Environment and Social Due Diligence Report

February 2016

IND: Accelerating Infrastructure Investment Facility in India
–Uttar Urja Projects Private Limited

Prepared by

India Infrastructure Finance Company Limited for the Asian Development Bank

6 ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

6.1 APPROACH

The assessment process has taken into consideration the impacts due to project sitting, land preparation, and construction and operation of the Wind Farm project. The Environmental & Social Impact Assessment (ESIA) is undertaken based on the following reference framework and approach:

- Applicable National Regulations;
- IFC's Performance Standards;
- IFC General EHS Guidelines
- IFC's Wind Power Sector EHS guidelines;
- Detailed discussion with project proponent to understand project schedule, technical features, and plans/procedures for construction and operation;
- Desk study of the socio-environmental profile of the project area;
- Field surveys and social consultations to ground-truth the socio-environmental conditions primarily understood from desk study; and
- Field environmental monitoring to establish the baseline environment quality in the locality of the project area.

6.2 IMPACT ASSESSMENT

Compared to the environmental effects of traditional energy sources, the environmental effects of wind power are relatively minor. Wind power consumes no fuel, and emits no air pollution, unlike fossil fuel power sources. Typical activities during the wind energy facility construction, and operation phase include construction, excavation, foundation preparation, turbine erection, soil preparation.

As a result of ESIA study, findings in terms of potential environmental and social risk and impacts from the proposed project have been discussed in relation to IFC Performance standards in the **Table 6.1**. Further, detailed analysis of typical impacts due to wind power projects on surrounding environment is also discussed in subsequent sections. A Social and Environmental Management Plan provided in chapter 7 of this report has been developed to mitigate impacts identified here.

TABLE 6-1: IFC PERFORMANCE STANDARDS – POTENTIAL IMPACT AND RISK

Title of Performance Standard	Performance Standard requirements	Assessment Findings	Recommendation
PS 1: Assessment and Management of Environmental & Social Risks and Impacts	When local communities are affected by risks or adverse impacts from a project, the project will conduct a process of environmental and social assessment and establish and maintain an ESMS appropriate to the nature and scale of the project and commensurate with the level of its environmental and social risks and impacts. The ESMS will incorporate the following elements: (i) Policy; (ii) identification of risk and impacts; (iii) management programs; (iv) organizational capacity and competency; (v) emergency preparedness and response; (vi) stakeholder engagement; (vii) monitoring	An environmental and social impact assessment study was carried out for the proposed wind power project and it has been found that: • A project level Environmental and Social Management System is required and will be developed later on by DJE and UUPL management or by third party consultant. Based on the observation and findings outline of management action plans have been provided in the ESIA study and detailed management plans along with roles, responsibilities and monitoring mechanism will be developed later on as a part of SEMS. The SEMS will guide in implementation of management actions plans. This system will develop the organizational capacity and also help to monitor the environmental and social performance of the project. • Typically construction or operation of a wind power project does not generate emissions and effluent and does not include generation of hazardous materials. Hence, significant adverse environmental and related social impacts from the project on the local community are not envisaged. However, impact due to natural resource consumption in terms of land and water for wind	Social and Environment Management System (SEMS) need to be developed

Title of Performance Standard	Performance Standard requirements	Assessment Findings	Recommendation
	and review	power projects are considered and mitigated through Environment and Social Management Plan. • As per the requirement of PS-1, this ESIA study is carried out to assess the environmental and social risks and impacts due to proposed project. The identified risk and impacts will be mitigated or controlled by the implementation of mitigation measures.	
PS 2: Labour and Working Conditions	The project proponent should provide the workers with a safe and healthy work environment in accordance with applicable labor laws, taking into account inherent risks in its particular sector and specific classes of hazards in the client's work areas. The proponent should take steps to prevent accidents, injury, and diseases arising from, associated with, or occurring in the course of work by minimizing, so far as	The construction work has been started for transmission line only. Temporary arrangements for 6-7 workers have been provided at the material yard location near the sub-station at Daluada to execute the transmission line work. The construction phase for the installation of WTG is not yet initiated. However, recommendations incorporated in this ESIA report to comply the requirements related to labour and working conditions. It will be the responsibility of EPC contractor and subcontractor to comply the requirement of labour and working conditions. Project proponent being a principal employer will ensure it. Following measures will ensure safe and healthy work environment for the workers: It is anticipated that on an average 200 people will be required during construction phase. Out of 200 people approx 5-10 workmen will be	Under the SEMS provision in HR policy and contractors agreement should be made in such a way so that availability of basic amenities and facilities as described under PS-2 should be ensured A Grievance

