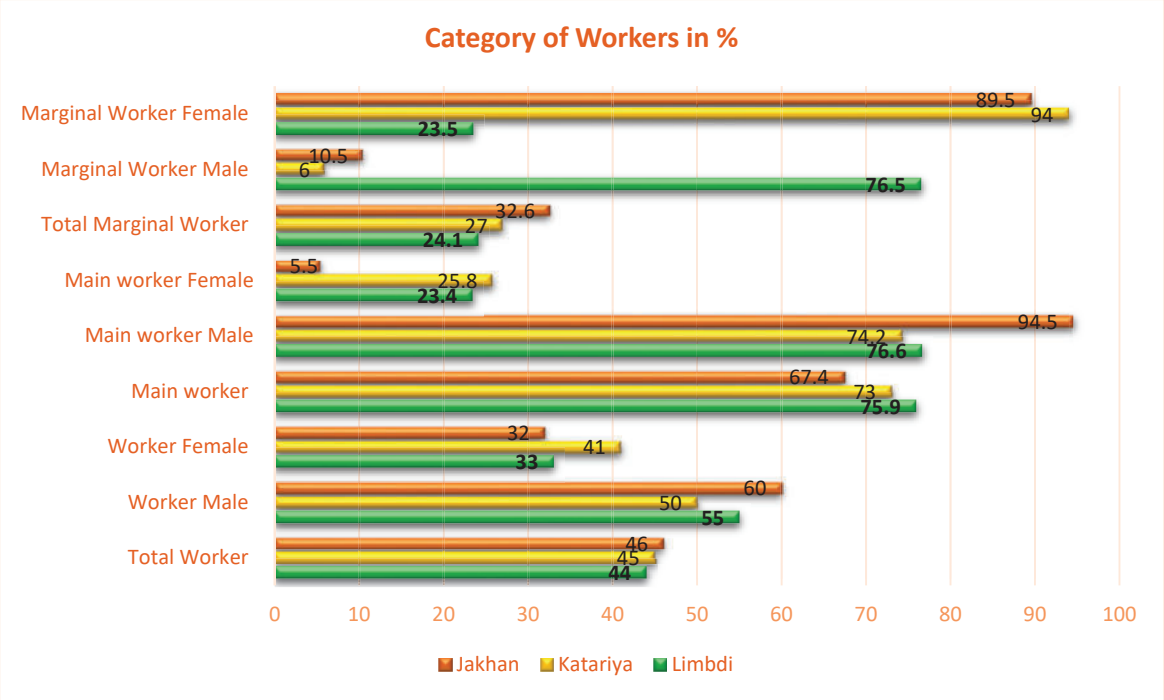
Block/ Village Name	Total Cultivator	Total Male Cultivator	Total Female Cultivator	Total Agriculture Labour	Total Agri Labour Male	Total Agri Labour Female	Total Household Industries	Total Household Industries Male	Total Household Industries Female	Total Other workers	Total Other Male	Total Other Female
Limbdi	11,584	9,287	2,297	30,857	17,211	13,646	1437	1004	433	14798	9,950	4,848
Katariya	393	276	117	709	313	396	118	73	45	130	92	38
Jakhan	67	65	2	267	141	126	13	13	0	61	55	6

Table 3-46: Classification of Workers in the Study Area in no. & percentage

Block/ Village Name	Total Cultivator in Nos.	Total Agriculture Labour in Nos.	Total Household Industries in Nos.	Total Other workers in Nos.	Total Cultivator %	Total Agriculture Labour %	Total Household Industries %	Total Other workers %
Limbdi Tehshil	11,584	30,857	1437	14798	19.7	52.6	2.4	25.2
Katariya Village	393	709	118	130	29.1	52.5	8.7	9.6
Jakhan Village	67	267	13	61	16.4	65.4	3.2	15.0

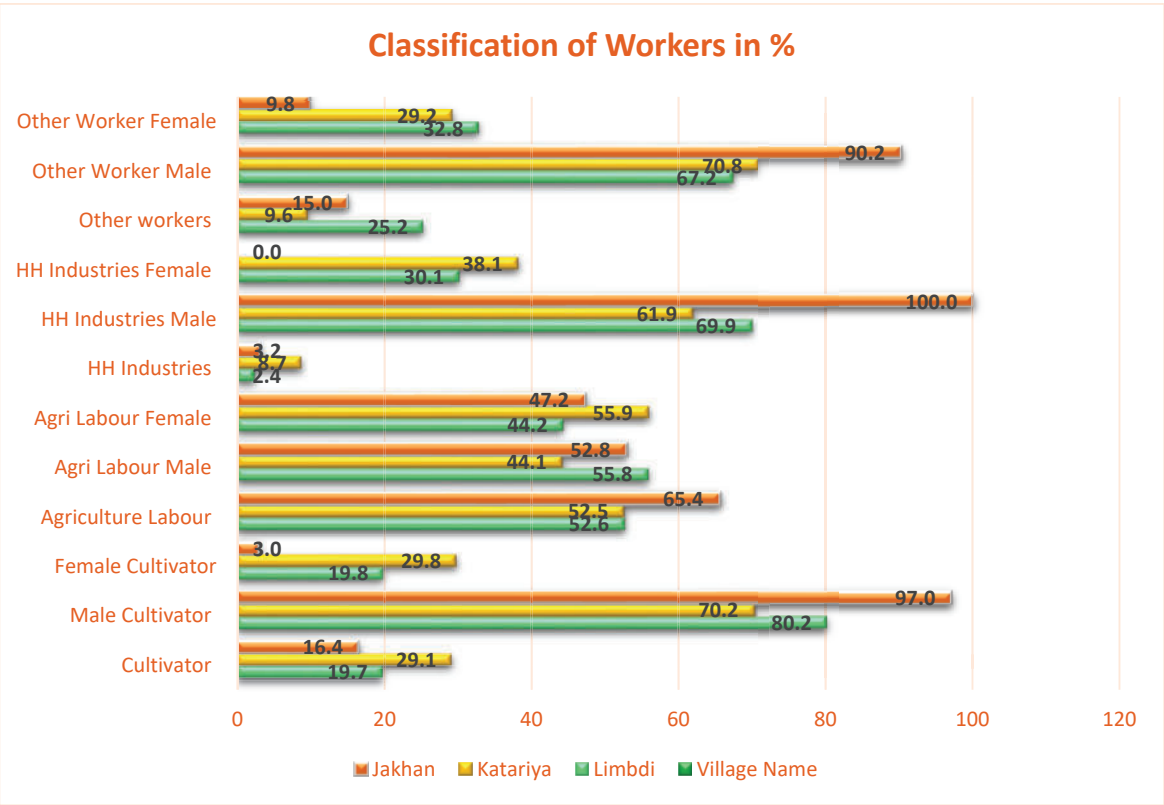
Source: Census of India 2011

Figure 3-39: Category of Workers in Study Area



Source: Census of India 2011

Figure 3-40: Classification of Workers in Study Area



Source: Census of India 2011

3.8.7 Wages

As given through circular of notification Labour Department Gujarat Govt., Minimum Wage rule w.e.f 1st April 2021 to 30th September 2021 in all sectors is Rs. 293/day, Rs. 284/day and Rs.276/day for skilled, semi- skilled and unskilled labourers respectively. The minimum wages paid in the agriculture sector was Rs 178 per day as per the Gujarat state government notification, and on January 1, 2021, a revised notification released according to which the minimum wages were raised to Rs 268. However, the prevailing wage rate in the region as reported by male and female agriculture daily wage labours is Rs. 200-250 per day.

Table 3-47: Minimum Wages rate in Gujarat

Sl. No	Schedule Employment of Contract Labour	Basic Wage (INR)
	CATEGORY	Per day
1	Skilled	293/day
2	Semi-Skilled	284/day
3	Unskilled	276/day

Source: https://paycheck.in/salary/minimumwages/Surendranagar

3.8.8 Livelihood Source

The whole district is drought prone area with annual rain fall of the district of about mm 506.8 mm (19.95") and 94% Annual normal rainfall. Moreover, the rainfall is irregular. Soil is medium black poorly drained and saline in Limbadi talukas.

The district has the total geographical area of 10.46 lakh hectares of which 67% is under cultivation. However, the net area irrigated was only 20% of the total. The average size of land holding in the district is 3.35 hectares and 27% of the holdings are small and marginal. Cotton is the most important crop of the district accounting for about 65% of the net cropped area. The area under fodder crops, sesame, and gram are also traditionally important in the district. The new commercial crops like cumin and castor are also emerging in a big way. The changing crop pattern in favor of high value crops and in favor of B.T.Cotton are promising developments for prosperity of farmers in the district.

Agriculture and cropping pattern: As recorded in the Census, 2011 about 70.75% and 91.76% of the study area villages Kataria and Jakhan are dependent on agriculture and animal husbandry as their main livelihood resource. During site visit, it was noticed that there is no irrigational facility available and due to the rising cost of production agriculture has gradually become difficult. Yet, in absence of any other alternative source for livelihood, agriculture continue to be the prime livelihood resource. The important crops grown are cotton, corn (Jowar), bajra, and pulses.

Cropping Pattern

Especially Jowar, bajra, pulses, and cotton are cultivated in the project area villages. As informed by the farmers and the community members, a crop wise productivity in the study area and market price is given in Table 3.48.

Table 3-48: Production & Productivity and Price of Major Crops

Sl. No.	Crop	Harvest Period	Productivity (q/acre)	Price/ Quintal (in INR)
1	Bajra	June – October	2.5 quintal per acre	INR 2000

Sl. No.	Crop	Harvest Period	Productivity (q/acre)	Price/ Quintal (in INR)
2	Gawar	June – October	2.5 quintal per acre	INR 3800

Source: Primary Consultation in the Study Area Village

Figure 3-41: Main Agriculture Production

Corn (Jawar) Cultivation

Cotton Production

3.8.9 Livestock

Surendranagar has rich livestock resources especially cow, goat and sheep population. The livestock population of the study area consists mainly of milk producing animals. The village have notable number of livestock population i.e. cow, sheep and goats. Grazing (Goucher) lands are available for grazing purpose in both the villages.

Figure 3-42: Main Livestock in the Study Area

Cow in Jakhan Village

Goat in Katariya Village

3.8.10 Industry

By and large, the non-farm sector in the district is dominated by enterprises in the unorganized sector. Handloom and handicraft products using traditional skills are the important sources of livelihood for the schedule castes families in the study area villages. This sector is emerging as a sustainable and has its brand famous all over the state.

Figure 3-43: Small scale industry (Rajkot patan patola saree) operated by vulnerable community

3.8.11 Local Employment and Migration

A large percentage of the working population is dependent on wage labour in farm and nonfarm sectors. During consultation with the community, it was observed that agriculture, animal husbandry are important sources for livelihood in the study area village. Also, the same has been reported in Census 2011.

Due to low level of urbanization and industrial development, a majority of the workforce outside agriculture is in low-income, self-employed and engaged as wage labour in the informal sector. However, supplemental sources of income in the livestock economy give some stability to livelihood.

High incidence of seasonal migration reported in households who belong to 'agarias', 'padhars', and 'maldharis', migrate seasonally normally for a period of six months or more for livelihood.

It is also found that the study area villages have the advantage of the proximity to commercial districts of Ahmedabad, Rajkot and Kutch.

3.8.12 Gender Empowerment Status

In Surendranagar district, female mostly is engaged into household activities. This is same in case of the study area villages i.e Katariya and Jakhan. Following the Census, 2011, the average literacy rate of female both at district and tehsil level is found much lower than the male.

As observed in the study area, women play a significant role in agriculture and allied activities including crop production, livestock production, horticulture, post-harvest operations, agro-forestry etc. Women contribute to enhancing quality of life especially through rural and agricultural economies in many ways. A notable part of the agricultural labour-force in the study area are women.

Animal husbandry is the second largest economic activity next to agriculture in study area villages. Many of the important tasks in animal husbandry are performed by women apart from their responsibilities as home makers.

Besides animal husbandry activities like bringing fodder from field, chaffing the fodder, preparing feed for animals, offering water to animals, protection of animals from ticks and lice, cleaning of animals and sheds, preparing of dung cakes, milking etc are performed by women. Thus, involvement of women in farming activities is a common feature in the study area villages.

The female work participation in Surendranagar is notably lower than that of male. The women workers in the state are still not better placed, specifically by financial status because the workforce is concentrated in activities which are unorganized, informal, seasonal, insecure, menial and poorly paid. There is also significant wage disparity between the male and female workforce.

During consultation with the women participant, it was observed that, early marriage and child marriage, minimal participation of women in household or economic decision making and lesser economic freedom is common in the area. The women are entirely responsible for household chores and additionally engaged as agriculture labour, harvesting, feeding the cattle, and taking care of livestock. Female laborers are engaged in cultivation, sowing, weeding, plant protection, grading, kitchen gardening, cleaning of grains, harvesting, feeding the cattle, irrigating fields, taking care of livestock, growing vegetables etc.

Figure 3-44: Interaction with local village women

Cotton handicraft operated by woman of Katariya vulnerable community (SCs)

Patola Saree weaving by women of Jakhan vulnerable community(SCs)

Consultation with Asha workers, Anganwadi workers and women agriculture labour in Katariya

Consultation with women agriculture labour In Jakhan

3.8.13 Below Poverty Line (BPL) Families and Vulnerable Groups

Vulnerable group is “Group that experience a higher risk of poverty and social exclusion than the general population. Ethnic minorities, migrants, disabled people, the homeless, those struggling with substance abuse, isolated elderly people and children all often face difficulties that can lead to further social exclusion, such as low levels of education and unemployment or under employment.”

During community consultation, it was observed that some vulnerable groups like landless households, single women households, BPL families and physically handicapped are present in the study area village. The project proponent has to identify vulnerable community members as mentioned above

during land procurement process. As per consultations with the land aggregators and project proponent, the land of vulnerable groups especially women (widow)/ disabled persons headed households and marginal farmers has been avoided for leasing purpose. During dialogue with AEW representative, it was informed that land has not been procured from any vulnerable household or family. The project proponent may be required to focus on providing employment opportunity to the vulnerable members and implementation of program under CSR activity for them.

Table 3-49: Below Poverty Line (BPL) Families and Vulnerable Groups

Village Name	Physically Handicap	BPL Family	Widow	Single Headed Households	SC	ST
Katariya	20	100	25	NA	100	00
Jakhan	5	35	20	5		00

Source: Primary Survey by Arcadis

3.8.14 Land Holding Pattern

During discussions with the local community in the study area, it was reported that the average land holding size varies between 5-10 acre per household in both the villages (Katariya & Jakhan). As reported during the consultation, all the project landowners are owning minimum of 5 acres.

3.8.15 Irrigation

As information revealed during consultation with the community, Wells & Narmada Canal is the main source for irrigation in the study area villages (Katariya and Jakhan).

3.8.16 Social & Physical Amenities and Infrastructure

The Social and physical infrastructure and amenities available in the study area denotes the social and economic wellbeing as well as the Quality of Life (QoL) of the region. No major physical infrastructure facilities are available in the study area. Communications and transportation facility are poor.

A review of infrastructure facilities available in the area has been done based on the information given in the Surendranagar District Census Handbook, the data of National Informatics Center, for the year 2011 as well as from other resources and Katariya and Jakhan study village visits are described in the subsequent sections.

Medical Facilities

***Study area*- Katariya and Jakhan villages**

As observed the health facility in the study area villages are inadequate to cater with the needs of the populace there. As informed by the community and the panchayat members that access to health services is very limited. People normally go to the nearest community health centre in Limbdi taluka which is about 7 km from the site. There is three Anganwadi Centres (AWC) in village Katariya and two in Jakhan. As reported during consultation Emergency No. 108/ Ambulance is also available locally in the study area, hence the local people do not face any major critical situation during the time of emergencies.

Communicable seasonal diseases like Malaria, dengue, swine flu is the common disease in villages. The health facilities are given in Table 3.50**.** Facilities available at community health centre at Limbdi is shown in Figure 3-45**.**

Table 3-50: Health Amenities in the study area villages

Sr. No.	Village Name	Primary Health Centre	Primary Health Sub Centre	Community Health Centre	Maternity and Child Welfare Centre
1	Katariya Village	0	1	0	0
2	Jakhan villages	0	0	0	0

Source: Primary Survey by Arcadis

Figure 3-45: Health Amenities at Study Area

Visit to Primary health centre (PHC) in Jakhan village

Toilet facility in PHC of Jakhan village

Education: As observed during visit and consultation in the study area villages Katariya and Jakhan, it was found that there is one primary school in Jakhan and one primary and secondary school in Katariya village. Both villages do not have any higher educational facility. For higher education, people send their children to school located in Limbdi Taluk which is about 7 km from the villages. The available educational facilities in the area as per 2011 census are given in Table 3.51. Available educational facilities in the study area villages are shown in Figure 3-46.

Table 3-51: Educational Facilities in Study Area

Name of Town	Primary school	Middle school	Secondary school	Senior Secondary school	Arts/ Science/ Commerce colleges
Katariya	1	0	1	0	Limbdi, & Surendranagar
Jakhan	1	0	0	0	Limbadi & Surendranagar

Source: Primary Survey by Arcadis

Figure 3-46: Educational Facilities in study area

Government Primary School and secondary school, Katariya

Smart Class facilities, Katariya

Kitchen Facility, Katariya

Drinking Water, Katariya

Visit to Primary school in Jakhan village

Consultation with Principal of school in Jakhan village

Water purifier, Jakhan PS

Toilet facility, Jakhan PS

Drinking Water Facility: As per the census data 2011 both villages have tap water. Covered and uncovered well is present in both the villages. It was informed by both Panchayat samiti and community that Narmada piped water supply system through reservoirs exists in both the villages. It was informed by villagers that well is present in both the villages. Water is also supplied through government run Narmada pipeline to every household.

Cooking fuel source: During consultation, a gradual growth of preferring LPG over fuel wood was observed in the consulted villages. On an average around 20% households use LPG and 80% uses firewood, dried biomass, animal dung briquette as other cooking fuel sources of energy for cooking and heating. The preference of traditional use of cooking fuel is cheap and easily assessable. Moreover, the price of LPG cylinder has increased therefore, majority of the local population cannot afford it despite the fact that they have LPG connection through government launched Ujjawala Yojana.

Communication and Transportation Facilities: Most of the villages are covered with all-weather roads, other district roads, gravel roads, black topped roads and footpaths. Transportation facilities are available at the district, and village level. Study area villages are covered with public bus service, auto-rickshaw, jeeps and govt. buses as the major modes of transportation in the area. Self-owned motorcycles and bicycles are frequently used as private transport by the villagers. As reported during consultation Emergency No. 108/ Ambulance is also available locally in the study area, hence the local people do not face any major critical situation during the time of emergencies. Telephone and mobile connectivity are also available. Available road network is shown in Figure 3-47.

Figure 3-47: Transportation Facilities at Site

Approach road towards Jakhan village

Jakhan village is accessible through public transport

Sanitation: During community consultation, it was informed that proper sanitation facilities is available in almost all households. Mostly villages are having open drainage system, drain water is discharged directly into water bodies. Sanitary grant is provided to the villager under the Central Government Scheme Swachh Bharat mission. Open defecation has been stopped.

Power supply: As informed by the local's, electricity connections is available in both the villages. It was told by the local people in village Jakhan and Katariya that electricity is available for more than 20 hours daily. Electricity shortage is only reported during rainy reason. Tariffs are being charged for these connections.

Figure 3-48: Transmission line & Transportation Facilities at Site

Choraniya Transmission Line

Access road towards project site (Funded by Village Panchayat)

Schemes Sponsored by Government Department: Several schemes are adopted by both the central and state governments to reach out to the remote most rural population of the state. A few of such programmes are,

(1.) Indira Awas Yojana IAY was primarily aimed at providing housing for the poor in rural societies in rural India. So, Households under the BPL were te primary beneficiaries, however, IAY was not restricted to just that category. Here is the list of all thode eligible under this scheme:

- Disabled or handicapped
- Ex- service Personal
- Scheduled castes and Scheduled tribes categories
- Free bonded labours
- Widows
- Marginalised sections of the societies

(2.) Atal Bihari Yojana: Atal Pension Yojana also know as APY Scheme was launched in continuation to the Jan Dhan Yojana Scheme to bring those employed in rural and unorganized sector under the ambit of Pension Schemes. The idea of the scheme is to provide a definite pension to all Indians. Any Indian national within the age group of 18 to 40 years is eligible to contribute under APY. However, any member of a statutory social security scheme is not eligible to get the governments contribution for this pension scheme.

(3.) Jyoti Gram Yojana: is an initiative of the Government of Gujarat, India, to ensure that a 24-hour, three-phase quality power supply is available to rural areas of the state and supply power to farmers residing in scattered farmhouses through feeder lines with specially designed transformers. The purpose of the scheme was to provide uninterrupted, good quality, scheduled, and subsidized power supply to the irrigating farmers for eight hours, separated by uninterrupted, unsubsidized, 24-hours supply to villagers for daily life usage

(4.) Sardar Awas Yojana: Sardar Patel Awas Yojana for land less agricultural laburers and village artisan living Below Poverty line in rural areas of the State. Sardar Awas Vasahat, Rampun, dist. Vadodara Govt. has made strategic planning for solution of houses in the village. The poor has right to live new life and to turn to new culture as colony of poor population

(5.) Indira Gandhi National Pension Schemes: Under the scheme, BPL persons aged 60 years or above are entitled to a monthly pension of Rs. 200/- up to 79 years of age and Rs.500/- thereafter.