Title of Performance Standard	Performance Standard requirements	Assessment Findings	Recommendation
	reasonably practicable, the causes of hazards. In a manner consistent with good international industry practice, the client will identify potential hazards to workers, particularly those that might be life-threatening; provide preventive and protective measures, including modification, substitution, or elimination of hazardous conditions or substances; train workers; document and report occupational accidents, diseases, and incidents; and be prepared for preventing and responding to emergencies. The proponent should also ensure that child labour is not availed at any stage of the project.	on the rolls of DJ Energy and UUPL for the supervision of the project and the remaining will be on contract. The company shall ensure that local accommodations with adequate food, water, sanitation facilities are hired for people working in project site. If in case, sufficient accommodations are not available, then only the labor camps will be set up with adequate food, water, sanitation facilities etc. The contractor workforce will comprise of both skilled and unskilled labors and is likely to be sourced from the nearby villages depending on their skills and capabilities. Less than 5% of the total workforce will be female and we expect a project to generate indirect employment of about 100-120 people (5-6 people per village). During the operations phase approx.50 people will be deployed on site including security guards. DJ Energy and UPPLas a principal employer is required to ensure the necessary registration of the EPC contractor and sub-contractors for the establishment in accordance with the provision of Contract Labor Act. Also, the project civil contractors engaging 20 or more contract laborers during the construction phase need to have valid labor license as per the directives of the aforesaid Act. All such civil contractors will maintain necessary documentation for contractual employees viz. Muster Roll, Wages Register, Deduction Register, Overtime Register, Register of Fines, Register of Advances, Wage	Redressal Mechanism has been developed in this ESIA report. It should be reviewed and adopted

Title of Performance Standard	Performance Standard requirements	Assessment Findings	Recommendation
		slip etc. to ensure compliance with the Contract Labor Rules. All contract workers engaged by the project contractor for onsite will be provided with an employment card specifying the worker, contractor and principal employer name, nature of work, wage rate, wage period etc. Adequate surveillance of construction work areas need to be undertaken by EHS manager of project proponent to check for any deployment of child labour onsite which is prohibited under relevant provision of Child Labour (Prohibition and Regulation) Act, 1986. Safety at work will have to be ensured during (a) manual excavation during construction (cut hazard), (b) manual loading and unloading of materials (c) work at height during installation of wind turbines and maintenance work (fall hazard), and (d) working on electrical equipment during repair and maintenance work (electrocution hazard). Taking into consideration the nature of activities expected during the operations phase, the only work-related emergency that seems likely is an outbreak of fire at sub- station but the same will be controlled with fire extinguishers. The company will ensure the health and safety of workers as required by Building and other Construction Workers (Regulation of Employment and Conditions of Service) Act 1996; Contract Labour	

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		Act, 1970 and the Central Electricity Authority (Safety Requirements for Operation, Construction and Maintenance of Electric Plants and Electrical Lines) Regulations 2008. Aligned to specific provision of the aforesaid Act and Rules, adequate measures will be taken by project proponent to ensure proactive efforts are being made by the civil contractors towards provision of welfare facilities in onsite/offsite labour camp for contract workers viz. canteens, restrooms, sufficient supply of drinking water, latrines and urinals, washing facilities etc. In case the construction workers require temporary shelters at site during the construction period, the same will be managed as per the guideline published jointly by International Finance Corporation (IFC) and the European Bank for Reconstruction and Development (EBRD) [10]and relevant provisions of the above-mentioned regulations. Project Proponent will also ensure that adequate compensation is provided by the respective project contractor to the contract laborers in case of any death or personal injury (resulting into total or partial disablement) that might arise from construction work and related activities.	

[10]"Workers accommodation: process and standards" guideline published by IFC and EBRD. It addresses the processes and standards that should be applied to the provision of workers' accommodation in relation to projects funded by the EBRD or IFC.