(6.) Vikas Karya Village Development Work (Road Electricity, Drainage)

(7.) Vikas Karya Village Development Work (Road Electricity, Drainage)

Non-Government Organisations (NGOs) Working in the area: There are list of NGOS working in the Limbadi taluk however, none of them are working in the project impact villages as confirmed by village head and local communities.

Table 3-52: List of NGO

Sl. No	Name of NGO	Cause	Address
1	Aaishri Nagbai Mahila Vikas Trust Limbdi	Animal Husbandry	Old Police Station B/H Motovash Limbdi
2	Adarsh Seva Mandal Limbdi	Animal Husbandry	Visnunagar Society Kharovash Near R R Hospital Limbdi 363421
3	Gramin Seva Trust Limbdi District Surendranagar	Agriculture	Kharovas, , Behind R. R. Hospital, Limbdi , Pincode 363421
4	Jay Madi Mahila Utkarsh Mandal at Limbdi	Women's Development & Empowerment	Chamunda Krupa Vishnunagar Society B/H Chamanbaag Limbdi 363421
5	Navnirman Seva Trust Limbdi	Rural Development & Poverty Alleviation	Vishnunagar Society,Kharovash Near R R Hospital Limbdi 363421 Dis Surendranagar
6	Navrachana Sarvajanik Trust	Environment & Forests	C/O Ranchhodbhai Raghubhai Jadav, Shiv Shakti Nagar, Opp English School, Sauka Road, At- Limbdi
7	Nav Rachana Seva Trust	Drinking Water	Opp. Bus Station, Mafatiyapara, Siddhanath Society, Limbadi.Disurendranagar.- 363421
8	Nutan Sikshan Ane Gramodhyog Mandal	Environment & Forests	At And Post Limbdi Taluko Limbdi District Surendranagar Gujarat 363421
9	Saugun Khadi Gram Udhyog Trust	Children	At Tokarala , Taluko Limbdi, Dist Surendranagar, Pin
10	Shree Chamunda Mahila Vikas Mandal Limbdi	Education & Literacy	Parvatiben Khushalbhai Singal, "Parul", Krishn Nagar, O/P Mill, B/H College. At -Limbdi, Ta - Limbdi,Pin 363421 Dist- Surendranagar
11	Shree Jansali Sarvjanik Seva Trust	Dalit Upliftment	C/O Jadav Ranchhodbhai Raghubhai, Shiv Shakti Nagar, Opp English School, Sauka Road, At- Limbdi
12	Shree Khadivikas Rachnatmak Samiti	Human Rights	At Untadi Ta Limbdi Dist Surendranagar Pin 363421
13	Shree Khadi Vikas Rachnatmak Samiti	Labour & Employment	At: Untadi Ta: Limbdi Dist: Surendranagar, Pin-363421

Source: Secondary Source

3.8.17 Common Property Resources (CPR)

During consultation with villagers, it was noted that the Katariya and Jakhan villages have some Common Property Resources (CPR) like temples, community hall, community toilets, pond/river and graveyards, etc. for each community separately as presented in Table 3.53. No CPR is located within the project site.

Table 3-53: Common Property Resources

Study Area Village	Common Property Resources (CPR)					
	Temple	Cremation Ground	Community Hall	Community Toilet	Grazing Land	Pond/River
Katariya	11	3	0	1	1	1 Dam (known as Bada Talab)
Jakhan	10	2	2	1	1	2

Source: Primary Survey by Arcadis

Figure 3-49: Common Property Resources of Study Area Villages

Visit to Anganwadi in Jakhan village

Visit to village panchayat in Jakhan village

Pond in Katariya Village

Temple in Jakhan Village

Visit to Primary health centre (PHC) in Jakhan village

Temple in Kataria Village

Grazing of cattle on open land

Temple on the entrance of Jakhan village

3.8.18 Archaeological and Cultural Heritage

As observed during field visit there is no structure of archaeological and cultural heritage on the proposed project site. No monument or structure of religious importance were observed within 10 Km radius of the study area town.

3.8.19 Stakeholder Consultation

Prior to the conduct of this study, the project proponent through the land aggregator had conducted informal consultations with the landowners to inform about the proposed project and to obtain necessary basic documents to screen the legal status of the land (consultation details provided in table below). They discussed about the land procurement processes and lease rentals and ensure that land would be leased from those landowners who are willingly ready to lease the land for the project. The project proponent has appointed the land aggregators who are directly and in regular contact with the landowners of Jakhan and Katariya village. For socio-economic baseline study, consultation with landowners and community members were held separately at each study area village. Consultation was carried out with representative of Project Proponent, land aggregators, Village Landowners, School Teacher, Health Staff, vulnerable peoples like women, single headed household, scheduled castes etc. and other community members from Katariya and Jakhan village. Outcomes of the consultations are included in the sections such as infrastructure, migration, occupation etc. The date of meeting with different Stakeholders consulted in study area village is provided in Table 3.54.

Figure 3-50: Geotag map of stakeholder consultations at various location of project site

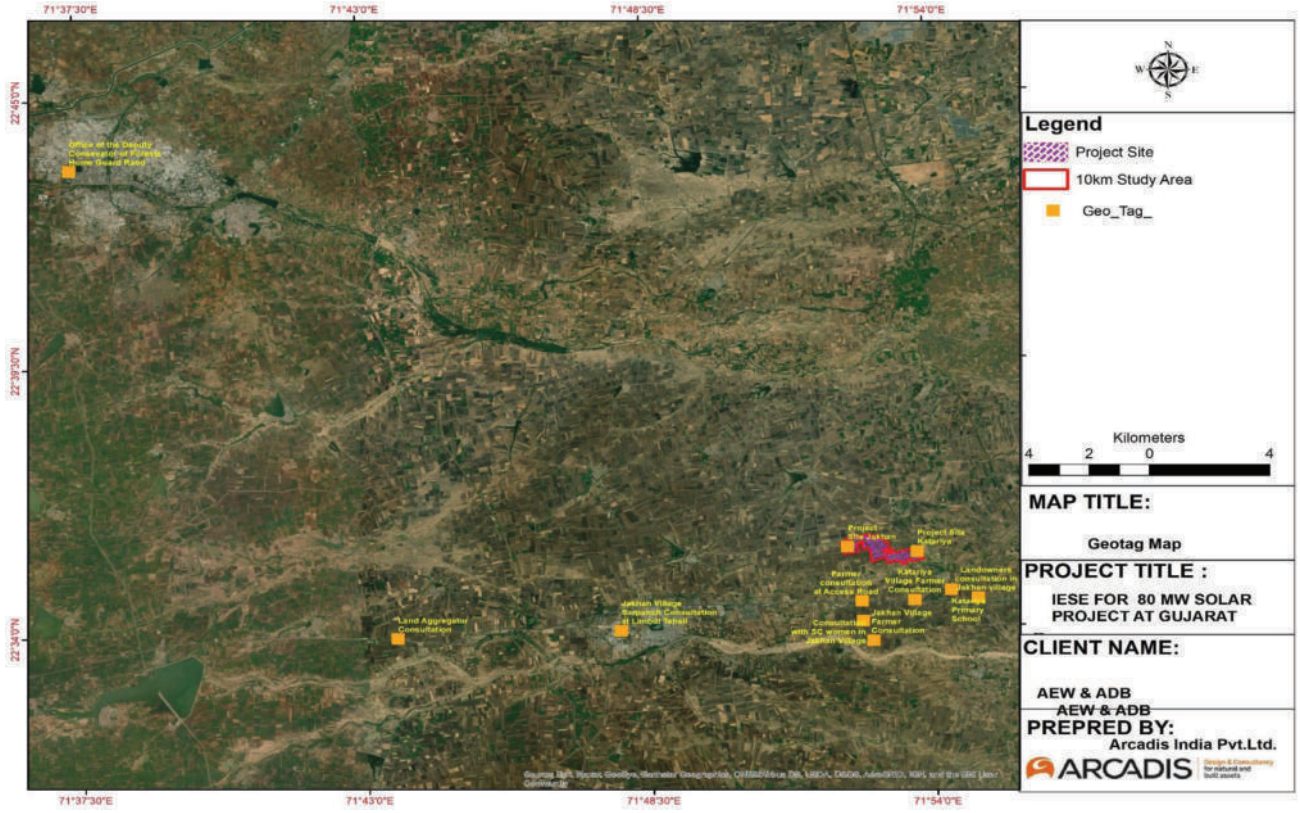


Table 3-54: Consultation with Different Stakeholders conducted by AEW

S.No	Date / Period of Consultation	Stakeholders Consulted	Agency Carried out Consultation / Disclosure	Outcome of the Consultation
1	November 2020	Landowners, Gram Panchayat including Sarpanch of Village Jakhan & Katariya.	Proposed Land Aggregator	• Landowners had expressed their consent to lease their land for the Project. • Gram Panchayat members and Sarpanch were also positive towards the development of the Projects in their villages.
2	November 2020	Revenue Officials of the Taluk & District	Proposed Land Aggregator & AEW land team	• Discussion on the available land revenue records for the Land Parcels. • To understand if there are any issues with respect to the land documents in the current area. • To understand the process of the land acquisition in the area. • Basis the discussion, revenue officials informed us that all revenue records are properly maintained both online and offline and there were no pending issues in the Land documents.
3	December 2020	Precedent Renewable Energy Developers	AEW Land team	• Discussion on issues faced by them during the execution of the Project, market rates in the area and acceptance of the Project. • We understood that there are no major issues faced by developers at the Project site and all the stake holders for the Project welcomed the Project in the area. Further, we also understood the lease rent prevailing in the area is Rs 33500/- per acre per year with an escalation of 5% every 3 years.
4	January 2021	Landowners	Proposed Land Aggregator & AEW land team	• Meeting with Landowners and AEW to get a first-hand information and consent. • Discussed the lease rent for the Project land and agreed the tentative terms of lease with the Landowners.
5	January & February 2021	Revenue Officials of the Taluk & District	Proposed Land Aggregator & AEW land team	• Understood the status of revenue documents for the Project land. • Initiated the process of document collection for the Land parcels through proposed land aggregator.
6	March 2021	Gram Panchayat of Village Jakhan & Katariya along with Sarpanch	Proposed Land Aggregator & AEW land team	• Understood the willingness of the Gram Panchayat and Sarpanch for the construction of the Project.

S.No	Date / Period of Consultation	Stakeholders Consulted	Agency Carried out Consultation / Disclosure	Outcome of the Consultation
7	April 2021	Land Aggregator	AEW Land Team	• Appointed Ocean Trading Co as the land aggregator for the Project
8	March 2021 to August 2021	Revenue officials, Landowners	Proposed Land Aggregator	• Collection of land revenue records from revenue authorities and landowners
9	March 2021 to August 2021	Landowners	Land Aggregator	• Signing of Consent letters from Landowners
10	July 2021	Gram Panchayat Officials	Land Aggregator & AEW Land team	• Obtained Gram Panchayat NOC for the Project.
11	March 2021 to August 2021	Revenue Officials and Other Statutory Authorities	Trilegal, Land Aggregator & AEW Land team	• Legal due diligence of Land documents.
12	July 2021 to ongoing event	Landowners, Revenue Officials	Land Aggregator	• Coordination for application to non-agriculture conversion of land, mutation of revenue records and other documentation required for leasing of the land. Clearing of loan/encumbrances on the land by payment of advances from AEW.
13	October 2021 to ongoing event	Landowners	Land Aggregator, AEW Land Team	• Execution of lease and other necessary agreements, payment of lease consideration. Application for mutation of revenue records.

Table 3-55: Consultation with different Stakeholders as part of IESE

Stakeholder	Name & Designation	Department/Address	Date
Project Proponent	Mr. Divya Bhagat	Jenwa	20/09/21
Land Aggregator	Chandrakant Soyala Felenthy H (Bhavesh Bhai-9376899992)	Ocean Trading Company	20/09/21
Panchayat Member	Mahavir Singh Janak Ben Wife of Bharat singh)	Panchyat Head, Jakhan Village Panchayat Head, Kataria Village	20/09/21
Anganwadi workers	Nirmala Ben-jantabhai Pramila Ben, Prabha ben, Kanta Ben	Jakhan Anganwadi Kataria Anganwadi	21/09/21
Educational Institution	Nilesh Bhai	Principal/ Government High School, Kataria	21/09/21
Educational Institution	Varshuben Vinodchandra Pandit	Principal/ Middle School, Jakhan	21/09/21
Health Sub-centre	Lalita Ben, Dulera Usha Ben, Chaya Ben (Asha Workers) Ratan Ben Mbora- Asha Worker	Kataria	22/09/21

Stakeholder	Name & Designation	Department/Address	Date
Landowner,	Villagers Name Khoman Chand (5acre) Jaswat Bhai (7.2acre) Praveena Ben(3 acre) Ramesh Bhai (4acre) Jairam Kabji bhai(3 acre) Kalubhai bhikabhai Premjibhai Bhikabhai Dhirubhai bhikabhai (24 acre for all 5 total) Mahipatbhai bhikabhai Kalubhai Bhikabhai "Dikpal singh zala (7acre) Harjiwan Bhai Lakshman bhai (7acre) Kathiya Pratak Singh (5.6acre)	Kataria Village	22/09/21
Landowner	Villagers Name Mayur Dhwaz singh Kanchan singh Zala (7acre) Shakti singh Mayur singh Rana (20acre) Digpal singh Hardeep singh Zala (7.2acre) Dilip singh Gajendra Singh (10acre) Vrajkuvarba Dilubha Rana (9.8acre) Divya raj singh chandra singh Zala (10acre) Kirti singh natuba zala (9acre) Aniruddh singh Jitubhai Zala (8.9acre)	Jakhan Village	23/09/21
Agricultural laborers	Women Participant Savitaben Ranjan Ben Champaben Sajan Ben Sangeeta Ben Manjula Ben	Katariya	22/09/21
Agricultural laborers	Not available	Jakhan	22/09/21
Women	Pramilaben Prabhabhai Jayaben Pramilaben Savitaben Ranjan Ben Champaben Sajan Ben Sangeeta Ben Manjula Ben Ranjan Ben Gauri Ben Pahu Ben Koyal ben Chaya Ben	Katariya	23/09/21
Women	Fula Ben Janaki Ben	Jakhan	22/09/21

Stakeholder	Name & Designation	Department/Address	Date
	Savitri ben		
	Chhaya Ben		
	Ratan Ben		

Source: Primary survey by Arcadis Team

Consultation with Project Proponent (AEW)

The proposed solar power project is located at village Katariya and Jakhan which falls under Limbdi taluka in Surendranagar district. Representatives of the project proponent informed the visiting ESIA team that the land procurement is underway. the project will be spread over on 332 acres of land. Land identification and non-objection certificate has been obtained with half of the landowners. It is estimated that around 101 landowners would be affected due to land leasing process. During consultation with the Land aggregator as well as land sellers, it was found that that land leasing is being undertaken on voluntary basis and land lease agreement made for 29 Years 6 months. It is confirmed further by sample copy of sale deed and complete list of lease deed. The representatives of the project proponent informed that NOC from the respective Village Panchayats has been obtained.

Consultation with Community Members and Sarpanch

As informed during consultation, the study area village population are involved in agricultural activities & animal husbandry. Agriculture is mostly rain fed and irrigation through wells and Narmada canal was also reported. The main crop cultivated are cotton, Bajra, Jowar, and Pulses. Majority of the households have sanitary latrines at their households. Population resort to open defecation. There is no PHC facility in the village. The health care facilities available at Limbadi taluka Town (around 7 Km) is availed. Health workers visit the village monthly for health-related monitoring, routine immunization and vaccination. Emergency Service availed during the times of need.

It was informed by the Community and the Panchayat Members that they are aware of the solar power project to be started in the village. It was reported that the solar project will not result in any physical displacement. There are floating farm labours work on the affected land parcels as reported during interaction They are expecting betterment in their livelihood with the initiation of the same. Some of the issues raised during public consultation.

- Basic Infrastructure: Roads, schools, health centres
- RO to provide fresh water. Ground water or water from Narmada canal stored in reservoirs is used for drinking- very high in fluorides.
- Lack of community toilet & community hall in Kataria village, proper drainage facilities
- Lack kill development and capacity building programme for women

The people have general aspirations of development in the locality with the upcoming solar power project.

Consultation with Land aggregator of Solar plant

Consultation meeting was held with the Land Aggregator on 22nd September 2021. As informed by the Land Aggregator, they have individually approached to landowners during land procurement process. A total of 332 acres have been finalised till date. Landowners have voluntarily agreed to lease the land on the compensation/term payment provided which is Rs 33,500/Acre/Annum for 29 years & 6Months and with escalation of 5% after every 3 years. No physical and economic displacement reported during consultations with land aggregator. This was further verified from the landowners. List of landowners consulted during site visit has been provided in Appendix F.

Figure 3-51: Stakeholder Consultation at Site

Consultation with Land aggregator/facilitator and project proponent

Consultation with Sarpanch of Jakhan village

Consultation with farmers of Jakhan village

Consultation with farmers of Jakhan village

Consultation with Asha workers of Jakhan village

Consultation with women of vulnerable community

Consultation with Landowners of Kataria village

FGD with women stakeholders

Consultation with Asha workers, Anganwadi workers and women agriculture labour

Consultation with Principal of school

Details and summary of stakeholder's consultation have been provided in Appendix G.

Key Findings of Consultation

Some notable key findings of different level stakeholder consultation are appended below:

As per consultations with the landowners of the Kataria and Jakhan village (rural areas lying in Block - Limbdi, District - Surendra nagar) most of the land is non irrigated agricultural land with private ownership of the farmers. A total of 28 consultations were held out of which 19 consultations were held with landowners of Kataria village (Khasra no. 644, 794, 795, 663, 770, 769, 774, 779, 767, 247, 793 and 9 consultations were held in Jakhan village (Khasra no. 258, 258/1, 347, 240, 264, 542, 255, 254).

The landowners are majorly Hindu and are socially categorised as OBC (Koli Patel), General (Rajput - Zala), etc. All the 28 landowners were ration card and voter card holders. Among all the 28 consultations, 70% of the total consultations were done with OBC community as majority of the landowners were from OBC category.

None of the landowners/ titleholders belonged to marginal and small category because their total landholdings were more than 5 acres (As per definition of Ministry of agriculture and farmer welfare, Farmers having less than two hectares (five acres) of land are called small farmers and those having less than one hectare (2.5 acres) are called marginal farmers). The total land of the project site is 76% cultivable and 24% non-cultivable. The landowners of Kataria and Jakhan village reported that land for the proposed site is largely remain uncultivated for the last five to seven years because of irregular rainfall and there is lack of irrigation facilities. The land is devoid of trees and standing crops except in few land parcels in which cotton, bajra, jwar crops are being cultivated. More than 85 percent of these landowners have an additional land parcel which is more fertile and have better irrigation facility which

enables the landowners to continue the farming activities on the remaining land near the village and grow crops like cotton, bajra, jwar crops and make their livelihood.

During the consultations with the landowners of both Kataria and Jakhan village it was seen that all the landowners have an approximate land holding of area equal to or greater than 5 acres in the proposed site and have given their consent for the land leasing. This proposed site land parcel mostly remains uncultivable throughout the year, landowners practice farming when there is enough rain in the season. Three landowners reported that the average earning of a good season from their land parcel leased for project was Rs. 8000-12,000 per acre per annum.

No landowners reside in the land parcel proposed for leasing, thus no effect on livelihood is seen and there are no major effects or reduction in income of the landowners because of the upcoming project. There is no contract labour, sharecropper and tenants etc. associated on the proposed land as verified during discussion with the local community. There has not been any case of physical displacement as no structures were reported during site visit. Majority of the landowners who have agreed to lease the land for solar plant are also owing an additional land parcel either in the same or some other villages.

As reported by the landowners, the average market rate of the land in the region is around 3.5 lakh/acre to 4.5 lakh/acre. As per discussion with the land aggregator, and landowners, it was found in Jakhan village that women are also engaged in agriculture activities. Women equally participate in agriculture activities and spend 7-8 hours in field during peak cultivation period.

During consultation, farmers reported that for appropriate annual income, farmers of kataria village opts to cultivate the land on their own as hiring a labour is costly business to them and the labour cost is about Rs. 200-300 per day. The cost of labour is exclusive of the transportation cost and refreshment meal which cost around Rs. 50-60 additionally to the farmers. Their annual income completely depends on the cultivation of crops, any bad season or poor yield affects their profit margins, thus hiring agricultural labour add to additional expenses which might can lead to the loss in the income. So, they opt to cultivate the land on their own.

As reported, the landowners are satisfied with the leasing of land because the existing agriculture practices on the proposed land has become unviable due to increased labour cost, infertile land and shortage of rainfall in the region. Now they can have fixed income from leasing of land. And are Voluntarily agreeing on the compensation/term payment provided which is Rs 33,500/Acre/Year for 29 years & 11 Months with 5% escalation after every 3 years. However, along with the cash compensation landowners expressed their interest in learning new skills through skill development programmes.

Key points of Women consultation

In both Kataria and Jakhan village consultations were carried out with women, majority of the women population of the village works as agricultural labour within their land holdings. Their working hours are mostly from 7a.m. to 2 p.m. or depend as per the work requirement. About 15 women agriculture workers were consulted during site visit, these women were in involved as agricultural labour on daily wages of Rs. 200/-. Among the workers consulted, about 6 farmworkers reported that there may be reduced agriculture works due to the upcoming solar projects in the region. These workers floating agriculture labors from the nearby villages and are not primarily dependent on the project site land. During consultation women of both the Kataria and Jakhan village reported that all the houses are equipped with a decent sanitation facility. Open defaecation practice has been stopped in the village.

Women informed that they participate in the decision making of performing daily chorus works as well as in the public sphere. Although women are mostly busy with domestic (housekeeping, taking care of children, washing, cooking, home gardening and poultry raising and with productive work in the farm. During consultation it was reported that man of Rajput family of both Kataria and Jakhan village do not

want their wives to be exposed to other men. Women of this community were not supposed to talk with other men and were mostly asked to stay at home. Women of OBC (Dalit) community work on producing income with their husbands. Women of this community are free to work on fields as agricultural labour. Also, some of these women work in their houses producing patola sarees. Also, they expressed their interest in learning new skills through skill development programmes which will somewhere resolve the purpose.

In Kataria village women were not aware of the proposed solar project. They only knew was that their land parcel is being taken on rent in exchange of a sum of money During consultation, women were imparted knowledge of the upcoming solar plant.

Access to education: Majority of the women in Kataria and Jakhan village have received formal education upto primary level. The older generation was lacking the access to education.

Access to Health: In Kataria village there is no established primary health centre. Although a mobile vehicle visits the village on weekly basis for medical health services. In casualties, the villagers move to the Limbdi district hospital, where they utilize the health care services.

- In Jakhan village there is an established primary health centre (PHC). The PHC is run by two Ashaworkers who organize weekly camps to impart knowledge to the women about malnutrition, childbirth etc. In casualties, the villagers move to the Limbdi district hospital, where they utilize the health care services.

Access to Skill development Programme: In Kataria and Jakhan village both, there are no skill development programmes accessible to women. Although women expressed their interest of learning new skills through skill development programmes.

Access to marketplace: In Kataria and Jakhan village both, women have all the access to the marketplace in kataria village as well as they occasionally go for shopping of clothes and other essentials in the Limbdi district market on their own

3.8.20 Needs Gap Assessment for CSR Initiatives

Analysis of socio economics description and community consultation in project area villages reveals that concern of villagers is linked with the fulfilment of basic needs and improvement of some infrastructural facilities at school/ Anganwadi/ health etc. levels. On the basis of discussion with villagers, schoolteachers and village counsellor, following gaps have been identified which needs to be addressed in Table 3.56.

Table 3-56: Key Needs/Gaps Identified and Recommendation for CSR Activity

Key Areas	Gaps identified	Recommendation for CSR
Education	• Lack of Education facilities • Very Low female literacy rate compared to male • Lack of vocational training in study area villages • Lack of computer literacy in study area villages especially in primary schools. • Lack of Sitting Arrangements in Primary School	• Awareness program regarding female education at village level. This can be linked with vocational training programme of study area villages • Providing computer literacy program at village level • RO provided for drinking purpose so that treated water would be available • Smart classes in Katariya School and library in Jakhan primary school. • Training on health, hygiene and road safety
Drinking water	• The quality of drinking water is poor as informed by the locals.	• Providing additional drinking water facilities in the nearby villages with help

Key Areas	Gaps identified	Recommendation for CSR
	• Lack of purified water	of concerned government dept and consultation with Village Panchayat • Clean or purified drinking water is expected to significantly affect the quality of life and health for the villagers
Health	• Absence of basic Health Care facility in study area villages impacting the basic health of the local people in a way. • Major diseases observed are vector borne communicable diseases like malaria, dengue and seasonal diseases like swine flu and water borne diseases like fluorosis	• Organizing awareness camp on general health awareness. • Improving sanitation facility in the area. • Facilitating mosquito breeding control measures. • Health camps or mobile health clinics can be provided.
Agriculture/ Irrigation	• Agriculture is mainly dependent on rain. The project affected villages lacks adequate irrigation system. • Water scarcity has been reported as the project study area has not received any rainfall in last 3 years. The area has been declared drought prone. The ground water has excess fluoride content. • Limited irrigation facility is available through Narmada water canal, but as informed by the villagers in most of the cases it can be made possible only after full discharge from the minor Scheme present in the area.	• Facilitate learning camps
Employment opportunities in the area	• Majority of the villagers are unskilled and working as daily wage earners in constriction work • Labourers are mostly seasonal workers and migrate only for a short while in the nearby towns, either as Masons, or carpenter.	• Organizing training/capacity building program for unskilled youth group.
Others	• Poor basic infrastructure facilities such as electricity, roads, schools, health centres, Anganwadi centres and Panchayat Ghar. • Lack of community hall, community toilets etc	• Provide basic infrastructure facilities, if possible

4 ANALYSIS OF ALTERNATIVES

The section gives analysis of alternatives with respect to the project. The following scenarios have been considered:

- Current or No Project Scenario
- Alternate methods of power generation
- Site suitability and justification for the project

4.1 Current or No Project Scenario

There is a need to bridge the gap between the demand and supply, renewable/non-conventional sources of power to supplement the conventional sources. The project intends to contribute towards bridging this demand supply gap being a non-conventional source of power generation.

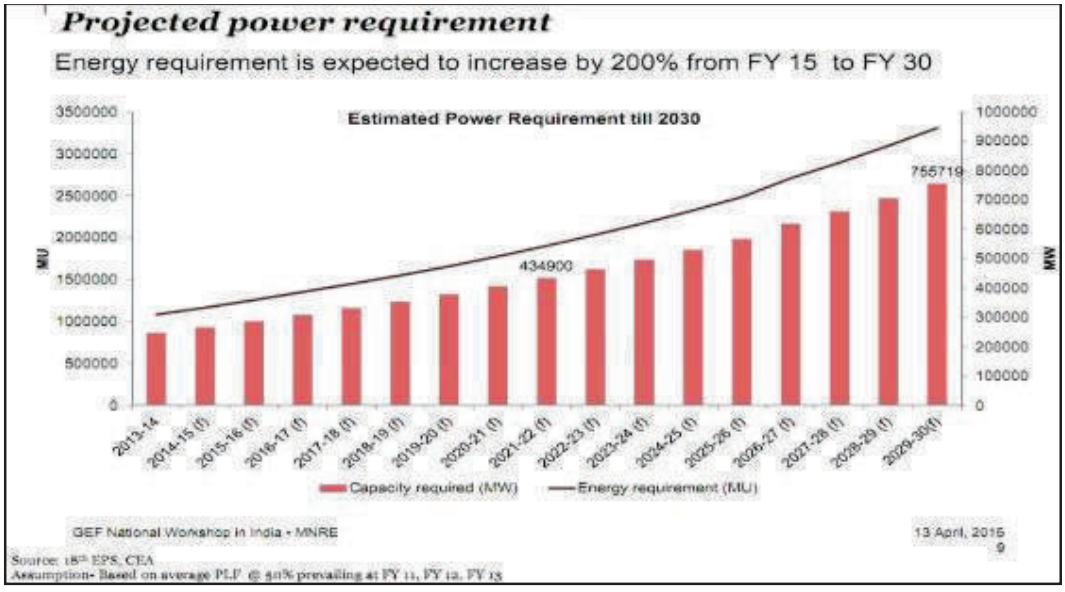
The project presents an opportunity to utilize the potential for integrated renewable energy generation. A “No Project Scenario” will not address the issue of power shortage. An alternative ‘without the project’ is undesirable, as it would worsen the power supply-demand scenario, which would be a constraint on economic growth of the surrounding region.

4.2 Energy Security

In 2007 the Ministry of Environment Forests and Climate Change (MoEF&CC), Ministry of Power (MoP) and the Bureau of Energy Efficiency (BEE) issued a paper entitled ‘India: Addressing Energy Security and Climate Change’. In India the need for expanding the role of domestic Renewable Energy (RE) sources is a logical next step. Wind power is already able to provide a significant portion of India’s planned capacity addition up to 2030, with simple regulatory and grid modernization initiatives. Unlike oil, coal or LNG, wind power is not subject to fluctuating fuel prices which drain India’s limited foreign reserves, and in addition, wind power helps in reducing the carbon footprint of the economy. In the Figure 4-1, India’s projected power requirement until 2030 has been indicated.

This project is a step towards achieving energy security in India.

Figure 4-1: India’s Projected Power Requirement



4.3 Alternate Methods of Power Generation

There are various non-renewable and renewable energy sources which can be utilized for power generation. Each option has its own advantages and disadvantages. Based on the site conditions, availability of resources, environmental & social concerns and project cost suitable option for power generation need to be selected. Comparison of advantages and disadvantages of various non-renewable and renewable energy is represented in Table given below.

Table 4-1: Advantages and disadvantages of various non-renewable and renewable energy

Source of Energy	Advantages	Disadvantages
Coal	• Relatively cheap form of energy availability in large scale worldwide • Easily transported to power stations • Reliable for of energy with steady output • Coal is available in India	• Non-renewable energy source • Large water requirement • High emission and generation of fly ash • Source of greenhouse gases • Mining of coal causes impacts on land and surrounding environment.
Oil & Gas	• Oil and gas can be easily transported by pipes or ships. • Natural gas is the “cleanest” of the fossil fuels	• Non-renewable energy source • Working environment risks to staff and environment • Burning oil and gas releases can cause pollution & health impacts. • Releases GHG and hence causes global warming and climate change. • India imports majority of Oil and Gas requirement and hence high dependency of raw material outside the country
Nuclear	• Nuclear fuel does not create greenhouse gases when making energy. • Only a very small amount of nuclear fuel is needed to make a lot of energy. • Does not produce significant atmospheric pollutants.	• Expensive, especially in capital costs, maintenance costs • The waste produced from nuclear energy is radioactive and Safe long-term disposal of nuclear waste can be difficult.
Solar	• Energy from the sun is exhaustive & free. • Solar energy does not create greenhouse gases.	• Only specified places are right for solar power. • Solar energy cannot be produced at night
Wind	• Wind power does not create greenhouse gases. • The energy used to build one of the large turbines is repaid in 3-6 months. They last for 25 years.	• Need a lot of turbines to make electricity. • Location specific resource • Wind turbines can only be used where it is windy. On days where there is little wind, less energy will be generated.
Hydroelectric	• Hydroelectricity creates no greenhouse gases. • Energy from water is free and will not run out. • Hydroelectric energy is more reliable than wind or solar power.	• Hydroelectric power needs enough water to turn the turbines. • Dams are expensive to build. • Building large dams can cause damage to water courses which affects people and wildlife, and it can be difficult to find the right site.

Source of Energy	Advantages	Disadvantages
		• Small dams for local buildings on weirs do not have these problems.
Biomass	• Biomass fuel is cheap and could use rubbish that we might otherwise throw away. • Biomass fuels will not run out. • Biomass crops that are grown absorb the same amount of pollution whilst they are growing as they release when they are burned, so do not create extra greenhouse gases in the atmosphere.	• Growing biomass crops needs a lot of space and could replace growing valuable food crops. • Biomass fuels that are not grown (such as waste products) create greenhouse gases when burned.

The conventional sources of power generation have high environmental cost when compared to non-conventional sources like solar, wind, hydro, etc. its construction periods are longer with higher environmental risks from emissions. On the contrary power source from solar energy is most eco-friendly. It does not have any kind of emissions during operation. While wind power requires high wind zones to be set up and micro siting along with detailed meteorological analysis is required, site selection for solar power is relatively easier. Solar power energy is a clean power project with no emissions and feasible for the project area keeping in mind the good solar potential in Gujarat throughout the year.

4.3.1 Alternate Routes for Transmission Lines

As discussed with AEWIWOPL official at during site visit of Arcadis team, the route of the transmission line will be selected keeping in mind the following factors.

- Transmission line route is planned to avoid any habitations along the route.
- No house or community structures are located under the transmission line.
- Areas requiring extensive clearing of vegetation have been avoided.
- Selection of the transmission route avoids any environmental sensitive site like schools, health centres, etc.
- Right of way/access roads will be shared with the common user of the substation.
- Ecologically sensitive areas

The following three alternatives have been selected also keeping in mind not to disturb the grassland area where Lesser Florican species were sighted:

Option 1. AEW proposed independent TL Route 1, from 220KV PSS AEW to GETCO Choraniya 400KV Substation as shown in Red color in Figure 4.2.

Option 2. AEW proposed TL Route 2 with Juniper line, from 220KV PSS AEW till Juniper line independent line (green color) and then with Juniper line (Pink color) to GETCO Choraniya 400KV Substation as shown in Fig 4.2 .

Option 3. AEW proposed independent TL Route 3, from 220KV PSS AEW to GETCO Choraniya 400KV Substation as shown in Green color in Fig 4.2.

Figure 4-2: Google earth Map with 3 options for Transmission Line of AEW

. (*Source AEW*)

4.4 Conclusion

Various factors are considered such as solar resource potential at the project site, favorable environmental and social settings, lowest GHG emissions in the project life cycle. Availability and suitability of solar power potential, land and other allied infrastructure availability and various government supporting policies. Considering these factors, it can be concluded that the site is the good location for development of solar power project.

5 ENVIRONMENTAL & SOCIAL IMPACT ASSESSMENT

5.1 Approach & Methodology

ADB's safeguard policies require that (i) impacts are identified and assessed early in the project cycle; (ii) plans to avoid, minimize, mitigate, or compensate for the potential adverse impacts are developed and implemented; and (iii) affected people are informed and consulted during project preparation and implementation. ADB emphasizes on the use of a screening process as early as possible, to determine the appropriate extent and type of environmental assessment so that appropriate studies are undertaken commensurate with the significance of potential impacts and risks.

As discussed in section 3.1.1 & 3.1.2 of the report, the project study area is represented by the Area of Influence (AOI) & project footprint area. The AOI is demarcated by 10 km radius from the project site boundary (solar plant area) by considering the extent of project impact in terms of noise, water resources, human settlement, cultural heritage sites, location of labour sites, location of the access roads besides considering the actual land area which is to be procured for the project and its utilities footprints. In case of air quality, fugitive emissions, noise, extent of impacts may be felt less widely within the AOI, however, to gauge impact on habitations/senstitve receptors, locations have been selected within the entire AOI.

The study area is falling in two villages namely Jhakan and Kataria of Limbdi Tehsil in Surendranagar district of Gujarat.

The project footprint is the area that is expected to be physically touched by project activities, across all phases. The project footprint includes land used for the setting up the Solar PV's, transformer rooms, storage of materials, site office, access roads, and internal and external transmission lines.

The methodology adopted to assess the significance of impact associated with project activities during construction and operational phase has taken following criteria into consideration. Details of screening criteria are given in Table 5.1.

Table 5-1: Screening Criteria for Environmental and Social Impact Assessment

Impact	Distribution of impact	Duration of Impact	Intensity
Low/ Short	Influence of impact within the project site boundary and RoW of Transmission line (Site)	Limited for duration of less than 6 months (Short)	Limited local scale impact resulting in temporary disturbance/ loss of environment/ social components (low)
Moderate/ Medium	Spread of impact within 10 km from the of the project site boundary (Area of Influence)	Impact may extend up to 2 years (Medium)	Local scale impact resulting in short term change and/ or damage to the environment components. (Moderate)
High/ Long	Influence of impact beyond 10 km from the project site boundary (Widespread)	Impact extends beyond 2 years (Long)	Regional impact resulting in long term changes and/ or damage to the environment components. (High)

5.1.1 Significance Evaluation Matrix

Significance of environmental impact has been analyzed and presented in further section of this chapter. The environmental impacts associated with the project activities have been identified and analyzed to evaluate their significance. Because of clean category projects, environmental impacts are few with minor significance and can be controlled through mitigation measures.

Table 5-2: Aspect Impact Matrix for Construction and Operation Phase

	PHYSICAL ENVIRONMENT									BIOLOGICAL ENVIRONMENT						SOCIO-ECONOMIC ENVIRONMENT					
	Aesthetics and Visual impacts	Air Quality	Noise Quality	Top soil removal / Soil Quality	Land Use	Local Drainage & Physiography	Surface water quality	Groundwater Resources	Ground water quality	Terrestrial habitat	Ecological Sensitive Areas	Aquatic Habitat and resources	Migratory Birds/ Avifauna	Agriculture	Domesticated Animals	Loss of land and livelihood	Common Property Usage	Local Job and Economic Opportunity	Cultural and Behavioral Conflict	Community Health and Safety	Occupational Health and Safety
A. Construction Phase																					
Land sub lease/purchase process for the solar power plant and transmission line					L					L						M					
Sourcing and transportation of construction material etc.		M	L	L						L	M						L	P		L	L
Storage and handling of raw material and debris	L	L	L	L																L	
Interaction of migrant labor with locals																	L	P	L	L	
Operation of DG sets		L	L	L							M		M								
Access road construction		M	L	L	L					L			M				M	P		L	L
Site Clearance		M	L	L							M		M		M			P		L	L
Foundation excavation		M	L	M									M					P		L	L
Transformer yard construction		L	L	L									M							L	L
Substation construction		L	L	L									M							L	L
Laying of transmission lines											M		M				L		L	L	L
B. Operation Phase																					
Vehicular movement carrying Officials on site during routine inspection, maintenance and operation of solar power plant		L	L								L										
Periodic maintenance of all solar modules (washing modules)																		P			L
Maintenance of ancillary facilities such as store, yard, site office																					
Inspection of transmission lines																					L
Security of solar power plant in operation																		P			L
Operation of solar power plant/panel cleaning								H			L							P			L

	PHYSICAL ENVIRONMENT									BIOLOGICAL ENVIRONMENT						SOCIO-ECONOMIC ENVIRONMENT					
	Aesthetics and Visual impacts	Air Quality	Noise Quality	Top soil removal / Soil Quality	Land Use	Local Drainage & Physiography	Surface water quality	Groundwater Resources	Ground water quality	Terrestrial habitat	Ecological Sensitive Areas	Aquatic Habitat and resources	Migratory Birds/ Avifauna	Agriculture	Domesticated Animals	Loss of land and livelihood	Common Property Usage	Local Job and Economic Opportunity	Cultural and Behavioral Conflict	Community Health and Safety	Occupational Health and Safety
Transmission line electrocution/collision								H					H								
C. Decommissioning Phase																					
Access roads and other components	L	M	L																		
Disconnecting and removal of Inverter Stations,	P			P	M																
Loss of Jobs																		M	M	M	

L: Low Impact

M: Moderate impact

H: High Impact

P: Positive Impact

N: No Impact

5.2 Impacts on Physical Environment

5.2.1 Air Quality

Construction activities

In construction phase, various project components such as site preparation, transmission cable laying, switchgear, approach roads, internal road network and porta cabin construction will require land clearing, levelling, excavation, grading activities, vehicle movement and DG set operation. This results in an increased level of dust and particulate matter emissions, which in turn will directly and temporarily impact ambient air quality. If improperly managed, there is a risk of nuisance and health effects to construction workers onsite and to a lesser extent to nearby receptors from windblown dust (on the access road) due to transportation of raw materials. However, most of these project activities are expected to be restricted within the project boundary. Further, the movement of vehicles carrying raw materials on unpaved area within the project site and on access road causes fugitive dust emission and may extend to surrounding of project site like nearest settlements. Hence, the distribution of impact can be considered medium, duration of impact is short an intensity of the impact as medium. Since the impact is widespread, but for short duration and of low intensity, the impact can be termed of a **Moderate significance**. But the impact is reversible, and temporary in nature, if the following mitigation measures are adopted.

Construction Mitigation measures

- Vehicle speed to be restricted to 20-30 km/hr on unpaved road.
- Raw material & fine materials like sand should be covered with tarpaulin sheet during transportation and in storage area.
- Ensure water sprinkling (tanker water from authorised vendors) on unpaved area to minimize the dust emission
- All the project vehicles shall have PUC.
- Ensure regular maintenance of project vehicles during construction and operational phase.
- Turn off the machineries when not in use.
- All *project* vehicles will comply with national emission standards
- Provide regular maintenance of vehicles in accordance with manufacturer specifications
- Turn off the DG sets & machineries which are not in use.
- DG sets preferably should be placed away from settlement area.
- It will be ensured that exhaust emissions of construction equipment adhere to emission norms as set out by MoEF&CC/ CPCB.
- Stabilize disturbed areas as soon as possible after construction with vegetation or other materials
- Provide dust control at crushing and crushing plants (if crusher is established in the project site)

Operation activities

During operation phase, there would be minimal vehicular movement of about 1-2 nos. project vehicles/day for O&M purpose. Since major source of emission into the ambient air will be absent during the operational phase therefore impact can be termed as insignificant.

Operational mitigation measures

- Revegetation to bind the soil & minimise particulates

- Vehicle speed to be restricted to 20-30 km/hr on unpaved road.
- All the project vehicles shall have PUC.
- Ensure regular maintenance of project vehicles during construction and operational phase.
- Turn off the machineries when not in use.
- All *project* vehicles will comply with national emission standards
- Provide regular maintenance of vehicles in accordance with manufacturer specifications

5.2.2 Soil quality

Construction activities

These impacts are associated with the project activities such as piling of module mounting structure and storage of diesel, spent oil or transformer oil. Disposal of broken PV panels and operation of septic tank. Septic tank will be considered for the plant.