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		In line with the IFC PS requirements for development and implementation of SEHSMS, Occupational Health and Safety Procedure and Worker Accommodation Guidelines including applicable national labour legislations will be developed and implemented by project proponent in different phases of the project life cycle. This includes ensuring provision of adequate PPEs by contractors to the workforce, supply of potable drinking water to contractor workforce, medical support, adequate sanitary facilities, rest room, kitchen etc. Further the project proponent willenhance awareness of the contractor workforce on occupational health and safety risks through implementation of training programs in accordance with SEHSMS. Project proponent need to ensure incident reporting and investigation as integral to its SEHSMS and the same has been communicated to the project contractors	
PS 3: Pollution Prevention and Abatement	The project proponent should ensure that adequate control techniques are provided to minimize emissions or achieve a pre-established performance level. The proponent should	***Ambient Air Quality*** The wind power plant has no point or fugitive sources of air emission during operational phase. However, during construction phase, fugitive dust generated due to excavation work and material handling can temporarily contribute to the ambient air pollutant load at the	Pollution prevention and abatement plan should be developed to control the

Title of Performance Standard	Performance Standard requirements	Assessment Findings	Recommendation
	ensure that generations of hazardous wastes are minimized and handling, storage and disposal are managed properly to prevent any adverse social and environmental impacts. Reasonable inquiry about the location of the final disposal of their waste, even if the disposal is conducted by the third party and especially if the waste is considered to be hazardous to human health and the environment should be carried out.	work site. DG set operation for power supply during construction phase and vehicular emissions may leads to increase in air pollutant levels in ambient air. Considering relatively short construction period, impact of DG and vehicular emissions and dust generation is not likely to cause any community health and/or environmental impacts. The increase in air pollutant concentration caused by the proposed project during its constructional phase is expected to be short-lived and insignificant. ***Ambient Noise Level*** Ambient noise level surrounding the wind mill locations may be impacted during construction and operation phase. However, impact will be short lived during construction phase. In operational phase, aerodynamic noise from wind mills may impact ambient noise level up to certain extent. In order to quantify the impact on settlements existing within 200 m from WTG, noise propagation will be computed through noise modeling.	impacts on environment Consensus will be sought from the local communities, prior to extraction of water from nearby water bodies

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		Water During the construction phase water will be either sourced from the tankers or from nearby existing bore well on chargeable basis. Preferably, local villagers will be selected to fulfill water requirement through contractors and in this way employment opportunities will be developed for the local people. Common property resources like water pond which is being used by community will not be disturbed for project cause. However, a possibilities of using water from pond always exist due to close proximity with WTG locations therefore prior consent should be taken from community before using water from these ponds ***Waste Water*** In the proposed project, pooling substation will be developed at Bathkheda village. There is a pond existing at 80 m (approx.) away from pooling substation location which has risk of contamination during construction phase. During the construction phase, waste water from labour camp may deteriorate quality of nearby existing water pond therefore sanitation arrangements like mobile toilets and septic tank system for the disposal will be provided. During operational	

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		phase, 7-8 people will be present in site office therefore very low quantity of sanitation waste water is expected which will be treated through septic tank soak pit system. ***Hazardous Waste*** • During construction phase, used oil from DG sets shall be collected and recycled through approved recycler • Hazardous wastes such as empty paint containers (generated when the control room building/site office is painted) shall be handled and disposed in a manner that contamination of soil or groundwater is avoided. • Diesel oil and other paint containers may contaminate soil at the storage area, if not stored properly. Therefore, appropriate arrangement should be provided for the storage of hazardous waste.	
PS 4: Community Health, Safety and Security	The project proponent should avoid or minimize risks to and impacts on the health and safety of the local community during the project life-cycle from both	• With no significant emissions to air, effluent discharge and hazardous processes, the threat to community health and safety is minimal. Septic tank-soak pit system, if not built with proper design, may contaminate the groundwater and surface water (near	• Emergency Management Plan • Grievance Redressal

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	routine and non-routine circumstances. The proponent should also ensure that the safeguarding of personnel and property is carried out in a legitimate manner that avoids or minimizes risks to the community's safety and security. The proponent should avoid or minimize the exacerbation of impacts caused by natural hazards, such as, landslides or floods that can arise from land use changes due to project activities.	pooling substation). Soil percolation capacity and depth of groundwater must be considered during designing. Integrity testing is to be done during commissioning to ensure that groundwater is not polluted. • Movement of heavy vehicles carrying materials and machines for a short period of time is expected to disturb the local communities. Especially, locations where villages/cluster of settlements is in close proximity to the WTG are more sensitive with respect to community disturbance. This disturbance can be minimal provided that the locals are informed prior to beginning of such activities. However, traffic related stalls like congestion might pose reputational risks for the company hence sufficient management measures viz. maintenance of low vehicular speed limits, deployment of traffic marshals at key junctions, regulating night time movement of vehicles etc., need to be implemented to control vehicle movement near the village settlements and sensitive places like settlements and schools. During operations, only two or three site engineers will be operating on a daily basis between base location and the project site. The security staff is planned to be locally employed from nearby villages.	Mechanism • Traffic Management Plan as developed in this report should be reviewed and followed