During construction phase, loose topsoil is generated due to excavation on project site due to site levelling for erection of module structures towers and access roads. The impact anticipated here is loss of topsoil because of inappropriate storage. However, these activities and associated impacts are limited to be within the project boundary and during construction phase only. Considering the activities limited within the site, short duration of construction phase and low intensity, significance of impact is evaluated as ***Low***. Soil contamination may result due to accidental spillage and inappropriate storage of diesel or used oil during construction phase. Improper handling of broken solar modules may also lead to soil contamination. However, distribution of impact within the project boundary and short duration of construction phase with low intensity makes impact of ***Low*** significance and can be controlled with the recommended mitigation measures:

Construction Mitigation measures

- Provide appropriate storage of topsoil in an isolated and covered area to prevent its loss in high solar and runoff.
- Allow only covered transportation of topsoil within the project site.
- Topsoil to be given to nearby agricultural field after taking consent of the landowners/farmers.
- Store hazardous material like diesel and used oil in isolated room and on impervious surface to prevent seepage into project site soil.
- Filling and transfer of oil to and from the container shall be on impervious surface.
- Care should be taken with regard to possible changes in soil quality due to human activities, such as disposal of waste material and domestic effluents on soil of the surrounding area.
- Broken Solar panels will be stored at a designated area on paved surface within the plant with appropriate safety measures until the same is disposed of to the manufacturer/authorized dealer.
- Septic tanks are to be emptied and collected by contractor at appropriate intervals to avoid overflowing.
- The sewage generated onsite shall be treated and disposed through septic tanks and soak pits as per specifications given in IS 2470: 1995 (Part I and II)
- Re-vegetation shall be done in the area after the completion of construction, in order to reduce the risk of soil erosion.

Operational activities

During operational phase, project activities such as excavation and usage of chemicals such as diesel and spent oil will be absent except chances of accidental release of used oil from transformer, therefore impact associated with these activities such as topsoil loss and soil contamination are minimal. Impact can be considered as insignificant. Improper handling of broken / damaged solar modules may also lead to soil contamination.

Operational mitigation measures

- Broken Solar panels will be stored at a designated area on paved surface within the plant with appropriate safety measures until the same is disposed off to the manufacturer/authorized dealer.
- Septic tanks are to be emptied and collected by contractor at appropriate intervals to avoid overflowing.
- The sewage generated onsite shall be treated and disposed through septic tanks and soak pits as per specifications given in IS 2470: 1995 (Part I and II)

5.2.3 Noise Quality

The environmental impact anticipated in the project is the increment in ambient noise level due to various project activities.

Construction activities

The major noise generating sources in the project are vehicular traffic, and construction equipment like dozer, scrapers, concrete mixers, generators, pumps, compressors, rock drills, pneumatic tools, and vibrators. The project site is located amongst barren fields with no continuous noise generating sources in the vicinity of the project site. Assuming, the operation of these equipments is expected to generate noise in the range of 75 – 90 dB (A) and it can be lowered down from 90 dB(A) to 47 dB(A).

Construction Mitigation Measures

- Regular maintenance of machinery equipment & vehicles in accordance with manufacturers specifications
- Integral noise shielding to be used where practicable and fixed noise sources to be acoustically treated, for example with silencers, acoustic louvers and enclosures.
- Use DG set with acoustic enclosure.
- Restrict major noise generating activities during nighttime 10:00 pm to 6:00 am
- Provide personal protective equipment (e.g., Earmuffs) to all workers wherever noise is generated due to machinery operation.
- Procure low noise generating compressors and diesel generating sets/ DG sets should be placed in acoustic enclosure.
- Restrict use of horn near school and residential areas by placing signage
- Avoid construction during LF mating season

Operational actvities:

Any significant noise generating activity during operation of solar power plant is absent therefore impact in terms of increment in ambient noise level is not anticipated during the operational phase of the project.

5.2.4 Water Quality

Construction activities

The solar plant during construction is expected to generate sanitary wastewater, or stormwater.

Improper disposal of wastewater may pollute surface water & land. Considering the extent of impact outside of project boundary and low intensity, impact is considered as minor significance and following mitigation measures are suggested to implement:

Construction Mitigation Measures:

- Sanitary wastewater (with domestic sewage) will be discharged to septic tank, will be collected at intervals, to be arranged by contractor (also discussed under soil impact). Septic tank capacity is proposed to be 5000 lts, proposed to be emptied twice a month.
- Oil water separators and grease traps should be installed and maintained as appropriate at refueling facilities, workshops, parking areas, fuel storage and containment areas

Operation Activities

The solar plant in operation phase will generate mainly wastewater from utility operations or stormwater & some sanitary wastewater. Since dry/robotic cleaning will be used, wastewater will be much less.

Operation Mitigation measures

- Sanitary wastewater (with domestic sewage) will be discharged to septic tank, will be collected at intervals, to be arranged by contractor (also discussed under soil impact). Septic tank capacity is proposed to be 5000 lts, proposed to be emptied twice a month.

5.2.5 Water Resources

Construction activities

Project is required to estimate quantity of water required for civil works during construction stage. The water requirement will be met through tankers supplied by authorized contractors. EPC contractor will analyze the quantity of water required, AEW will test the water & approve, EPC contractor would buy water from licensed contractor as per contract. Water requirement for office areas, potable water required will also be quantified by EPC contractor & approved by AEW.

Considering the limited distribution of impact (within the site), short duration of activities and low intensity, significance of impact is assessed as **Moderate.**

Construction Mitigation Measures:

- 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 water from water supply tankers is necessary for efficient utilisation of water

- Periodic monitoring shall be carried out to ensure that the wastewater is not finding its way into ground or surface water.
- Conserve water at all project locations and ancillary facilities and if possible, recycle and reuse water utilizing every opportunity.
- Wastewater holding tanks / septic tank to be located at more than 500 m away from bore wells (if any)

Operational activity

As confirmed by AEWIWOPL, it is proposed use of 100% robotic dry-cleaning system for cleaning of solar panels which will reduce the water requirement of the project. If required, tanker water from authorised sources will be used on site. Water requirement for domestic use during operation phase considering 25 employees and workers will be ~ 1.25 KLD @50 lpcd each). Packaged water will be purchased for drinking purpose.

Mitigation Measures:

- AEW proposed to install robotic cleaning technique for cleaning of solar PV panels. This will significantly reduce water consumption during operation phase
- Ensure optimal usage of water viz., storage and reuse of wash water after module washing.
- Water to be used from authorised vendors, potable – packaged water for staff & workers.

5.2.6 Waste including Hazardous Waste

Construction activities:

Solid waste during the construction phase consists primarily of scrapped building materials, excess concrete and cement, excavated material, rejected components and materials, packing materials (pallets, crates, plastics etc.) and human waste. As consulted with representative of AEWIWOPL, the broken solar panels will be properly packed and will be sent back to manufacturer. A small proportion of the waste generated during construction phase will be hazardous and may include used oil, hydraulic fluids, waste fuel, grease and waste oil containing rags. If improperly managed, solid and hazardous waste could create negative impacts on land. Additionally, soil contamination during the construction phase may result from leaks and spills of oil, lubricants, or fuel from heavy equipment, improper handling of chemical/fuel storage and wastewater. Such spills could have a long-term impact on soil quality. Therefore, the receptor sensitivity and impact magnitude are assessed as medium. However, taking into consideration the impact within site, short duration and moderate intensity, the impact is considered as **Low.**

The project has prepared a Waste Management Plan (refer Annexure R) which will be followed during construction & operational phase. However, key mitigations are discussed below.

Construction Mitigation Measures

Following are the key mitigation measures identified for the project

- Distribute appropriate number of properly contained litter bins and containers properly marked as "Domestic & Hazardous Waste".
- All bio-degradable including kitchen waste to be put into humus pit, which can be covered with soil for composting.

- Ensure hazardous waste containers are properly labelled and stored onsite provided with impervious surface, shed and secondary containment system and disposed GPCB authorized vendors/recyclers.
- It is to be ensured that hazardous waste is not stored for more than 90 days
- Construction contractor will ensure that no unauthorized dumping of used oil undertaken.
- The construction contractor should ensure collection and timely disposal of construction waste generated debris, concrete, metal cuttings wastes as per the Construction and Demolition Waste Management Rules 2016;
- Transportation vehicles and equipment should undergo regular maintenance to avoid any oil leakage;
- Use of spill control kits to clean minor spills and leaks and workers trained to prevent/contain spills and leaks during unloading and loading for diesel, oil and used oil.
- Labourers will be given training towards proactive use of designated areas/bins for waste disposal and use of toilets. Open defecation and random disposal of sewage will be strictly restricted.
- Municipal domestic waste generated at site to be segregated onsite and ensure proper collection and handover to local municipal body/ local authority for further disposal;
- Workers will be strictly instructed against random disposal of any waste generated from the construction activity;
- Ensure contractual obligation that necessitates broken solar panels being accepted by manufacturer.
- Use a 2-bin system so that food waste and recyclables viz. paper, plastic, glass, scrap metal waste etc. are segregated and stored in designated waste bins/ containers. The recyclables should be periodically sold to local recyclers while food waste will be disposed through waste handling agency.

Operation activities:

During operation phase, the waste generated from project will include domestic solid wastes at SCADA office building and substation and hazardous wastes like waste oil from DG sets and transformers, and oil containing jutes and rags. The quantity of hazardous waste generated will be less than construction stage. Therefore, the receptor sensitivity and impact magnitude is assessed as low and small respectively.

Operation Mitigation Measures

- AEWIWOPL will follow the Gazette notification (no 158 MARCH 5, 2019) of Hazardous and Other Wastes (Management and Transboundary Movement) Amendment, Rules, 2019.
- Use a 2-bin system so that food waste and recyclables viz. paper, plastic, glass, scrap metal waste etc. are segregated and stored in designated waste bins/ containers. The recyclables should be periodically sold to local recyclers while food waste will be disposed through govt. approved waste handling agency.
- Ensure broken solar panels are properly & safely packed and sent back to manufacturer or should be sent back to the authorized vendor for safe disposal.The rejected modules shall be kept by AEWIWOPL and will be required to be taken back by the manufacturer from AEWIWOPL project site within 30 days from the date of intimation. However, in case the manufacturer does not comply,

AEWIWOPL will then make appropriate arrangement with an authorized vendor for safe disposal of the modules.

- The hazardous waste (such as transformer waste oil & bottom sludge) generated will be disposed through GPCB/CPCB approved vendors in accordance with Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016, as amended. The hazardous wastes will be stored onsite at separate designated covered area provided with impervious flooring and oil spill control kit will be used for cleaning small spills and leaks.

5.2.7 Ecology

Construction activities

Project construction involves land clearance, levelling, excavation and erection of towers causing loss of vegetation (like trees, shrubs, ground flora, etc.). The clearance of vegetation will be restricted to the project site. Minimal clearing of vegetation may also be required for transmission line. Transportation of construction equipment and construction activities is also likely to disturb faunal species. Human activity may also result in species avoiding the area.

The proposed solar power plant site is located on agricultural land, predominantly cotton and sorghum with adjacent patches of grassland. The ground cover occupied by grasses/ sedges and other shrubs/ herbs are mostly seasonal. The project site (footprint area) constitutes only 1.77% of the total AOI. About 95.58% of the project footprint area constitutes croplands and grasslands which is about 1.3% of the AOI. Thus, 1.3% of lekking space is being taken up by the project. If the time schedule of project execution is done as recommended, the project should have minimum impact on the LF.

The proposed solar power plant will result in habitat loss for resident species. There may also be a shift in small mammal and reptiles during construction. Temporarily, they may abandon the project activity area during the construction period and migrate to nearby areas. The associated impacts are anticipated to be minor and for short duration. However, with adequate implementation of suggested mitigation the impact can be reduced to low.

Habitat loss due to land clearance and human disturbance is particularly critical for the Lesser Florican. To minimize the loss of habitat for breeding, the Project has redesigned the panel layout, and agreed to underground the transmission line in the vicinity of the sightings. Panels will be directed and angled at 14°, south direction, to avoid lake effect and reflection disturbing species flying to the south of the Project area (in the grassland). Use of the village road that intercepts the grassland area will not be utilized for delivery of materials during breeding season. Project construction activities will, to the extent possible, also avoid breeding season. Mitigation measures will reduce impacts to medium.

Construction mitigation measures

The following measures should be considered to mitigate the impact during construction phase due to the project:

- Transmission line route to avoid habitat/sighting location of LF
- Layout of panels to avoid habitat of LF
- Timing of TL construction activities, including use of village road intercepting LF breeding area, to be avoided during breeding season
- Regular monitoring of the patch where the Lesser Florican was sighted, every year in the lekking season.
- Installation work to be avoided in lekking season

- Angle and direction of panels to avoid lake effect (14°, south direction)
- All project activities shall be undertaken with appropriate noise mitigation measures to avoid disturbance to faunal population in the region.
- Activities generating high noise shall be restricted to day time and will be mitigated to minimize the noise level outside the site boundary.
- Movement of construction and transport vehicles shall be restricted to dedicated paths to minimize any harm to small mammals within the site.
- Transportation of construction material shall be restricted to day time hours to minimize noise and disturbance to fauna in the area.
- General awareness regarding wildlife shall be enhanced through trainings, posters, etc. among the staff and labourers.
- No food waste will be disposed/littered in and around project site so that that it does not attract wild animals.
- Strict prohibition shall be implemented on trapping, hunting or injuring wildlife within subcontractors and shall bring a penalty clause under contractual agreements.
- Camp and kitchen waste shall be collected in a manner that it does not attract wild animals.
- Temporary barriers shall be installed on excavated areas.
- The footprints of the construction activities shall be kept to minimum to reduce disturbance to flora and fauna.
- Laying of transmission lines towards Plant side substation not to be in Lesser Florican breeding season.
- AEWIWOPL will require all contractors to adhere to the Indian National and World Bank Group environmental, health and safety regulations, policies and guidelines including compliance with a prohibition on the felling of trees for meeting fuel wood requirements (as part of their contract)
- Labour contracts will contain conditions to ensure that illegal felling is not done by the contract labour.
- AEWIWOPL' has to ensure provisions for use of kerosene oil or LPG as the primary fuel by the labour.
- Use of fuel wood as secondary option. This will be sourced from the State Forest Department and records of procurement and distribution for use will be maintained by the contractor.

A Biodiversity Action Plan will be developed with enhanced mitigation measures as outlined above.

Operational activities

Impacts during operation phase are likely to be restricted to the maintenance activities within the project site like ground cover clearing under PV arrays and from internal road network within site. Apart from a relatively small direct loss of habitat, the shading of the soil by the solar panels is likely to impact reptile composition in these areas, as the shading is likely to alter soil temperatures which has direct implications for cold-blooded animals. Most reptiles are also sensitive to the amount of plant cover which is also likely to be affected by the arrays.

There is potential for avian distraction due to glare/reflection from solar panels. PV solar energy facilities appear to be an “evolutionary trap” for birds who perceive them to be bodies of water on which they attempt to land. Insects, the prey of insectivorous birds, are also apparently attracted by this so-called “Lake Effect.” It might cause fatality or injury as birds contact the hard-solar panels or surrounding ground as they attempt to land mistaking it for water (Upton, 2014). Directing and angling of panels has been considered to avoid this impact to the extent possible. Collision & electrocution of avifauna is another impact on avifauna which is discussed below.

Collision Risk

The risk of collision with power lines represents an important and increasing concern worldwide and cause avian mortality (Smidt et al 2019; Manville 2005; Rioux et al 2013). Collisions with power lines are studied and confirmed cause of bird mortality in many countries (Alonso& Alonso 1999, Rubolini et al. 2005, Derouaux et al. 2012, Gáliset al. 2016, Bernardino et al. 2018) and may have fundamental negative impact on endangered and reduced populations on the local level (Crowder 2000, Drewitt & Langston 2008, Shaw et al. 2010, Raab et al. 2012).

A range of factors influence the risk of bird mortality:

1. Species-specific morphology and biology; birds with larger body sizes and high wing span, birds flying in flocks and/or in low light, birds with limited visual capacity, birds distracted while engaged in hunting/breeding behaviours, younger and more inexperienced birds and migrants not familiar with the landscape may all be at increased collision risk.
2. Landscape and topography, e.g. siting power lines near or crossing important areas or flyways used by birds may increase collision risk. Geographical conditions of the site influencing the resulting degree of risk of collision are above all the character and composition of the landscape. Open, flat land with low vegetation enables birds to fly low and close to the terrain, seeking out sources of food and resting places. As a result, they may tend to have reduced levels of concentration on potential obstacles such as electric power lines.
3. Weather, e.g. strong winds, fog, or heavy rain may force birds to lower their normal flight heights, affect flight control and reduce visibility and therefore reduce ability to avoid collisions.
4. Technical aspects, e.g. spacing of conductors (the current-carrying wires) and the availability of perches affect electrocution risk. Earth wires (sometimes called the static or ground wires, which protect the power line from lightning strikes) are thought to be responsible for a much higher rate of collisions than the thicker, often bundled conductor wires. This is because they are harder for birds to see and are typically positioned at the top of the wire array, putting them in the flight path of birds which have taken avoiding action to fly over the conductors.

Vantage point (VP) watches are a means of quantifying, for bird species of conservation importance, flight activity that takes place within the wind farm envelope, with the principal aim of determining the likely collision risk (Scottish Natural Heritage Guidelines 2009). From data gathered in the rapid bird survey, 68 species of resident and migratory birds were recorded from vantage point surveys covering the study area (combined data from both surveys), amongst which 14 species are at a high risk of collision and electrocution (High flying and soaring) with transmission lines. Other than the birds recorded during VP the birds that are recorded during line transects, point counts and during survey that are at a high risk of collision with transmission line are Shikra, Osprey, Red-naped Ibis, Painted Stork, Black-headed Ibis, Montagu’s Harrier and Lesser Whistling Duck.

Table 5-3: Species recorded from vantage points that are at high risk of collision

S.N.	Species	Abundance
1	Black-headed Ibis	3
2	Black-winged kite	4
3	Booted Eagle	1
4	Common Kestrel	1
5	Eurasian Marsh Harrier	4
6	Eurasian Spoonbill	1
7	Glossy Ibis	3
8	Hen Harrier	1
9	Indian Spot-billed Duck	2
10	Knob-billed Duck	2
11	Lesser Florican	1
12	Oriental Honey Buzzard	2
13	Short-toed Snake Eagle	1
14	White-eyed Buzzard	1

The group most susceptible to collisions and therefore at greatest risk are the large, heavy bird species (Janss 2000, Janss & Ferrer 2000, Rubolinietal. 2005, APLIC 2012, Barrientos et al. 2012) and certain specific orders of birds, e.g. Anseriformes, Ciconiiformes, Gaviiformes and Pelecaniformes (Bevanger 1998). The biometry of birds recorded in the field survey that are at a high risk of collision with transmission line are given in Table 5-4.

Power lines located between feeding and roosting areas of flocking birds may present an increased collision risk. Birds recorded from the study area during the field survey that fly in groups and are at a high risk of collision with transmission line are Chestnut-bellied Sandgrouse, Egrets, Swallows and Martins and Cormorants.

Installation of visual markers, use of bird guards and bird spikes in the transmission line has proven effective in deterring/diverting birds away from the transmission lines (Le et al. 2009; Slater and Smith 2010; Tracy et al 2012) and are recommended for the project.

Table 5-4: Bird Biometric for Collision Risk Assessment

Species	Length of bird (m)	Wing Span (m)	Flight Height (m)
Lesser Florican	0.5	0.35	8
Black-winged Kite	0.33	0.83	15
Common Kestrel	0.36	0.69	18
Indian Spotted Eagle	0.6	1.5	300
Short-toed Snake Eagle	0.66	1.9	100
White-eyed Buzzard	0.4	0.93	75
Oriental Honey Buzzard	0.6	1.35	120

Eurasian Marsh Harrier	0.48	1.25	75
Hen Harrier	0.45	1.125	75
Booted Eagle	0.49	1.255	300
Montagu's Harrier	0.45	1.125	100
Osprey	0.55	1.5	150
Shikra	0.36	0.69	50
Knob-billed Duck	0.66	1.32	125
Indian Spot-billed Duck	0.6	0.9	100
Lesser Whistling Duck	0.42	0.84	100
Glossy Ibis	0.6	1.15	120
Red-naped Ibis	0.68	1.15	100
Black-headed Ibis	0.75	1.2	150
Painted Stork	0.965	1.6	225
Eurasian Spoonbill	0.83	1.25	200

Physical features of a place such as a big tree plays a big role in bird flight, visibility and movement and therefore is an important factor in collision. Birds have a general tendency to look downwards, and thus for certain species the space ahead of them becomes 'blind zone' (Martin & Shaw 2010, Martin 2011). Tall tree growth that they use as perch in the vicinity of power lines may alert such birds to the potential obstacle (Bevanger & Broseth 2004, APLIC 2012). Based on a review during VP, PC and LTs, as outlined in Table 5-5, there are few trees of sufficient height to provide such alert.