Title of Performance Standard	Performance Standard requirements	Assessment Findings	Recommendation
		• Workforce (~200 nos.) required during construction phase will be sourced both locally from nearby villages and migratory labour depending on their skill sets. The company will ensure that there is no conflict between the migrant workers and the local people, as this could adversely affect the reputation of the company. Since, a large population of female sex workers are residing in the nearby area therefore necessary safeguards will be implemented to prevent sexually transmitted diseases among migratory workers. • Local people will be employed as security guards, as expected by the local people. Individual or group protest against the project is not a likely scenario because of the non-polluting nature of the project and positive perception of the locals about the wind power project as identified during the public consultations. However, company must be prepared for unforeseen emergencies such as an individual or group protest against the project, falling of windmill towers and such situations should be considered as an 'emergency'. The company will have to be prepared for such an emergency situation, ensure adequate management measures to handle such an emergency. In this regard, the company needs to develop and implement a community engagement and grievance redressal procedure to address any such potential conflicts and/or	

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		concerns and emergency management plan. • Transmission line is routed through revenue and private agriculture land in such a way to causes least disruption to local communities. • DJE and UUPL have HSE plans and they will ensure community safety during their operations. All the health and safety risk associated with the project activities will be covered through this plan. HSE plans can be referred in Annex-6 of this report	
PS 5: Land Acquisition and Involuntary Resettlement	The primary objective of IFC PS5 is to avoid or at least minimize involuntary resettlement wherever feasible by exploring alternative project designs; to mitigate adverse social and economic impacts from land acquisition or restrictions on affected persons' use of land; and to improve or at least restore the livelihoods and standards of living of displaced persons.	• To setup the proposed project, government revenue and private agricultural land is being procured. Under the proposed project, WTG will be installed on the government revenue land only whereas for the development of access road and transmission line, private land will also be required at some places. • Government revenue land has been allotted by Revenue Department for the installation of wind power project on approval and recommendation of Madhya Pradesh Urja Vikas Nigam	During execution of the project, the company will adopt various engagement measures with the local communities and the state government, to mutually agree on measures /

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		(MPUVN) • During the ESIA study, it is observed that some of the government revenue land is encroached by local villagers for practicing seasonal cultivation at some places near the proposed WTG locations. Encroachment in the form of small temporary house has also been observed near the WTG locations. However, WTG locations are free from encroachment. None of these encroachments seem to be regularized in any manner, as financial penalties are being imposed on them by the government. Although WTG locations are free from encroachment but the access roads may passes through nearby encroached land parcel at some locations viz., UUPL 10. Considering the limited nature of encroachment the company can mutually agree with these encroachers for compensation to evacuate these lands in view of safety during transportation of WTGs. • In case of development of access road and transmission line, private land is being purchased on willing to sell and willing to buy basis. As reported, compensation is or will be paid to the land owners after negotiation and it will be much higher than the	compensation for the WTG locations to be made free of encumbrances – in view of safety of these communities during construction phase.

Title of Performance Standard	Performance Standard requirements	Assessment Findings	Recommendation
		market price.	
PS 6: Biodiversity Conservation and Sustainable Natural Resource Management	The primary objective of PS 6 is to protect and conserve biodiversity and to promote the sustainable management and use of natural resources through the adoption of practices that integrate conservation needs and development priorities.	During the ESIA study, the ecological sensitive areas (enlisted below) have been identified in the nearby area. Based on Indian Bird Conservation Network's[11] the publication of Important Bird Areas in India, these ecological sensitive areas have been identified as Important Bird Areas (IBA). • Sitamata wild life sanctuary located at aerial distance of approx. 50 km west from the project site • Gandhi Sagar Reservoir and wildlife sanctuary at aerial distance of approx. 80 km Northeast • SailanaKharmor Sanctuary at aerial distance of approx. 22 km Southwest To assess the impact of wind power project and presence of migratory bird's species in the area, a rapid survey has been carried out by an ecological expert for one week period. During the study, 4 species of migratory birds have been identified near the water bodies in Kalukhera and Bagiya. Local species of birds have also been identified in the area near the water bodies. The presence of large	Detailed study will be carried out to find the important birds location (hot spots) in the project site area and their movement after the commissioning of the project A conservation and management plan based on the findings of detailed study post-

[11]The Indian Bird Conservation Network (IBCN) is a network of individuals, organizations and government. It was established in 1998 by the Bombay Natural History Society (BNHS) in collaboration with Bird Life International, UK and the Royal Society for the Protection of Birds (RSPB) – Bird Life Partner in the UK. The IBCN is promoting the conservation of birds and their habitats in India and strengthening the biological diversity of the region.

Title of Performance Standard	Performance Standard requirements	Assessment Findings	Recommendation
		water bodies (water dams in SW, NW and NE) and food do favour the conditions for birds, and therefore migratory as well as local bird species can be observed in the area potentially limiting to winter season. However, the water bodies in proximity to the proposed WTG locations are seasonal and most of the species observed in the area are under the least protection status of conservation. The wind farm operating nearby have so far not reported any particular instance of bird and bat collisions. In view of these facts and observations, the risk to biodiversity due to the proposed development is low.	commissioning will also be developed Also, a record of bird mortality (if any) will be recorded during the initial operational phase of the project, and feedback action planned accordingly.
PS 7: Indigenous People	This Performance Standard requires that the project proponent should respect and preserve the culture, knowledge and practices of Indigenous Peoples (known as Scheduled Tribes in India); avoid adverse impacts of projects on communities of Indigenous Peoples or when avoidance is not feasible, should minimize,	The proposed project does not fall in scheduled areas and also does not have a significant scheduled tribe population; therefore this Performance Standard does not get triggered.	Nil

Title of Performance Standard	Performance Standard requirements	Assessment Findings	Recommendation
	mitigate, or compensate for such impacts; provide opportunities for development benefits in a culturally appropriate manner; and when projects are to be located on traditional or customary lands under use by the Indigenous Peoples, foster good faith negotiation with them.		
PS 8: Cultural Heritage	This Performance Standard requires that the project proponent should protect areas and structures of cultural heritage (such as tangible property and sites having archaeological, paleontological, historical, cultural, artistic, and religious values, as well as unique natural environmental features that embody cultural values, such as sacred groves) from the adverse impacts of project activities and extend support in their preservation.	No significant structure of archeological importance is present on the project site. However, old temples and mosques have been observed close to the project site which may be of religious importance for the local communities. Also, community sentiment is generally linked with these structures and any disturbance to these structures may cause community dis-satisfaction. Therefore, project activities and movement of heavy vehicles will be planned in such a way so that no disturbance will happen to these structures	Chance find procedure as developed in this report should be followed.

Title of Performance Standard	Performance Standard requirements	Assessment Findings	Recommendation

6.2.1 Waste Water

Impact during Construction & Decommissioning Phase

In the wind power plant, the waste water during the construction and decommissioning phase is sewage only. The sewage will be generated from the labour camp. Considering the 80% of domestic water consumption as waste water, approximate 49.6 KLD of waste water generation is anticipated. Due to the presence of water pond near the proposed labour camp location at Bathkheda, possibility of contamination exists.

Mitigation Measures

Considering the absence of sewerage collection and network system, discharge of domestic sanitary water should be managed through septic tank system. Also, enough distance should be ensured between drain field and the ground water table or nearby receiving water body.

Impact during Operational Phase

During operational phase, no major impact is envisaged on nearby water bodies and ground water. Minor volumes of sewage will be generated from toilet facilities at the site office.

Avoidance or Mitigation Measures

This sanitary waste water should be disposed through septic tank, thus no significant impact is anticipated to surface or groundwater

6.2.2 Air

Impact during Construction & Decommissioning Phase

Being a clean category project and absence of air pollution source, major impacts on air pollution is not anticipated. However, emissions from the construction and decommissioning activities viz., site clearance and restoration, road construction and foundation preparation will lead to dust generation. Movement of project vehicles will also cause exhaust of construction machinery and equipment including generators (e.g., CO, NO_X, PM, SO_2, etc.).