Table 5-5: Big Trees near Vantage Points, Point Counts and Line Transects

Trees	Average height (m)	Family	Kataria village (VP 1 and LT 1)	Jakhan village(LT 03)	Trees beside Bhalgamda village waterbody (PC 03)
White Babool (Leucaena leucocephala)	3.5	Fabaceae	√		√
Copperpod Tree (Peltophorum pterocarpum)	4	Fabaceae	√	√	√
Shisham, North Indian rosewood (Dalbergia sissoo)	5.5	Fabaceae	√		
Gum Arabic Tree (Vachellia nilotica)	4.5	Fabaceae	√		√
Rain Tree (Samanea saman)	7	Fabaceae			√
Pongame Oiltree (Millettia pinnata)	3	Fabaceae			
Flame-of-the-forest (Butea monosperma)	6	Fabaceae		√	
Eucalyptus (Eucalyptus sp.)	5	Myrtaceae	√		
Algaroba (Prosopis juliflora)	3	Mimosaceae	√		
Siris Tree, Woman's Tongue (Albizia lebbeck)	6	Mimosaceae	√		
Neem (Azadirachta indica)	5.5	Meliaceae	√	√	√
Banyan Tree (Ficus benghalensis)	2	Moraceae	√		√

Cluster Fig (Ficus glomerata)	4.5	Moraceae		√
Sacred Fig (Ficus religiosa)	5	Moraceae	√	

Overhead power lines pose the biggest direct threat to birds (BHNS Report, 2015). Collisions most often occur with the overhead static wire, which may be less visible than energized conductors due to its smaller diameter. Power line spans in collision risk areas may be marked to make the wires more visible to flying birds. Installation of visual markers, use of bird guards and bird spikes in the transmission line has proven effective in deterring/diverting birds away from the transmission lines. Such diverters will be installed on the entire length of transmission line between the PSS and GSS.

Electrocution

Avian electrocution occurs when a bird's wingspan completes a circuit between energized and/or grounded structures, conductors, hardware, or equipment (Avian Power Line Interaction Committee 2006).

Erection of electrified towers could pose electrocution risks to certain bird species particularly those that perch on them. Raptor species reported in the project area tend to roost by perching on electric poles and are at higher risk of electrocution as they have larger body sizes and wing spans. The baseline status of the birds clearly suggests that four Schedule-I species of birds were observed in the study area - Indian Peafowl (*Pavo cristatus*), Eurasian Spoonbill (*Platalea leucorodia*), Osprey (*Pandion haliaetus*) and Lesser Florican (*Sypheotides indicus*). As per IUCN red data book, Lesser Florican (*Sypheotides indicus*) is Critically endangered. Following table illustrates the bird biometry of species in context of electrocution risk.

Table 5-6: Bird Biometric for Electrocution risk

Species	Length of bird (m)	Wing Span (m)	Flight Height (m)	Conservation status
Lesser Florican	0.5	0.35	8	Critically Endangered (CR)
Black-winged Kite	0.33	0.83	15	Least concern (LC)
Common Kestrel	0.36	0.69	18	Least concern
Indian Spotted Eagle	0.6	1.5	300	Vulnerable (VU)
Short-toed Snake Eagle	0.66	1.9	100	Least concern
White-eyed Buzzard	0.4	0.93	75	Least concern
Oriental Honey Buzzard	0.6	1.35	120	Least concern
Eurasian Marsh Harrier	0.48	1.25	75	Least concern
Hen Harrier	0.45	1.125	75	Least concern
Booted Eagle	0.49	1.255	300	Least concern
Montagu's Harrier	0.45	1.125	100	Least concern
Osprey	0.55	1.5	150	Least concern
Shikra	0.36	0.69	50	Least concern
Knob-billed Duck	0.66	1.32	125	Least concern
Indian Spot-billed Duck	0.6	0.9	100	Least concern
Lesser Whistling Duck	0.42	0.84	100	Least concern
Glossy Ibis	0.6	1.15	120	Least concern

Red-naped Ibis	0.68	1.15	100	Least concern
Black-headed Ibis	0.75	1.2	150	Near Threatened (NT)
Painted Stork	0.965	1.6	225	Near Threatened
Eurasian Spoonbill	0.83	1.25	200	Least concern

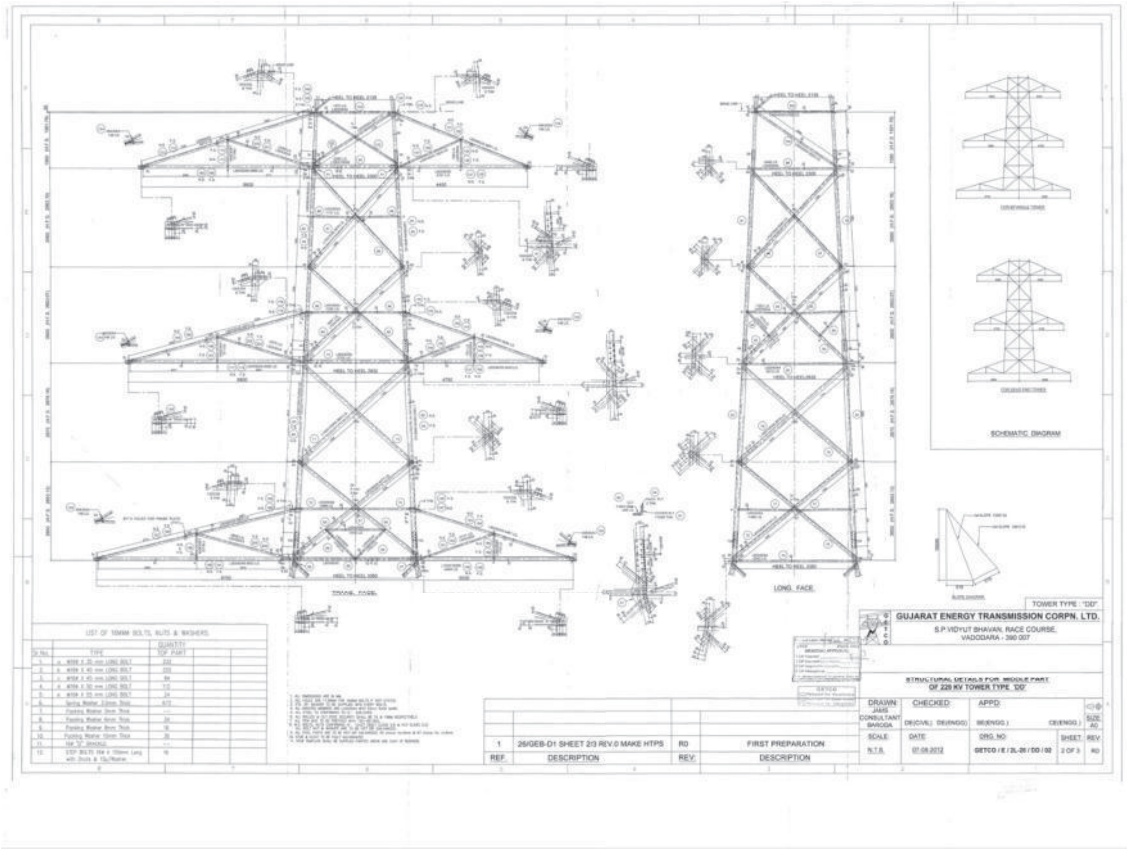
The Government of India is Signatory to the Convention on Conservation of Migratory Wild Animals (CMS) since 1983. The CMS aims to conserve terrestrial, aquatic and avian migratory species throughout their range. It is an intergovernmental treaty, concluded under the aegis of the United Nations Environment Programme (UNEP), concerned with the conservation of wildlife and habitats on a global scale. India also signed the Convention on Migratory Species (CMS) Memorandum of Understanding on the Conservation of Migratory Birds of Prey in Africa and Eurasia (Raptors MoU) which entered into effect in the country on 1 April 2016. Signatories to the Raptors MOU commit to adopting and implementing measures to conserve migratory birds of prey and their habitats, for example, by: (i) providing a legal framework to protect migratory species and a network of habitats and sites along their flyways; (ii) identifying important habitats, congregation sites and favoured routes; (iii) supporting relevant research and monitoring of populations, sharing results internationally; and (iv) developing cooperative international projects and initiatives to promote effective conservation efforts.

At the 13th CMS Conference of the Parties (COP) in 2020, Resolution 10.11 “Power Lines and Migratory Birds” was adopted. This is the latest of a number of COP resolutions, recommendations and position statements and urges Parties to implement Guidelines on How to Avoid or Mitigate Impact of Electricity Power Grids on Migratory Birds in the African-Eurasian region (the Guidelines). The Guidelines offer various technical and legislative approaches for avoiding or mitigating the impact of electrocution and collision of migratory birds across the African-Eurasian region as well as suggestions for assessing and monitoring the effectiveness of mitigation and preventive measures. Relevant to the current assessment, the Guidelines contain recommendations to mitigate electrocution risks from power lines through: (i) increasing separation between energized and grounded components larger than the wrist-to-wrist or head-to-foot distance of a bird; (ii) insulating energised parts and/or using suspended insulators; and (iii) applying perch management techniques. Resolution 10.11 notes that the recommendations in Resolution 7.4 “Suggested Practices for Bird Protection on Power Lines” remain valid.

It is understood that TL towers shall have 220 kV AL 59 conductor and each tower shall have porcelain insulator and connection at each tower point shall be through jumper conductor.

In the design of the transmission tower, the insulator will be between the Tower and Live Conductor as per Indian Electricity Rule (IE rule) and Directorate of Electrical Safety-Chief Electrical Inspector to Government Standard (CEIG standard) and there will be a wide gap between the Live conductor and Earth that is TL Tower. The horizontal separation distance between energized components (conductor) from the transmission tower is approx. 5.15 m. Further, the vertical separation distance between 2 conductors of transmission line is approx. 5.32 m. The design follows the generic/standard design for such towers in India which is approved by statutory authorities. AEW will not be able to amend the design of the transmission line in any way. Design of the transmission tower is provided below. Also, proper Porcelain Insulators being used in 220KV circuit with proper creepage minimizes risks associated with electrocution based on the separation between energized and grounded components. It is also confirmed that there are no oil filled electrical equipment envisaged to be used in the transmission line and the Equipment suppliers have confirmed that the oil filled electrical equipment (including transformers) to be utilized in the subsation will not contain polychlorinated biphenyls.

Figure 5-1: Design Drawing of Transmission Line Tower



Noting the species of conservation status in Table 5-6 above, none of the species will have potential risk of electrocution as their wingspan is less than the distance between energized & grounded components (as per design of the TL tower).

As noted above, IE and CEIG standard of design is followed, with AEW having limited ability to modify the design. A monitoring program which includes weekly carcass counts along the TL will be implemented for the first 2 years of operations to confirm if other adaptive mitigation may be required.

Cumulative impacts

There are five existing transmission lines within 1.5 to 2.5 kms in south and west of the patch where Lesser Florican was sighted (depicted in Table & figure below). All these are leading to fragmentation of the air space and have a cumulative impact on species migrating through or using the area for breeding, feeding or nesting.

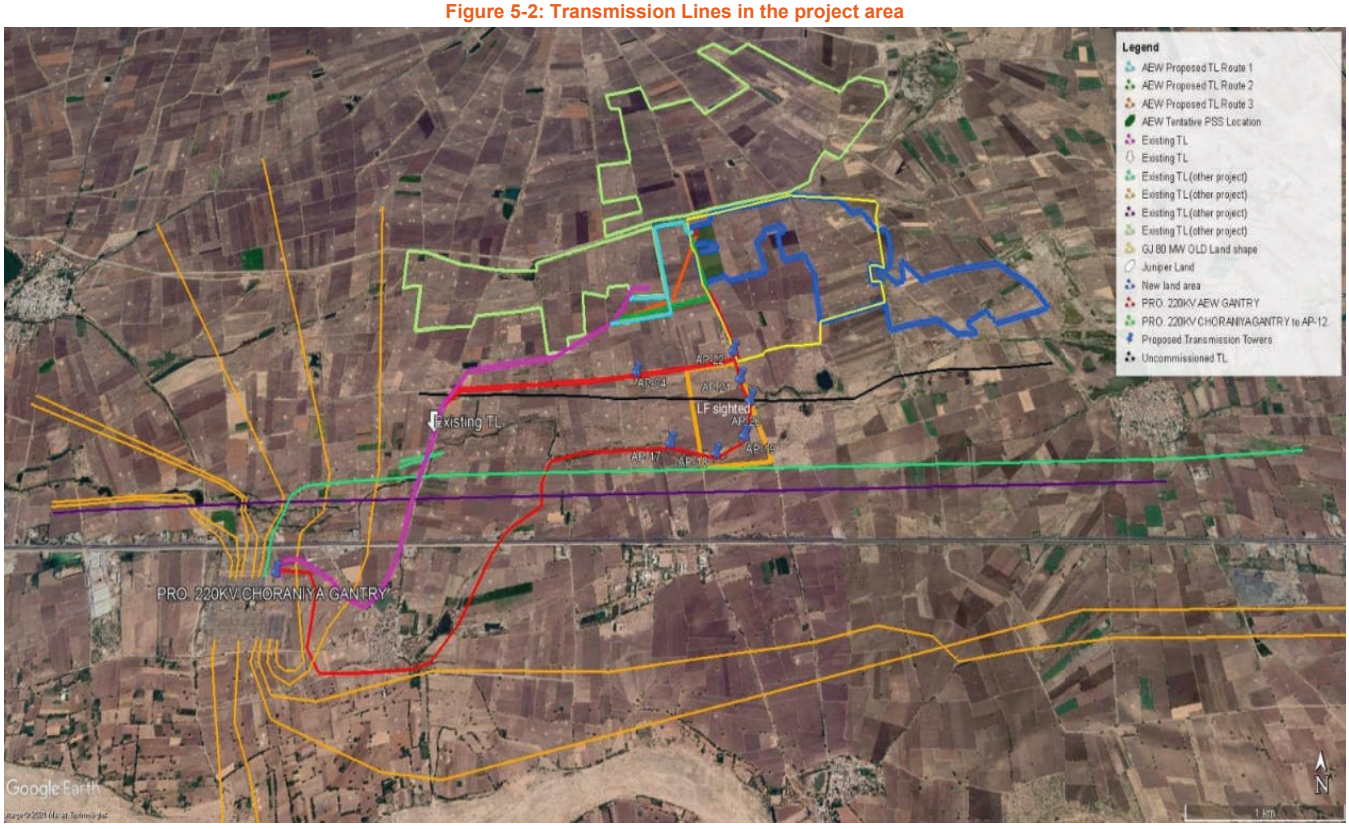
Table 5-7: Transmission lines in the wider area

Existing TL	Company	Type of TL	Distance from LF sighting patch
North of LF sighting	Juniper	Double circuit 220 Kv, 24m height	980 m
South of LF sighting	Chorania Gantry	Double circuit 220 Kv, 24m height	50 m
South of LF sighting	Chorania Gantry	Double circuit 220 Kv, 24m height	190 m
TL not yet commissioned but poles are casted	Getco	Double circuit 220 Kv, 24m height	Through the patch where LF was spotted

Proposed Line 3 (Alternative route proposed)		Double circuit 220 Kv, 24m height	150 m in North
Proposed Line 2 (Alternative routes proposed)		Double circuit 220 Kv, 24m height	150 m in North
Proposed Line 1 (Alternative routes proposed)		Double circuit 220 Kv, 24m height	180 m South

During operation, the physical presence and electricity transported by the project will represent a potential source of impact on avian species. Considering the number of existing and proposed transmission lines, the project poses a discernible but minimal incremental increase in the magnitude and significance of impacts from the transmission lines for migratory and water birds. To minimize this incremental impact, AEW will install bird diverters and underground part of the transmission line.

Figure 5-2: Transmission Lines in the project area



Operational mitigation measures

- Bird diverters are required on all capacity lines and the project is required to install them on the full length from PSS to GSS.
- Ensure adequate distance (5.15mts) between grounded and energized components to avoid electrocution of birds.
- Monitor bird mortality due to electrocution and collision with powerlines, poles, transformers, switchyards, fencing etc.
- Person involved in monitoring shall walk or drive all along the powerline and record if any bird electrocution or collision occurred or any other animal mortality has occurred.
- Evidence of feathers, bones, carcasses etc. lying under the transmission line or towers shall be considered as mortality.
- Mortality shall be recorded with place (pole number), date, time, photograph (taken from various angles).
- Vegetation clearing through brush cutting for maintenance activities shall be done manually wherever possible.
- Any cleared areas which do not have some vegetation cover to protect the soil shall be re-vegetated with locally occurring species and monitored to ensure recovery is taking place.
- Vegetation that needs to be reduced in height shall be mowed or brush-cut to an acceptable height, and not to ground level except where necessary.
- General awareness regarding wildlife shall be enhanced through trainings, posters, etc. among the staff and labourers.
- Sites must be fenced to keep large ungulates and carnivores out of the area. This will reduce wildlife damage to facilities and will aid in avian mortality surveys.
- Solar panels shall have an anti-reflective coating to minimize the light reflecting off of the panels so that there is very less impact due to glare from the panels.
- Direction and angle of the panels are fixed at 14°, south direction to minimize glare.
- Any dead animals/carcass shall be removed in time from the site so that it does not attract movement of raptors
- Training of local staff and security guards for spotting of bird carcass and reporting the same. This will help to ensure the strategic actions when the species are spotted in the region.
- Regular monitoring of the patch where the Lesser Florican was sighted. Weekly Carcass count monitoring is to be undertaken along the TL for the first 2 years of operation.

Impact on KBA, Protected areas around project site:

The Bhal area is the closest, about 15 km from project site. However, the project site being only 346 acres covering no prominent grasslands, the project poses low risk to the Lesser Florican. There is a high probability of the Lesser Florican population from Velavadar National Park, locally migrating to the other areas of the Bhal region in general and to the nearby grassland patches of the KBA.

5.2.8 Socio-economic Impact

Key Social Impacts

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

(A) Loss of Land/ Livelihood Conflict

Construction Phase:

Private land in the project impacted area is predominantly used for agriculture. Large portion of the land remains dry in most part of the year. Land leasing will not result in any physical displacement, the land sourced for developing the project is unirrigated rainfed agriculture land. As discussed in the earlier subsection, agriculture is not extensivedue to lack of irrigation. And as reported by during the consultation with the landowners, average earning of a good season from their land parcel leased for

project was INR. 8000-12,000 /acre /annum. And by leasing the land to the project the landowners were able to make assured income through yearly lease rental of INR. 33,500/Acre/Annum for 29 years & 6 Months with 5 % escalation for every three years. The agriculture workers reported to have reduced agriculture activities due to the development of solar project are not primarily dependent on the piece of project site land. Moreover, the project will generate number of direct and indirect employment opportunities in the neighboring villages both during construction and operation phase, the work includes various construction works during the construction phase and during operation phase like grass cutting, module cleaning, panel tilting works, deployment of security staffs etc. With respect to proposed transmission line, Right of way and payment of compensation will be decided following due criteria as per the Guidelines issued by Ministy of Power on Right of Way for Transmission lines dated 15th Oct 2015. Transmission towers are proposed to be erected on the private land through negotiation on voluntary basis. Hence, taking the distribution of impact as within site for short duration and low intensity, the impact significance can be termed as **Moderate**.

Mitigation Measures:

Considering the limited employment opportunity in project area, the solar power plant development in the study area can be considered as a major economic opportunity. Since the land lease process will have moderate economic impact, we recommend the following to optimize the benefit for local communities.

- Providing preference for livelihood opportunities to the families who were directly or indirectly dependent on the project site land.
- Providing training and assistance to upgrade the agricultural pattern and improve their farm yield.
- Developing a Livelihood Restoration Plan for agricultural laborers to enhance the livelihood income. Considering the possibility that some agricultural workers may have moved temporarily to other villages in search for livelihood opportunities, the plan will include provision for availing the support at a later date.
- Prepare a Stakeholder Engagement Plan
- Prepare a Resettlement Framework for the land transaction activities for the transmission line and to determine compensation for ROW
- Develop a Community Grievance Redress Mechanism and ensure that this is properly disseminated to all landowners and residents in the two villages.

Operation Phase:

There would not be any loss of land during operation phase, hence the impact can be taken as No Impact.

Mitigation Measures:

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

(B) Local Job & Economic Opportunity

Construction Phase:

The project will create job opportunities for local people. This will depend on the skill availability and willingness to do work, thus exact number cannot be confirmed in this stage. The impact significance can be termed as "**Positive**".

Considering the sensitiveness associated with the engagement of child, forced labour, AEWIWOPL has laid down policies through which it demonstrates compliance to all of the above factors. Its contractors should be made aware of all its policies for labour requirements and incorporated in their contracts prior to the starting of the project. AEWIWOPL need to monitor the implementation of the policies on regular basis.

Mitigation Measures:

- Employment will be provided to local people wherever possible, especially as unskilled construction workers and security guards.
- AEWIWOPL should prepare a Labor Management plan that includes:
    - Local recruitment process
    - Worker's rights such as non-engagement of forced and child labour, gender equity, non-discrimination on employment and opportunity and freedom to express their views, among others.
    - Monitoring of performance of contractors and subcontractors
    - training activities on health and safety issues involved in the project
- Preparation of Local Procurement Plan to provide additional income to local businesses.
- AEWIWOPL through its contractors should ensure that labour is being adequately paid by contractors. Also, ensure that wage is being paid as per the requirement of minimum wages act.
- AEWIWOPL through the contractor will inform the labour about emergency preparedness plan and communication system to be followed during emergency.

Operation Phase

Mitigation Measures:

Local employment and local procurement will be observed. All sand, cement, water, aggregates, construction consumables will be procured locally

HR Policy promoting workers rights and core labor standards will be adopted.

(C) Community Property Resource

During the project construction phase, there might be some sharing of resources by the villagers and the workers working on the project site. To an extent feasible this should be avoided to prevent potential conflicts between the project and the community. The movement of heavy vehicles and machineries might lead to conditions like disruption of electric wires and telephone wires in the project area and along transportation routes. All these damage utilities should be repaired/replaced to normal conditions, at the earliest. An account of the damage to the community resource should be documented and the root cause analysis should be carried out. The findings of the root cause analysis should also be documented and discussed with the agency/agencies found responsible for the incident. No water should be extracted from surface water bodies which are used by the community for drinking or domestic purpose. Any vacant or barren land, not assigned for project, should not be used for storage of fill/construction material, wastes, etc.

Mitigation Measures:

Responsibility: AEWIWOPL would take responsibility for construction of the road before the existing road is diverted / closed for use by villagers. AEWIWOPL (through the implementing agency/contractors) should start the process of dialogue with the community to decide on the alignment of the road and fix up the likely timeline for the construction.

AEWIWOPL and its contractors should ensure that the sharing of community resource is minimized by organizing necessary support infrastructure/facilities within premises. However, in case where sharing would be essential AEWIWOPL and/ or their contractors should have an agreement with the Gram Panchayats for the sharing of the resource. In case of damage to community property AEWIWOPL including its contractors should ensure that it is repaired or replaced to the satisfaction of the community at the earliest. AEWIWOPL should maintain documentation of all incidents of damages to the community property. All cost for repair/replacement should be borne by AEWIWOPL.

As part of the Environmental and Social Management System, a system should also be developed for recording such incidents and tracking the incident till it is closed to the satisfaction of the community.

(D) Cultural & Behavioural Conflict

Construction Phase:

It has been estimated that 150 nos skilled workers, 300 nos of unskilled manpower will be involved during the peak construction. Labour accommodation facility will not be developed nearby to the construction site as labour will stay in rented quarters in nearby villages and towns. And it is reported that AEWIWOPL will instruct contractors and their subcontractors to give preference to hire unskilled labourers from nearby villages during the construction phase.

There may have some chances that conflict between the migrated labours and the local community arise. Considering the possibilities of such conflicts and the existing situation the distribution of impact is local, duration is short, and intensity is low, the impact significance can be termed as "**Low**".

Mitigation Measures:

- Local people will be preferred for employment wherever possible, especially as unskilled construction workers and security guards
- Labor Management Plan should include code of conduct and policies on migrant workers
- Organize programs on education and awareness raising for workers
- AEWIWOPL will monitor and supervise to avoid any conflict between migrated labour and local community.
- Any waste generated during the construction phase should be properly managed to avoid any conflict with locals.
- During the construction phase efforts will be made to engage with the community through the Panchayat Raj Institution (PRI) representatives and key identified leaders of the community at each project area villages.
- AEWIWOPL shall conduct internal audits on the performance of contractors and subcontractors
- Adequate training on Grievance Redress Mechanism and its procedures to be given to all workers at site.

(E) Labour Accommodation (Offsite)

Construction Phase

"Housing provided to workers as part of the employment contract should meet certain minimum specifications in respect of the nature and standard of the accommodation and facilities to be made available as per the guidelines and standard of EBRD. Accommodation facilities like drinking water, canteen and cooking facility sanitation, bed arrangements, toilets facility medical facility and leisure and social entertainment and nutrition and food safety should be provided to the workers/labours in the labour camp/ accommodation set up in the project site." [13]

Under the proposed project, there are no labor camp has been proposed to be developed. However, rented houses from the nearby village / town will be provided to the skilled workers. AEW will make necessary arrangement to transport the workers from the guesthouse to site through four wheelers (jeeps / car / van). The unskilled workers are proposed to be hired from the local villages. The rented apartments / guesthouse shall be as per European Bank for Reconstruction and Development (EBRD) standards.

- Adequate supply of safe potable water.
- Sanitation facilities
- Adequate arrangements for comfortable and secure living within the sleeping room
- Arrangements for secured locker etc. for safe keeping of the individual and personal belongings. which can be locked by the occupant to ensure privacy.
- Common Hygienic dining rooms, canteens or mess rooms, located away from the sleeping areas.
- There must have arrangements for safeguard of health issues and immediate arrangements for addressing accidental incidents.
- Establish a workers' grievance redress mechanism

Mitigation Measures:

- During the site visit, the project is in its early development phase and land leasing is undergoing. Preference will be given to hire unskilled labours locally therefore reducing the requirement of labour camp. No onsite labour camp will be constructed for migrant labour. Labour will be accommodated in rented quarters in nearby villages and towns for migrant labours till the completion of construction phase. As informed, all the basic amenities such as drinking water, kitchen, toilets are being provided in the rented guesthouse/ quarters.
- Development of Workers' Accommodation Management plan that includes the following:
    - Setting up of accommodations and living condition
    - Water supply
    - Waste disposal
    - Medical facilities
    - Cooking, dining and other facilities
    - Health and safety management
    - Security
    - Community relations, health and safety
    - COVID-19 Control Plan
    - Monitoring and Reporting

[13] *Source: Labour Accommodation Standards, EBRD*

- Provision of furnished container (portable office container) with the required facilities, like toilet blocks and kitchen, centralized dining etc. will be made as per the requirement of onsite staff of AEWIWOPL.
- Drinking water needs during the construction phase will be met via local tankers/approve vendors. In operational phase, packet water will be made available for the drinking purpose.
- AEWIWOPL will formulate their own Environmental Social Management System (ESMS). Following that an Emergency Preparedness Plan to deal with health and safety issues during project life cycle of a Solar Power Plant will be built.
- AEWIWOPL will ensure that they will abide by the policy of safeguarding all issues regarding the health and safety of the workers who are working under the Projects.

5.2.9 Occupational Health and Safety

Construction activites

Occupational Health and safety hazard associated with project activities (during construction) in solar power plants are identified as follows.

- Fall from height: Construction workers involved in the installation of solar panels exposed to fall distances of 6 feet or more must be protected from falls.
- Crane & Hoist safety: Fatalities and serious injuries can occur if cranes are not inspected and used properly.
- Solar energy workers 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.
- 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. Workers may also be exposed to extreme cold weather conditions and should be protected from such conditions.
- Possible injuries associated with working with transmission line laying.
- Accidents during cutting, chipping and piling.
- Physical injuries*:* These can occur when workers involved in loading/unloading activities don't adhere to proper ergonomics discipline. Injuries like muscle strain, ligament tear, slip disc can occur which may prove to be fatal.
- Trip and fall hazards: The injuries are like those discussed under working at height. They occur when workers trip over/fall when debris etc. lies in the walkway/ passages.
- Diseases due to unhygienic condition: It should be ensured that proper and adequate number of toilets are constructed for the labourers so that hygienic conditions prevail in the site area.
- Violation of privacy and dignity of women involved: There can be a violation of the privacy and dignity of the women involved in the work force if there is no enclosed or exclusive provision for women. AEWIWOPL following their Environment, Health and Safety ("EHS") Management Policy and abide by the IFC Principles and Standards will ensure that the dignity and privacy of women is maintained through separate and protected provision for Sanitation Facilities during operation phase of the project as well as in other future projects of AEWIWOPL.

Construction Mitigation Measures

- All materials will be arranged in a systematic manner with proper labelling and without protrusion or extension onto the access corridor.
- Loading and unloading operation of equipment should be done under the supervision of a trained professional.
- There should be periodic training to educate the workers for proper use of PPE's.

- There should be proper monitoring system to ensure that each and every individual labourer are using the PPEs properly.
- Excavated areas should be temporarily fenced to avoid access to outsiders
- Electrical and maintenance work should not be carried out during poor weather and during lightning strikes;
- Electrocution and firing due to short-circuit: It should be ensured that proper training be given to workers before the initiation of any project activity as well as the workers wear their appropriate Personal Protective Equipment (PPE) viz. helmets, safety jackets, safety shoes, goggles, gloves etc. as per their nature of work involved.
- Permitting system (Permit to work) 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
- Safe drinking water supply should be provided for the workers;
- An up-to-date first aid box should be provided at all construction sites and a trained person should be appointed to manage it;
- As measure from snake bite, it is to be ensured that the nearest hospital has the required immunoglobulin. Route map & contact details of the hospital to be provided.
- All equipment should be turned off and checked when not in use
- Fire extinguishing equipment should be provided in adequate number on site to handle any possible fire outbreaks.
- Accident reporting and monitoring record should be maintained.
- Display of phone numbers of the city/local fire services, etc. at site should be done.
- The labour engaged for working at height should be trained for temporary fall protection devices.
- There should be arrangement for hygienic and sanitation facilities for all the labourers working in the site. Provision of the Contract Labour Rules, 1971 require the operator of a construction site to provide adequate sanitation facilities to worker within the site premises (1 toilet for every 25 males & 25 females & water availability by means of tap or where conveniently accessible).
- There need to have enclosed and exclusive provision for women to protect the privacy and dignity of the women involved in the work force.
- A safety or emergency management plan should be in place to account for natural disasters, accidents and any emergency situations. The nearest hospital, ambulance, fire station and police station should be identified in the implemented emergency management plan.
- AEWIWOPL should inform the labour about Emergency Preparedness Plan (EPP) and communication system to be followed during emergency.
- Trainings & Toolbox talk have to be implemented.

Operation activities

Occupational health and safety hazards specific to electric power transmission and distribution projects primarily include:

- Live power lines
- Working at height
- Electric and magnetic fields
- Exposure to chemical

Operation Mitigation measures

Prevention and control measures associated with live power lines include:

- Only allowing trained and certified workers to install, maintain, or repair electrical equipment;
- Deactivating and properly grounding live power distribution lines before work is performed on, or in close proximity, to the lines;
- Ensuring that live-wire work is conducted by trained workers with strict adherence to specific safety and insulation standards.
- Qualified or trained employees working on transmission or distribution systems should be able to achieve the following
    - Distinguish live parts from other parts of the electrical system

- Determine the voltage of live parts
- Understand the minimum approach distances outlined for specific live line voltages

- Ensure proper use of special safety equipment and procedures when working near or on exposed energized parts of an electrical system
- Workers should not approach an exposed energized or conductive part even if properly trained unless:
  - The worker is properly insulated from the energized part with gloves or other approved insulation; or,
  - The energized part is properly insulated from the worker and any other conductive object; or,
  - The worker is properly isolated and insulated from any other conductive object (live-line work).
- Prevention and control measures for working at height include:
  - Testing structures for integrity prior to undertaking work; Implementation of a fall protection program that includes training in climbing techniques and use of fall protection measures; inspection, maintenance
  - Safety belts should be of not less than 16 millimeters (mm) (5/8 inch) two-in-one nylon or material of equivalent strength. Rope safety belts should be replaced before signs of aging or fraying of fibers become evident;
  - When operating power tools at height, workers should use a second (backup) safety strap; · Signs and other obstructions should be removed from poles or structures prior to undertaking work;
- Occupational EMF exposure should be prevented or minimized through the preparation and implementation of an EMF safety program including the following components: ·
  - Identification of potential exposure levels in the workplace, including surveys of exposure levels in new projects and the use of personal monitors during working activities;
  - Training of workers in the identification of occupational EMF levels and hazards; · Establishment and identification of safety zones to differentiate between work areas with expected elevated EMF levels compared to those acceptable for public exposure, limiting access to properly trained workers;
  - Implementation of action plans to address potential or confirmed exposure levels that exceed reference occupational exposure levels developed by international organizations such as the International Commission on Non-Ionizing Radiation Protection (ICNIRP), and the Institute of Electrical and Electronics Engineers (IEEE).
- Occupational exposures to chemicals: Primarily include handling of pesticides (herbicides) used for right–of-way maintenance, and exposure to PCB in transformers and other electrical components

5.2.10 Emergency Preparedness

Emergency Identification: The Emergency Preparedness Plan/ERP will have defined nature of emergencies that can be encountered during construction & operation of a solar farm. Requirements of an Emergency Control Centre (ECC), firefighting facilities and medical facilities as applicable, will be detailed out. Roles and responsibilities of personnel at site, communication channel to be followed, and procedures for different emergencies will also be detailed. AEWIWOPL should ensure that Its EPC contractor identify construction and operation phase of first aiders and fire fighters, display of emergency numbers onsite etc.

Construction Phase hazard includes natural hazards, ERP to be evolved for both stages separately viz construction stage and operation stage. Some of the foreseeable hazards during construction stage could be fire, major accidents during transportation and handling of construction material, and erecting activities.

Similarly, operation stage hazards could be fire, electrocutions, structure failure etc. EPC contractor has to identify such hazards evolve ERP for operation stage accordingly.

ERP: Construction and Operation Stage Measures

EPC Contractor(s) will develop the Emergency Response Plan (ERP) in accordance with local emergency response regulations and standards, this is to be approved by AEWIWOPL. Contractor(s) will include the Emergency Response Plan in contractor's Project Safety Plan. Contractor(s) will train all contractor representatives on the provisions of the Emergency Response Plan. The ERP would be specific to the final site layout and location of site components and implemented to provide an integrated procedure for response to oil and hazardous materials spills, plant evacuation, medical/fire/law enforcement, and severe weather emergencies. The ERP would be consistent with applicable laws and regulations governing such emergencies.

An Emergency Preparedness and Response Plan needs to be prepared covering construction and operation stage both that is commensurate with the risks of the facility and that will include the following basic elements:

Emergency Organisation structure: define responsibilities at different level and function to ensure coordinated action during emergency including declaring emergency and closing emergency.

Worker notification and communication: Alarm bells, visual alarms, or other forms of communication to be used to reliably alert workers to an emergency. Also, Testing warning systems.

Fire Services · The level of local firefighting capacity and whether equipment is available for use at the facility in the event of a major emergency or natural disaster is to be looked at. If insufficient capacity is available, firefighting capacity should be acquired that may include pumps, water supplies, trucks, and training for personnel.

Medical Services · First aid attendants for the facility, first aid treatment as well as suitable medical equipment to be ensured prior to transportation to hospital.

Availability of Resources- Maintaining a list of external equipment, personnel, facilities, funding, expert knowledge, and materials that may be required to respond to emergencies. Tracking and managing the costs associated with emergency resources.

Contact List · Developing a list of contact information for all internal and external resources and personnel. The list should include the name, description, location, and contact details (telephone, email) for each of the resources, and be maintained annually.

Training and Updating: Identify training needs based on the roles and responsibilities, capabilities and requirements of personnel in an emergency. Develop training Plan.

Provide training exercises to allow personnel the opportunity to test emergency preparedness.

The impact significance can be taken as "**Low"**.

5.2.8 Community Health & Safety

Construction Phase

During construction phase, various project components such as transmission cable laying, switchgear, internal road network and porta cabin construction will require land clearing, levelling, excavation and grading activities. Vehicle movement will also take place. This will result in an increased level of dust and particulate matter emissions, as well as high traffic load, which in turn will directly and temporarily impact the local community. If improperly managed, there is a risk of nuisance and health effects. Taking

the distribution of impact as within site, duration as short and intensity as low, the impact can be considered as **"Low".**

Mitigation Measures

- Traffic Management Plan to ensure proper route of movement of project vehicles will be identified.
  - Depute traffic escorts as and when required near project site and major settlements to guide movement of project vehicles.
  - Keep limited speed of project vehicles near settlements and within the project site.
  - Provide necessary training to the drivers for speed restrictions and on dos and don'ts.
- Community Health and Safety Management Plan which includes community orientations, installation of signages and fences among others.
- Develop a Stakeholder Engagement Plan to provide communicate construction activities and possible health and safety risks in local language

Operation Phase

- **Traffic Movement:** In operation phase, very few (-maximum 1-2 nos/day) vehicles will be required (such as for security purpose/ when fault is found/ also for rectification purpose/ general supervisory of maintenance of the plant. Therefore, impact associated with movement of project vehicles is not anticipated.
- **Risk of Electrocution:** Risk of Electrocution is anticipated in the operational phase of the project, which could be mitigated through boundary wall and restricted entry in project site.

Taking all these points in consideration, with Area of Influence, duration short and intensity low, the significance of impact can be taken as **Low.**

Mitigation Measures

- Traffic Management Plan
- Community Health and Safety Management Plan
- Ensuring effective work permit system for critical activities such as electrical work.
- Boundary wall and restricted entry in project site.

5.2.11 Cumulative Impact of the project

Operational Phase

While the cumulative ecological impact, assessing the impact of avi fauna on transmission lines has been discussed separately under ecology section (section 5.2.4), also in Annexure P, other probable cumulative impacts are discussed here.

Cumulative impacts are envisaged mainly in the Operation phase of the project.

It was observed during the site reconnaissance survey that due to presence of other solar projects (operational & upcoming) in Surendranagar area:

- land rates in the area will increase due to multiple solar projects being developed in the area. Also, there will be further loss of agricultural land.

- there could be possibility of displacement of labour from the farm activities to road and construction activities and it could also impact the women farm workers and their dependency on the current proposed land.
- construction phase of current and upcoming projects in the area may cause increased air emissions and noise levels.
- Multiple projects in the area can contribute to water stress.

Detailed discussion on cumulative impacts on ecology is provided in Section 5.2.7.

It is recommended that the project should follow the mitigation measures:

Mitigation measures:

- Project developers need to schedule their activities such that no construction activity is carried out in the breeding season of the Lesser Florican.
- Social issues need to be adequately assessed in each project & studies such as Livelihood Impact Assessment & Restoration Plan carried out.
- All air & noise emissions of various projects need to be monitored in the construction & operation phase & proper measures implemented.
- AEW has planned robotic cleaning which will consume 400-600 Litres of water per year compared to 72000 Lt /year. Thus, the project would not contribute to water stress in the area. Robotic cleaning to be practiced by other developers also to ensure less impact on water

6 ENVIRONMENTAL & SOCIAL MANAGEMENT PLAN

The Environment and Social Management Plan (ESMP) specifies measures for addressing the limited negative risks and impacts and for enhancing the beneficial impacts. In addition, organizational capacity and training requirements, required to check and ensure effectiveness of the plan throughout the lifecycle of the project, have also been discussed.

AEWIWOPL is committed to implement an ESMP policy to continuously manage and communicate the potential social and environmental impacts and risks imposed on the project employees (direct and indirect) and the local communities residing in the immediate vicinity of the project area. The outcomes of the Environmental and Social Impact Assessment of the project have been used to formulate an Environment and Social Management Plan, presented in Table 6-1. The Plan specifies measures for addressing the limited negative risks and impacts and for enhancing the beneficial impacts. In addition, organizational capacity and training requirements, required to check and ensure effectiveness of the plan throughout the lifecycle of the project, have also been discussed.

Table 6-1:Environmental and Social Management Plan (ESMP)

SN	Aspect/Activity	Potential Impact	Impact Intensity without mitigation	Mitigation Measures – Action Plans	Impact Intensity with mitigation	Responsibility
CONSTRUCTION PHASE						
A. Environmental & Ecological Management Plan						
1.	**Air Quality**	• Fugitive Dust due to movement of project vehicles and site clearance • Emission from Diesel Generators	**Moderate**	• Vehicle speed to be restricted to 20-30 km/hr. on unpaved road. • Raw/fine material should be covered with tarpaulin sheet during transportation and in storage area. • Ensure water sprinkling on unpaved area to minimize the dust emission. • All Project vehicles will comply with national emission standards (valid PUC certificate • Turn off the machineries when not in use. • Spray water on unpaved roads as needed • Provide regular maintenance of vehicles in accordance with manufacturer specifications • Stabilize disturbed areas as soon as possible after construction with vegetation or other materials	**Low**	EPC Contractor
2.	**Landscape and Visual**	Visual and landscape impacts due to presence of elements typical of a construction site such as equipment and machinery.	**Low**	• Ensure the construction site is left in an orderly state at the end of each work day • Construction machinery, equipment, and vehicles not in use should be removed in a timely manner to the extent possible • Proper handling of waste streams.	**Low**	EPC Contractor
3.	**Water Resources and Quality**	• Possibility of contaminated runoff from the site • Medium term - increase in siltation load due to construction activities	**Moderate**	• Use of water through tankers- from authorized vendors, using water allotted for industrial purpose. • 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 water from water supply tankers is necessary for efficient utilisation of water; • Periodic monitoring shall be carried out to ensure that the waste water is not finding its way into ground or surface water. • Conserve water at all project locations and ancillary facilities and if possible, recycle and reuse water utilizing every opportunity. • Paved impervious surface and secondary containment to be used for fuel storage tanks. There shall be drums of 200 Ltrs which shall be stored on a paved surface with a slope and a pit on the corner for collection spill over of oil • Adequate drainage facility will be provided • Wastewater holding tanks / septic tank to be located at more than 500 m away from bore wells (if any). • Establish a system for collection, segregation, and disposal of solid waste in the worker camps. • Apply appropriate storage, transport and use practices to recognized standards for fuels, chemicals, explosives, hazardous substances. • Chemicals, and hazardous substances to be handled by authorized personnel • Diesel to be stored in truck tankers or in overhead tanks to a maximum of 5000 lit and on flat ground at least 50 m from a waterway • All refueling to be done on flat ground	**Low**	EPC Contractor/ AEWIWOPL

SN	Aspect/Activity	Potential Impact	Impact Intensity without mitigation	Mitigation Measures – Action Plans	Impact Intensity with mitigation	Responsibility
				• Chemical, and oil-based materials in a suitable storage tank with concrete floor for ultimate disposal at an authorized disposal facility; • Prohibit deliberate discharge of oil, diesel, petrol or other hazardous materials to the surrounding soils and waterways. • Provide community septic system to treat domestic wastewater at the worker camps if any		
4.	**Noise Level**	• Disturbance to habitants • Vehicular noise from heavy vehicles utilized to deliver construction materials and solar plant parts. • Noise from DG sets • Construction noise from using mobile equipment, and concrete mixing	**Moderate**	• Regular maintenance of machinery equipment & vehicles in accordance with manufacturers specifications • Integral noise shielding to be used where practicable and fixed noise sources to be acoustically treated, for example with silencers, acoustic louvers and enclosures. • Use DG set with acoustic enclosure. Keep stationary source of noise such as DG sets (during construction phase) at farthest point from the settlements. • Restrict major noise generating activities during nighttime 10:00 pm to 6:00 am • Provide personal protective equipment (e.g., Earmuffs) to all workers wherever noise is generated due to machinery operation. • Procure low noise generating compressors and diesel generating sets/ DG sets should be placed in acoustic enclosure. • Restrict use of horn near school and residential areas by placing signage • Avoid construction during LF mating season	**Low**	EPC Contractor
5.	**Soil Quality**	Top Soil Loss	**Moderate**	• Provide appropriate storage of topsoil in an isolated and covered area. • Allow only covered transportation of topsoil within project site. • Construction debris shall be reused in paving on site approach road to prevent dust generation due to vehicular movement. • Re-vegetation shall be done in the area after the completion of construction, in order to reduce the risk of soil erosion • Use topsoil to give it to nearby agricultural field after taking consent with the landowners/farmers. • Store hazardous material like diesel and used oil in isolated room and on impervious surface to prevent seepage into project site soil. • Filling and transfer of oil to and from the container shall be on impervious surface. • Care should be taken with regard to possible changes in soil quality due to human activities, such as disposal of waste material and domestic effluents on soil of the surrounding area. • Broken solar panels should be stored in paved surface. The rejected modules will be kept by the Owner and will be required to be taken back by the manufacturer from the Owner's site within 30 days from the date of intimation. However, in case the manufacturer does not comply, the Owner shall have the right to dispose of the modules as per standard procedure.	**Low**	EPC Contractor
		• Soil Contamination due to spill of civil construction material • Dumping of construction material outside the Project construction footprint Erosion and compaction		• In case of any accidental spill, the soil will be cut and stored securely for disposal with hazardous waste. • Store hazardous material (like used oil) in isolated room with impervious surface. • Remove empty containers/sacs/boxes etc. on daily basis and dispose of through authorized vendors.		
6.	**Solid & Hazardous Waste**	• Contamination of land • Improper solid waste disposal could lead to health hazards.	**Low**	○ Distribute appropriate number of properly contained litter bins and containers properly marked as "Domestic & Hazardous Waste".	**No Impact**	EPC Contractor

SN	Aspect/Activity	Potential Impact	Impact Intensity without mitigation	Mitigation Measures – Action Plans	Impact Intensity with mitigation	Responsibility
				○ Company will implement measures for Solid waste disposal which includes the following: ○ Identification of all solid waste generation sources. All bio-degradable including kitchen waste to be put into humus pit, which can be covered with soil for composting. ○ Ensure hazardous waste containers are properly labelled and stored onsite provided with impervious surface, shed and secondary containment system and disposed GPCB authorized vendors/recyclers ○ It is to be ensured that hazardous waste is not stored for more than 90 days ○ Construction contractor will ensure that no unauthorized dumping of used oil and other hazardous wastes is undertaken at the site ○ The construction contractor should ensure collection and timely ((bi-monthly) disposal of construction waste generated debris, concrete, metal cuttings wastes as per the Construction and Demolition Waste Management Rules 2016; Whatever waste is generated shall be dumped in low lying areas for levelling ○ Transportation vehicles and equipment should undergo regular maintenance to avoid any oil leakage; ○ Use of spill control kits to clean minor spills and leaks and workers trained to prevent/contain spills and leaks during unloading and loading for diesel, oil and used oil. ○ 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. ○ . Construction Labour deputed onsite to be sensitized about water conservation and encouraged for optimal use of water; ○ Municipal domestic waste generated at site to be segregated onsite and ensure proper collection and handover to local municipal body/ local authority for further disposal; ○ Workers will be strictly instructed against random disposal of any waste generated from the construction activity; • Ensure contractual obligation that necessitates broken solar panels being accepted by manufacturer. Or should be sent back to the authorize vendor for safe disposal • Use a 2-bin system so that food waste and recyclables viz. paper, plastic, glass, scrap metal waste etc. are segregated and stored in designated waste bins/ containers. The recyclables should be periodically sold to local recyclers while food waste will be disposed through waste handling agency. • Waste/spent/used oil & bottom sludge from transformer will be collected and stored in paved and enclosed area and subsequently sold to SPCB authorised recyclers.		
7.	**Ecology**	Ecological impacts	**Moderate**	• Transmission line route to avoid habitat/sighting location of LF • Layout of panels to avoid habitat of LF • Timing of TL construction activities, including use of village road intercepting LF breeding area, to be avoided during breeding season	**Low**	AEWIWOPL/ EPC contractor

SN	Aspect/Activity	Potential Impact	Impact Intensity without mitigation	Mitigation Measures – Action Plans	Impact Intensity with mitigation	Responsibility
				• Regular monitoring of the patch where the Lesser Florican was sighted during construction. • Installation work to be avoided in lekking season • Angle and direction of panels to avoid lake effect (14°, south direction) • All project activities shall be undertaken with appropriate noise mitigation measures to avoid disturbance to faunal population in the region. • Activities generating high noise shall be restricted to day time and will be mitigated to minimize the noise level outside the site boundary. • Movement of construction and transport vehicles shall be restricted to dedicated paths to minimize any harm to small mammals within the site. • Transportation of construction material shall be restricted to day time hours to minimize noise and disturbance to fauna in the area. • General awareness regarding wildlife shall be enhanced through trainings, posters, etc. among the staff and labourers. • No food waste will be disposed/littered in and around project site so that that it does not attract wild animals. • Strict prohibition shall be implemented on trapping, hunting or injuring wildlife within subcontractors and shall bring a penalty clause under contractual agreements. • Camp and kitchen waste shall be collected in a manner that it does not attract wild animals. • Temporary barriers shall be installed on excavated areas. • The footprints of the construction activities shall be kept to minimum to reduce disturbance to flora and fauna. • Laying of transmission lines towards Plant side substation not to be in Lesser Florican breeding season • From AEW's PSS the TL will be 220kv to the existing GSS. Bird diverters are required on all capacity lines, and the project is required to install them on the full length from PSS to GSS. • The insulator will be between the Tower and Live Conductor as per IE rule and CEIG rule and there will be a much gap (5.153 mtr) between the Live conductor and Earth that is TL Tower. • Proper Porcelain Insulators is used in 220KV Circuit with proper creepage to minimise electrocution risk. TL towers shall have 220 kV AL 59 conductor and each tower shall have porcelain insulator and connection at each tower point shall be through jumper conductor. • AEWIWOPL will require all contractors to adhere to the Indian National and World Bank Group environmental, health and safety regulations, policies and guidelines including compliance with a prohibition on the felling of trees for meeting fuel wood requirements (as part of their contract) • Labour contracts will contain conditions to ensure that illegal felling is not done by the contract labour. • AEWIWOPL' has to ensure provisions for use of kerosene oil or LPG as the primary		

SN	Aspect/Activity	Potential Impact	Impact Intensity without mitigation	Mitigation Measures – Action Plans	Impact Intensity with mitigation	Responsibility
				fuel by the labour. • Use of fuel wood as secondary option. This will be sourced from the State Forest Department and records of procurement and distribution for use will be maintained by the contractor.		
8.	**Emergency Preparedness (EP)**	Fire risk Electrical hazards	**Moderate**	EPC Contractor to draft the Emergency Preparedness Response Plan to chart out the risks & controls. Developer to approve the same. • Worker notification and communication • Fire services • Medical services • Availability of resources • Contact List • Training	**Low**	EPC contractor/ AEWIWOPL
9	**Occupational Health and Safety**	Material handling and storage Possible injuries associated with working with transmission line laying Other occupational hazards	**Low**	• Loading and unloading operation of equipment should be done under the supervision of a trained professional. • All work at height to be undertaken during daytime with sufficient sunlight. • Proper PPEs should be provided to workers handling welding, electricity and related components. • Fire extinguishing equipment should be provided in adequate number on site to handle any possible fire outbreaks. • An accident reporting, and monitoring record should be maintained. • Display of phone numbers of the city/local fire services, etc. at site should be done. • The labour engaged for working at height should be trained for temporary fall protection devices • The project site should maintain Snake antivenom Injection in order to mitigate the risk associated with snake bite.	NO IMPACT	Contractor under the supervision of AEWIWOPL's Personnel
B. Social Management Plan						
1	**Loss of Land/Livelihood Sources**	Agricultural land will be converted into industrial land.	**Low**	• Titleholders/landowners who are giving land on lease should be properly compensated on a timely manner so that they can manage their livelihood adequately. • Provide training and assistance to upgrade the agricultural pattern and improve the farm yield. • Develop and implement a CDP to ensure that affected communities can benefit from the project. Potential gender responsive programs should be included as part of the CDP. Prepare a Stakeholder Engagement Plan to provide updates and secure feedbacks from the landowners. • Establish a Community Grievance Redress Mechanism to address any concerns from the landowners.	NO IMPACT	AEWIWOPL /EQMS
		Loss of Livelihood	**Moderate**	• Give preference for livelihood opportunities to households who lost their livelihood due to the project activity. • Develop a Livelihood Restoration Plan for agricultural laborers that are getting impacted to enhance/ improve their livelihoods to the level prior to leasing of the farmlands. Considering the possibility that some agricultural workers may have moved temporarily to other villages in search for livelihood opportunities, the plan will include provision for availing the support at a later date. • Prepare a Stakeholder Engagement Plan to identify all economically displaced individuals, provide project information and secure feedbacks from the affected persons, and community members in the affected villages.	NO IMPACT	AEWIWOPL /EQMS

SN	Aspect/Activity	Potential Impact	Impact Intensity without mitigation	Mitigation Measures – Action Plans	Impact Intensity with mitigation	Responsibility
				• Establish a Community Grievance Redress Mechanism to address any concerns from the affected persons and community members in the affected villages. • Conduct validation activities to identify all affected persons.		
2	**Access to common facilities**	The construction of access road could potentially prevent locals from using the road	**Low**	• Conduct stakeholder engagement activities to inform community members of the project, construction schedule, access road construction and other activities that may lead to temporary impact on access to common facilities. • Provide alternative access to community members during construction of the access road • Implement the Grievance Redress Mechanism to assure that any complaints regarding project related components are promptly and adequately investigated and resolved. • Contractors and subcontractors should provide migrant workers adequate information on expected social behavior and hygiene practices to be followed at site.	NO IMPACT	Developer/ Contractor under the supervision of AEWIWOPL's Personnel Social Management team for grievance handling
3	**Common Property Resources**	Damage to the community resource Impact on the common road, water resources, pond, grazing land, place of religious importance	**Low**	• AEWIWOPL would take responsibility for construction of the road before the existing road is diverted / closed for use by villagers. • AEWIWOPL (through the implementing agency/contractors) should start the process of dialogue with the community to decide on the alignment of the road and fix up the likely timeline for the construction. • AEWIWOPL and its contractors should ensure that the sharing of community resource is minimized by organizing necessary support infrastructure/facilities within premises. However, in case where sharing would be essential AEWIWOPL and/ or their contractors should have an agreement with the Gram Panchayats for the sharing of the resource. • In case of damage to community property AEWIWOPL including its contractors should ensure that it is repaired or replaced to the satisfaction of the community at the earliest. AEWIWOPL should maintain documentation of all incidents of damages to the community property. All cost for repair/replacement should be borne by AEWIWOPL.	NO IMPACT	Project Developer
4	**Cultural and Behavioural Conflict**	The migratory labour would disturb the social and cultural fabric of the affected villages resulting to conflicts between local and migrant labour Conflict between contractor and labour	**Low**	• Local people will be preferred for employment wherever possible, especially as unskilled construction workers and security guards. • Prepare a Labor Management plan, including code of conduct of workers and policies on migrant workers. • Organize programs on education and awareness raising for workers • Coordinate with local authorities to manage temporary residents and to monitor security in the area • AEWIWOPL shall conduct internal audits on the performance of contractors and subcontractors. • Establish a Grievance Redress Mechanism	NO IMPACT	Developer/Contractor under the supervision of AEWIWOPL personnel Project
5	**Labour Accommodation/ Rented Quarters**	Lack of basic infrastructure facilities in the labour accommodation	**High**	• Develop a Workers' Accommodation Management Plan that includes guidelines on setting up accommodation and ensuring that living conditions are within standards, health and safety of workers, security, community relations and COVID-19 control. • Develop an emergency preparedness plan for on-site emergencies • Establish a workers' grievance redress mechanism	**Low**	AEWIWOPL/ EPC contractor
6.	**Community Health, safety, and Security**	Increased traffic movement may lead to road accidents	**Moderate**	• Develop a Traffic Management Plan • Develop a Community Health and Safety Management Plan	**Low**	EQMS/ EPC contractor

SN	Aspect/Activity	Potential Impact	Impact Intensity without mitigation	Mitigation Measures – Action Plans	Impact Intensity with mitigation	Responsibility
		Road construction may result to accidents Risk of electrocution		• Develop a Stakeholder Engagement Plan to provide communicate construction activities and possible health and safety risks in local language • The local community and children will be sensitized to the dangers of construction sites prior to and during the works. • Appropriate signage in the local language will be erected. • Excavation for foundations will be closed as soon as practicable to prevent people or animals falling into the excavations. • The transport of heavy and abnormal loads will be undertaken out of normal working hours whenever possible. • Security personnel engaged do not use force except when used for preventive and defensive purposes in proportion to the nature and extent of threat		
7.	**Gender mainstreaming**	• Gender-based division of labour • Unequal access to and control over land and productive resources • Limited participation in decision-making • Gender Based Violence	**Moderate**	Ensure that the Resettlement Framework, Livelihood Enhancement Plan, Stakeholder Engagement Plan, Labor Management Plan including local recruitment, Local Procurement Plan, Workers' Accommodation Management Plan and Grievance Redress Mechanism will include gender mainstreaming measures to ensure women participating and benefitting from the project. Specifically, these plans should include: • Access to and control over land and productive resources • Participation and decision-making • Access to Project Compensation and Benefits • Training for women, especially young women, was a high priority in the focus group setting • Organizational capacity for gender mainstreaming – Capacity for gender mainstreaming in responsible institutions – Gender balance in project staffing and implementation • Collection and analysis of gender disaggregated data • Existing measures aimed at promoting gender equality	**Low**	AEWIWOPL/ EQMS/EPC Contractor
OPERATION PHASE						
A. Environmental & Ecological Management Plan						
1.	**Air Quality**	• Fugitive dust • Vehicle Emissions • Climate Change	**Moderate**	• Enforce speed limits along dirt roads near communities. • Regular maintenance of vehicles in accordance with manufacturer Revegetation • Specifications Reduction of vehicle idling time to a minimum	**LOW**	O&M contractor
2.	**Noise**	Increased vehicular noise & use of horn in the area will disturb inhabitants in neighbouring villages	**Low**	• Provide regular maintenance of vehicles and equipment in accordance with manufacturers specification. • Restrict use of horn near school and residential areas by placing signage	**No impact**	O&M contractor
3.	**Water Quality**	• Degradation of ground and surface water quality	**Moderate**	• AEW plans robotic cleaning technique for cleaning of solar PV panels. This will significantly reduce water consumption during operation phase • Ensure optimal usage of water viz., storage and reuse of wash water after module washing. • Water to be used from authorised vendors, potable – packaged water for staff & workers. • Use of spill control kits to clean minor spills and leaks and workers trained to prevent/contain spills and leaks during unloading and loading for diesel, oil and used oil.	**Low**	O&M contractor/ AEWIWOPL

SN	Aspect/Activity	Potential Impact	Impact Intensity without mitigation	Mitigation Measures – Action Plans	Impact Intensity with mitigation	Responsibility
				• The domestic wastewater would be managed through septic tanks followed by soak pit. • Ensure that septic tanks are emptied and collected by contractor at appropriate intervals to avoid overflowing. The sewage generated onsite shall be treated and disposed through septic tanks and soak pits as per specifications given in IS 2470: 1995 (Part I and II) • Discharge of all sanitary and process wastewater to waterbodies must meet IFC EHS Guidelines and Government of India standards.		
4.	**Solid & Hazardous Waste**	• Land pollution • Improper solid waste disposal could lead to health hazards	**Moderate**	• AEWIWOPL will follow the Gazette notification (no 158 MARCH 5, 2019) of Hazardous and Other Wastes (Management and Transboundary Movement) Amendment, Rules, 2019. • Use a 2-bin system so that food waste and recyclables viz. paper, plastic, glass, scrap metal waste etc. are segregated and stored in designated waste bins/ containers. The recyclables should be periodically sold to local recyclers while food waste will be disposed through govt. approved waste handling agency. • The sewage generated onsite will be treated and disposed through septic tanks and soak pits • The rejected modules will be appropriately stored as per prudent practices at a designated place at site. Module manufacturer will be provided 30 days time to replace and take back the modules. However, in case no action is taken by the Module manufacturer within 30 days from the date of intimation by the Owner, appropriate arrangement with an authorized vendor will be entered into by the Owner for safe disposal of the modules. • The hazardous waste (such as transformer waste oil & bottom sludge) generated will be disposed through GPCB/CPCB approved vendors in accordance with Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016, as amended. The hazardous wastes will be stored onsite at separate designated covered area provided with impervious flooring and oil spill control kit will be used for cleaning small spills and leaks. During operation phase, the quantity of municipal waste and hazardous waste generated is less and probability of the hazardous waste generation is only during maintenance work and therefore occasional. The waste generated would be routed through proper collection and containment. A formal tie-up with GPCB/CPCB approved vendors will be executed.	**Low**	O&M contractor/ AEWIWOPL
5.	**Ecology and Biodiversity**	Impacts on existing flora and fauna	**Moderate**	• Monitor bird mortality due to electrocution and collision with powerlines, poles, transformers, switchyards, fencing etc. • Person involved in monitoring shall walk or drive all along the powerline and record if any bird electrocution or collision occurred or any other animal mortality has occurred. • Evidence of feathers, bones, carcasses etc. lying under the transmission line or towers shall be considered as mortality.	**Low**	AEWIWOPL/ O&M contractor

SN	Aspect/Activity	Potential Impact	Impact Intensity without mitigation	Mitigation Measures – Action Plans	Impact Intensity with mitigation	Responsibility
				• Mortality shall be recorded with place (pole number), date, time, photograph (taken from various angles). • Vegetation clearing through brush cutting for maintenance activities shall be done manually wherever possible. • Any cleared areas which do not have some vegetation cover to protect the soil shall be re-vegetated with locally occurring species and monitored to ensure recovery is taking place. • Vegetation that needs to be reduced in height shall be mowed or brush-cut to an acceptable height, and not to ground level except where necessary. • General awareness regarding wildlife shall be enhanced through trainings, posters, etc. among the staff and labourers. • Site to be fenced to keep large ungulates and carnivores out of the area. This will reduce wildlife damage to facilities and will aid in avian mortality surveys. • Solar panels shall have an anti-reflective coating to minimize the light reflecting off of the panels so that there is very less impact due to glare from the panels. • Any dead animals/carcass shall be removed in time from the site so that it does not attract movement of raptors • Training of local staff and security guards for spotting of bird carcass and reporting the same. This will help to ensure the strategic actions when the species are spotted in the region. • Regular monitoring of the patch where the Lesser Florican was sighted, during lekking season every year. • Survey/monitoring during Lesser Florican breeding season (July to September)		
6.	**Occupational Health and Safety of Workers**	Electrocution Fire due to short-circuit Possible injuries associated with working at height Diseases due to unhygienic condition	**Low**	• Provide and ensure wearing of personal protective equipments viz., gloves, helmets, dust musk, ear plug, safety belt, etc. • Ensure effective work permit system for critical activities such as electrical work and working at height. • Prepare emergency communication system and emergency preparedness plan. • Ensure proper sanitation facilities.	NO IMPACT	EPC Contractor
B. Social Management Plan						

SN	Aspect/Activity	Potential Impact	Impact Intensity without mitigation	Mitigation Measures – Action Plans	Impact Intensity with mitigation	Responsibility
7.	**Loss of Land/Livelihood Sources**	Community Empowerment	**POSITIVE IMPACT**	• Continue implementation of the Livelihood Restoration Plan • Implement Community Development Plan • Implement Local Procurement Plan • Implement Grievance Redress Mechanism	**POSITIVE IMPACT**	AEWIWOPL
9.	**Community Health, safety, and Security**	Increased traffic movement may lead to road accidents Risk of electrocution	**Moderate**	• Implement Traffic Management Plan • Implement Community Health and Safety Management Plan • Continue Stakeholder Engagement Plan to provide possible health and safety risks in local language • Appropriate signage in the local language will be erected. • Security personnel should not use force except for preventive and defensive purposes in proportion to the nature and extent of threat.	**LOW**	AEWIWOPL
C. Cumulative Impact Management						
1	**Presence of other projects in the area**	• Disturbance to LF in breeding season • Possibility of displacement of labour from the farm activities, impact the women farm workers and their dependency on the current proposed land • increased air emissions and noise levels • stress on ground water	**Moderate**	• Project developers need to schedule their construction such that no construction activity is carried out in the breeding season of Lesser Florican. • Social issues need to be adequately assessed in each project & proper compensation ensured. • All air & noise emissions of various projects need to be monitored in the construction & operation phase & proper measures implemented. • Robotic cleaning to be practiced by the developers to ensure less use of ground water.	**LOW**	

6.1 Provisions for ESMP implementation

The ESMP Implementation responsibility matrix of AEW & Contractor is represented by two teir structure:

- Head Office
- Site management

Table 6-2: ESMP Implementation Responsibility Matrix of AEW

Sl No	Project Designation	AEW Designation	Responsibility
A	**Corporate Level**		
1.	Project Incharge	Head Renewable Energy	Allocation resources, Interaction with ADB, Head- Grievance Redress panel.
2.	Project HR	Manager Accounts	Ensure availability of requisite personal, arrange EHS training and awareness programme, medical check up as may be required of site staff as per law, participate in GRM, ensure availability of PPE at site.
3.	Project Technical Design Incharge	Director - Technical	Ensure adoption of EMP measures related to design in project design and procurement, inclusion of Environmental and social measures as per ESIA, LRP, RP in the contract and ensure its implementation, participate in GRM, reporting to ADB.
4.	Technical EHS&S advisory and management team	EQMS Global Pvt Ltd- Mr Sanjay Kumar Jain supported by Social expert of EMQS	Ensure compliance of EMP and Social management plant at site, help in periodic EHS reporting to ADB, participate in GRM.
B	**Site Level**		
1.	Project Manager/Contract Manager	Construction Manager	Ensure compliance to Environment and social management requirement by every vendor at site as per ESIA, RF, LRP and other committed documents, resolve Grievance and forward those which can not be resolved at Site level to Head office, manage engagement of E&S experts. Ensure effective implementation for EHS requirements by contractors, participate in GRM.
2.	Admin Manager- Site	AEW Site Admin Manager	Reporting to construction manager, ensure compliance to ESIA, RF, LRP- including coordinating with affected persons for conduct of trainings, awareness sessions, assist in post training support in LRP measures, in coordination with the E&S Expert..

3.	EHS Expert	Third Party Outsource Agency – EQMS Global Pvt Ltd	• Reporting to the Construction Manager, conduct regular surveillance and ensure implementation of E&S requirements (including health and safety) at site as per ESIA, LRP, RF. Undertake assessment as per RF, LRP for transmission line, prepare periodic compliance report, participate in missions, receive, analyze grievance and help resolve. They will also ensure the following. ○ conduct community consultations and other engagement activities ○ decide on eligible affected persons ○ conduct trainings or engage third party groups to conduct trainings ○ identify and hire affected persons ○ conduct monitoring activities prepare reports

Grievance Redress panel is represented by all officers (of AEW) mentioned at corporate & site level.

Table 6-3: ESMP Implementation Responsibility Matrix of EPC contractor

Sl No	Project Designation	Belectric Designation	Responsibility
A	**Corporate Level**		
1.	Project Incharge	Director - Operations	Responsible for monitoring of the Project, Head of grievance and Compensation, Responsible for Project Operations, Project delivery, allocation of resources, Engineering & Procurement.
2	Project Technical Design Incharge	Head - Project Design & Engineering	Responsible for Overall Design & Engineering for the Project, Review & approve design submissions including vendor documents review for further ordering as per project specification and applicable standards
4.	Head – HSE		• The HSE Head is responsible for designing and structuring a health, safety, and environmental program and implementing it at all the project and O&M sites. • Ensures that there is adequate safety officers / Managers available at the site as per the project Client requirements and provide the required training to

			the HSE officers / Managers to handle the projects sites by ensuring all the safety compliances as per the HSE policy & guidelines and proactively identify the risk to avoid any incidents / accidents. • To review the HSE policies to ensure that they are updated and meet the current trends, and to assess the hazard and risk assessment and develop new regulations by taking into account the recommendations made. • Conducting incident investigations, determining root causes, and auditing. • Ensure that the site team report site monthly HSE Report /HSE KPI Static/Incident/Near miss.
B	**Site Level**		
1.	Project Manager	Project Manager	Project Manager: Responsible for Site Management and Site Incharge. Looking after overall site activity including electrical, civil, mechanical & all the construction related activity. Responsible for site compliance & HSE activities, Sub-Contractor Management, HR & Admin management. Client Coordination and supervision of all project activities. Local manpower and machinery management. Ensure compliance to Environment and social management requirement by every vendor at site as per ESIA, RF, LRP, and other committed documents, resolve Grievances and forward unresolved grievances at Site level to Head office and manage the engagement of the E&S expert. Ensure effective implementation for EHS requirements by contractors, participate in GRM.
2.	Admin & HR Manager	Admin & HR	Site (Site Admin Manager): Reporting to the Project Manager & HR Head, ensure compliance to statutory requirements. Ensure Sub-Contractor labour compliance and employees attendance management. Site store and house keeping administration and vehicle management.

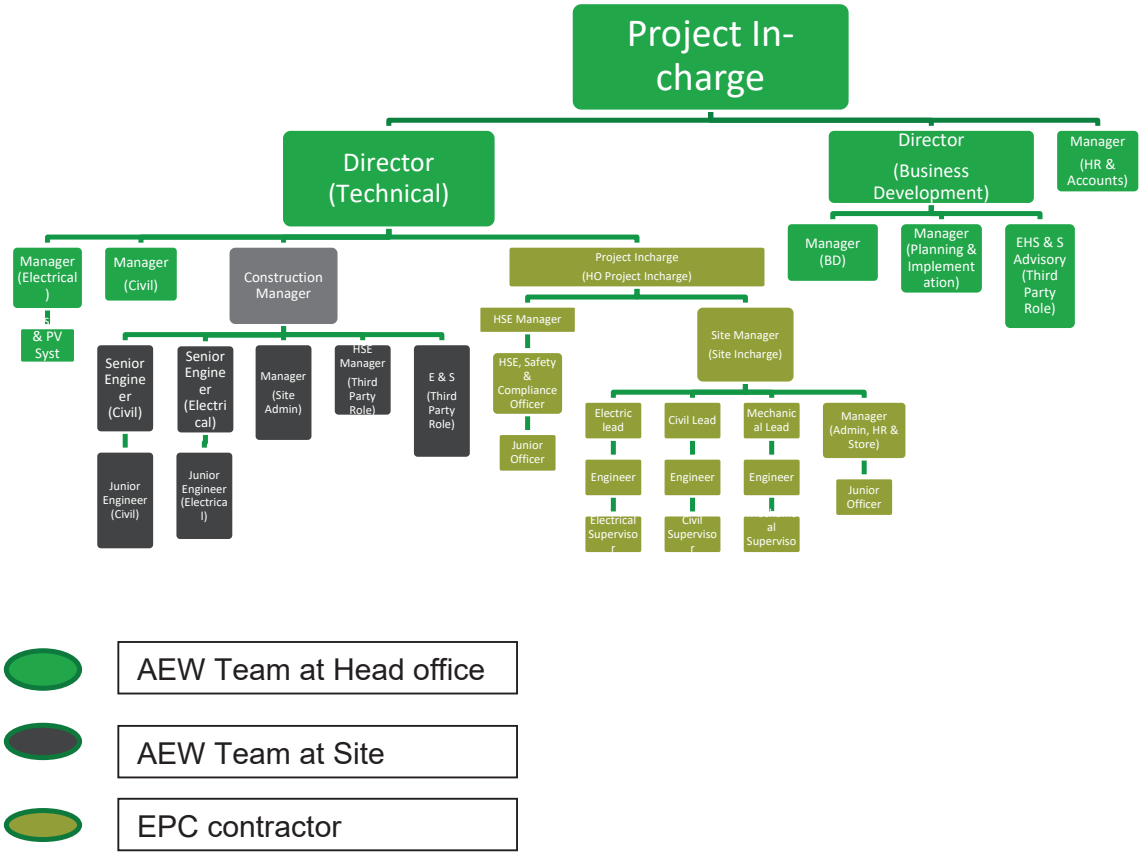
3	Site HSE Manager		The SHSEM is responsible to the SM for monitoring that all site employees conform fully to the relevant HSE requirements. This position has the authority to advise and instruct employees, both BELECTRIC and contractors at all levels on matters relating to HSE. In addition, in case of immediate threat to life, property or environment, this position has the authority to instruct work to cease immediately until the conditions/behaviours have been satisfactorily rectified. However, this position does not take over the responsibility of each individual employer to manage their own risks and to consult their HSE professionals to ensure compliance with their legal duty. The main responsibilities are as follows: • To develop, assist operational managers and supervisors to implement this site HSE plan and ensure continual compliance by all parties engaged on BELECTRIC scope with the requirements of this plan. • To aim for “Zero” severe accident/incident and to pursue the concept that all accidents are preventable. • To minimise BELECTRIC’s potential liability by ensuring that BELECTRIC protects itself against assertions of breaches of HSE regulation in relation to statutory compliance and provide an effective HSE advice to BELECTRIC site personnel to ensure compliance with the applicable local regulation. • To ensure that the HSE coordination of works between the different contractors includes safety matters • To conduct regular reviews of the site HSE plan, environmental management plan, emergency response plan and any other HSE-related site-specific plan, ensuring that they remain effective and relevant to the progress of the site execution maintaining a focus on effective risk management

			strategies and a process of continual improvement. • To develop the site HSE induction program for all levels within the site team and ensure all personnel are familiar with their obligations and responsibilities both in terms of applicable law and this site HSE plan • To develop and/or manage and implement appropriate educational programs in workplace health and safety and environmental awareness • Implement an HSE audit and inspection program, making recommendations for improvement where applicable • To work closely with, and routinely report to, the SM on the overall state of HSE on site and the outcome of all HSE audits and inspections and any continuing non-conformance, hazards or unsafe acts or conditions identified; • To liaise with, and to provide advice and assistance to BELECTRIC and contractors' management and employees on any matter of health, safety and environment legislative compliance, effective risk management, and the implementation and compliance to the site HSE management system • To ensure all HSE records are properly maintained • To investigate, or assist in the investigation, of all HSE events • To coordinate the site HSE incentive and disciplinary schemes • To assist statutory authorities in the performance of their duties while on site

6.1.1 Organization, Roles & Responsibilities

The overall management and co-ordination of the environment, health, safety, and social requirements of the project is being managed by Project In charge of AEW. The project will have adequate staff of specialists and support staff throughout the project life cycle and would be responsible for implementation of mitigation measures, internal and external monitoring and reporting under the ESMP. The project will develop organization chart to fulfil environment, health, safety and social requirements under the ESMP. Depicted below is the organization chart of the project proponent including the EPC Contractor.

Figure 6-1: Organisation Chart



6.2 Inspection, Monitoring and Auditing

Inspection and monitoring of the project activities along with the suggested mitigation measures will minimize adverse impacts and increase effectiveness of environmental and social performance. Through the process of inspection, monitoring and auditing, AEWIWOPL will ensure that all the contractors comply with the requirements of stipulated conditions under various permits as well suggested mitigations (ESMP) for project cycle related activities.

Monitoring of the project is proposed as per the responsibility matrix above.

6.2.1 Environmental & Social Monitoring Plans

The Environmental Monitoring Plan is formulated to ensure and demonstrate compliance with the regulatory and Institutional Agency's EHS requirements. Monitoring of environmental parameters and social plans and comparing environmental parameters with benchmarks set by regulatory and institutional authorities will help AEWIWOPL's assess the environmental performance; social safeguards will be monitored in line with the approved plans, gaps or non conformance will be identified ensuring immediate actions. The following environmental parameters (**Table 6.4)** will be monitored as when required during project construction & operational phase for compliance.

Table 6-4: Environment & Social Monitoring Plan

No	Environmental Quality Indicator (EQI)	Monitoring Parameter	Location	Period & Frequency
A. Environment Parameters				
Construction Phase				
A1	Ambient Air Quality	Measurement of $PM_{2.5}$, SOx, NOx, CO	Study Area villages (within ~ 5-10 km radius from project site)	One sample over 24 hours continuous duration, twice a week on a quarterly basis except during monsoon. Monitoring to be done annually in Operation Phase.
A2	Ambient Noise quality	Measurement of Noise Pressure Level in dB(A)	Study Area villages	Quarterly basis during construction, annually during operation.
A4	Surface Water quality	IS: 2296 Class C Specifications	Near to the project site	Quarterly basis during construction, annually during operation.
A5	Soil Quality	Soil parameters viz. pH, SAR, Water holding capacity, Conductivity, Organic Carbon, NPK	Project site	Once a Year (construction & operation phase).
	ESMP Implementation (*Construction & Operation Phase)*			Contractors (EPC & O&M) will report to the Company on a quarterly basis concerning implementation of the ESMP requirements during construction and biannually during operations.
B. Ecology (Construction & Operation phase)				
B1	Biodiversity Monitoring (during construction & operation phase)	Survey/monitoring during Lesser Florican breeding season (July to September) Weekly Carcass count monitoring along the TL first 2 years of Operation.		
C. Social Safeguards				
Pre-Construction Phase (to be implemented/monitored by AEW/EQMS)				
C1	Resettlement Framework	This is already prepared and will be implemented as per the timelines of Resettlement Framework.		
C2	Land Acquistion Audit	This is already prepared and will be implemented as per the timelines of Land Acquisition Audit.		
C3	Livelihood Restoration Plan	This is already prepared and will be implemented as per the timelines of the Livelihood Restoration Plan		
C4	Community Development Plan	To be Prepared Prior to first disbursement & implemented		

No	Environmental Quality Indicator (EQI)	Monitoring Parameter	Location	Period & Frequency
Construction Phase				
C5	Labour Management (including Workers Accommodation Mgmt Plan, Labour Management, Grievance redressal -internal)	Prepared prior to first disbursement. To be monitored by AEW/EPC Contractor.throughout construction phase.		
C6	Maintain Stakeholder Engagement Plan (SEP) & Grievance Redressal Mechanism (GRM)-external	Prepared prior to first disbursement & implemented throughout project cycle by AEW.		
Operation Phase				
C4	Stakeholder Engagement Plan & Grievance Redressal	EHS & S advisory (Third party role) to ensure implementation & monitoring as per the plan		
C5	Livelihood Restoration/Enhancement Plan	EHS & S advisory (Third party role) to ensure implementation & monitoring as per the plan		
C6	Community Development Plan	EHS & S advisory (Third party role) to ensure implementation & monitoring as per the plan		
C8	Community Health and Safety Management Plan	EHS & S advisory (Third party role) to ensure implementation & monitoring as per the plan		

6.2.2 ESMP Review and Amendment

AEWIWOPL will annually review the ESMP and identified management action plans to address any changes in the organization, process or regulatory requirements. Upon any amendment, the amended ESMP will be communicated to all the staff by the Project Head. External auditing will be carried out half yearly during the construction phase. These reports will be forwarded to financial institution (if required) for necessary review. During operation phase, the external auditing will be done on an annual basis.

6.2.3 Reporting, Review and Communication

AEWIWOPL will ensure external reporting of environmental and social performance through Project In charge. External reporting includes reporting of status of compliance of conditions stipulated under various permits as well as reporting of environmental statement under the provisions of Environment (Protection) Act, 1986 and amendments. Project will ensure mechanism for timely reporting of responses against any complaints or notices issued by regulatory agencies or other stakeholders.

To ensure effective implementation of the ESMP, the inspections and audit findings will be communicated by EHS Technical Advisory team- EQMS Global to ADB & to to all concerned departments of AEW for effective implementation of suggested mitigation measures. Open communication on EHS issues will be ensured on regular basis during the work specific team briefing, onsite work group meetings, work specific instructions and meeting with stakeholders etc.

Reporting will be done on a semi-annual basis.

6.2.4 Documentation & Record Keeping

Documentation and record keeping system need to be established to ensure updating and recording of requirements specified in ESMP. Responsibilities must be assigned to relevant personnel for ensuring that the ESMP documentation system is maintained and that document control is ensured. The following records should be maintained at site:

- Documented Environment Management System.
- Legal Register.
- Operation control procedures.
- Work instructions.
- Incident reports.
- Emergency preparedness and response procedures.
- Training records.
- Monitoring reports.
- Auditing reports; and
- Complaints register, and issues attended/ closed.

6.2.5 Training and Capacity Building

Regular job specific training and EHS induction training needs will be imparted to project personnel and contractors and sub-contractors engaged for the project activities. Specific training will also be imparted to undertake the required ESMP management actions and monitoring activities.

A training needs assessment should be prepared in construction & operation phase based on the skill set required & gaps in the site, training plan to be developed accordingly & implemented. Weekly training is recommended. Training to cover safety issues, workplace hazards & safety practices (electrical, mechanical), environmental & ecological issues & generate awareness among site staff. Effectiveness of training to be monitored by EHS/Project head & reported monthly to the Senior Management.

Training to be be conducted by third party group.

6.3 Management Plans under ESMP

In addition to the suggested mitigation measures, the project will develop and implement following management plans under the ESMP.

- Resettlement Framework
- Livelihood Restoration Plan
- Stakeholder Engagement Plan
- Grievance Redress Mechanism
- Labour Management Plan
- Workers Accommodation Management Plan
- Road Safety and Traffic Management Plan

- Occupational Health and Safety Management Plan
- Community Health and Safety Management Plan
- Emergency Preparedness and Response Plan
- Waste Management Plan
- Biodiversity management plan
- Community Development Plan

All environmental and social management plans relevant to construction phase are required before construction activities commence (Including land clearance and other preparatory works)

The Plans outlined below will be updated and enhanced by AEWIWOPL or the EPC contractor, as relevant.

6.3.1 Grievance Redressal Mechanism

AEWIWOPL should incorporate a GRM Policy mentioning the procedures for lodging of grievances, processing of grievances, resolving grievances and closing of grievances Grievance redressal framework for onsite implementation should also be formulated for the purpose.

However, it must be ensured that:

- The grievance mechanism should be scaled to the risks and adverse impacts of the project.
- It should address affected people's concerns and complaints promptly, using an understandable and transparent process that is gender responsive, culturally appropriate, and readily accessible to all segments of the affected people at no costs and without retribution.
- The mechanism should not impede access to the country's judicial or administrative remedies.
- The affected people will be appropriately informed about the mechanism.

AEWIWOPL will follow their grievance mechanism to ensure that grievances from affected communities are addressed and necessary mechanisms exist for catering to external communications from others. If the client anticipates ongoing risks to or adverse impacts on affected communities, the client will establish a grievance mechanism to receive and facilitate resolution of the affected communities' concerns and grievances about their environmental and social performance. The grievance mechanism should be scaled to the risks and adverse impacts of the project. It should address concerns promptly, using an understandable and transparent process that is culturally appropriate and readily accessible to all segments of the affected communities, and at no cost and without retribution. The mechanism should not impede access to judicial or administrative remedies. The client will inform the affected communities about the mechanism during its community engagement process.

6.3.2 Corporate Social Responsibility

Construction Phase

To empower the local community through different development and support programmes, AEWIWOPL is recommended to take some initiatives for Community Development Plan under their CSR Policy in the project affected village.

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

The CSR activities may include:

- Creating provisions for employment opportunities to the people who are skilled and semi- skilled in project area village.
- Supporting the Anganwadi Centres by facilitating them with provisions of exclusive drinking water and toilet facilities for them in project area village.
- Facilitating the anganwadi centres/ local schools by providing them with amenities like chairs, benches etc.
- Facilitating development and creation of health infrastructure in the project area village, where it is found to be inadequate.
- Promotion of education, including special education and employment enhancing vocation skills especially among children, women, elderly and the differently abled and livelihood enhancement projects.
- Promoting gender equality, empowering women, setting up homes and hostels for women and orphans, setting up old age homes, day care centres and such other facilities for senior citizens and measures for reducing inequalities faced by socially and economically backward groups etc.

Since AEWIWOPL has specific implementation mechanism under their CSR Policy, they should create provisions for the above-mentioned matters and any other pertinent issues. CSR can be funded as per the prevalent laws.

7 CONCLUSION AND RECOMMENDATION

The Project is a white category project proposing to generate 80 MW power through solar energy. The Project and its key components such as access road, project office building, and transmission lines are likely to have potential environmental impacts on baseline parameters such as land use, ecology, water, ambient air quality, noise quality in the immediate vicinity of project during the construction phase. The project is also likely to have potential impact on biodiversity (avifauna) during operation phase due to operation of high voltage transmission line. Most of these impacts due to proposed power project are short term, generally limited to construction phase and operation phase & have negligible, moderate to high environmental, social and ecological impacts.

During bird survey, three male Lesser Florican (*Sypheotides indicus*) (IUCN EN v. 2021-1) were sighted in Jakhan village on three different days, in the grassland about 50-100 m opposite to the project land for the solar power project. Due to their presence in the AOI, adequate measures such as underground TL & bird diverters, also continuous monitoring during display/breeding season has been recommended in the EMP.

The social impacts from the project are assessed to be generally beneficial in terms of local employment and overall local area development

It is important for AEWIWOPL to implement the suggested mitigation measure to minimize the impacts over the environment, social and ecological resources in order to mitigate overall impact significance.

The Environmental and Social Management Plan (ESMP) and specific management plans will help AEWIWOPL in complying with national/ state regulatory framework as well as to meet ADB Safeguard policy framework requirements.