Mitigation measures

- Materials and earthwork should be stored in covered area.
- Water suppression should be used on loose material and unpaved road surface
- Transportation of material will be in covered truck to avoid fugitive dust emission

Impact during Operation Phase

Emissions during this phase will be limited to exhaust emissions and dust generation from a low number of vehicle movements for maintenance purposes. The main impact of the project on air quality will be the benefit provided by the replacement of conventional power generation with Renewable energy. Wind energy will replace fossil fuel power energy generation (primarily coal powered); therefore carbon dioxide emissions into the atmosphere will be reduced. Overall the project will have a beneficial impact on air quality due to the replacement of non-renewable energy generation.

6.2.3 Noise

Impacts during construction & decommissioning phase

The major impact on ambient noise level during construction and decommissioning phase is due to the operation of equipments and movement of heavy vehicles on the project site. The construction activity will be mainly carried out during day time. Project construction involves activities such as road construction, grading, excavating and drilling of tower foundations, concrete batching, tower erection, construction of ancillary structures, and operation of diesel generators, concreting, material movement and site cleanup. During the decommissioning phase, dismantling activities to restore the site in its previous form will cause noise.

Noise levels generated by equipment vary significantly depending on the type and condition of equipment, operation methods and schedule, will be generally in the range of 84–109 dB(A).

Noise Propagation – Mathematical Estimation

During noise propagation, initial energy in noise is distributed over a larger area, and as the distance from the source increases, it leads to reduction in noise pressure level. Thus assuming spherical propagation, the same energy that is distributed over a square meter at a distance of one meter from the source is distributed over 10,000 sq. m. at a distance of 100 m away from the source. (Anthony L. Roagers, march 2004). To estimate the sound pressure level at a desirable distance following simple model calculation is used.

$$L_p = L_w - 10 \log_{10} (2\pi R^2) - \alpha R$$

Here, Lp = sound pressure level (dB) at a distance of R from a noise source radiating at a power level,

Lw= sound pressure level (dB) at source

R = distance of receptor from source

α = frequency dependent sound absorption coefficient.

The above given equation can be used with either broadband sound power levels or a broadband estimate of the sound absorption coefficient (α = 0.005dB (A)/meter).

Using the above given equation, it is calculated that at a distance of 100 m from the source of sound power level 102 dB(A) the estimated sound intensity level would be 53.5 dB(A) which is less than the ambient noise level in the area i.e. 60 dB(A).

As the surrounding villages are located at the distance of more than 100 m, construction phase noise during day time will not have a significant impact on existing ambient noise levels at villagers. However, at some places individual and small cluster of household exist at a distance of less than 100 m and may be impacted due to construction activities noise. Also, at ground situation may vary due to operation of many equipments and machineries at a time simultaneously therefore mitigation measures should be implemented to reduce the cumulative noise.

Mitigation measures

- To reduce the impact on sensitive settlements viz., school and temple (within 100 m distance) noise barrier or curtains will be provided at the construction site.
- Workers in close proximity to machines are prone to exposure of high levels of noise of machinery. This will be taken care by proving personal protective equipment like ear plugs/muffs and workers will be rotated in shifts to avoid long term noise exposure.
- Working hours will be restricted to day time only.
- During decommissioning noise barrier should be installed at project site to minimize the noise impact on nearby settlement (individual and cluster of households)

Impacts during Operation Phase from Wind Turbines

Well-designed wind turbines are generally quiet in operation, and compared to the noise of road traffic, trains, aircraft and construction activities. Some of noise levels for different activities are as follow:

TABLE 6-2: INDICATIVE NOISE FROM DIFFERENT ACTIVITIES

Source/Activity	Indicative Noise Level dB (A)
Threshold of hearing	0
Rural night-time background	20-40
Quiet bedroom	35
Wind farm at 350m	35-45
Car at 40mph at 100m	55
Busy general office	60
Truck at 30mph at 100m	65
Pneumatic drill at 7m	95
Jet aircraft at 250m	105
Threshold of pain	140

Source: The Scottish Office, Environment Department, Planning Advice Note, PAN 45, Annex A: Wind Power, A.27. Renewable Energy Technologies, August 1994
Committee on Environmental Impacts of Wind Energy Projects, National Research Council (2007).Environmental Impacts of Wind-Energy Projects, p. 158-9.

As the above table shows, the sound of a working wind farm is actually less than normal road traffic or an office noise.

Source of Noise in Operation Phase

During the operational phase, noise will be generated from rotor movement through the air, turbine operation, vehicle movements, and machinery operation around the site for maintenance and repair purposes. Due to wind mill operation, mechanical and aerodynamic noise is produced which may have impact on nearby communities.

Mechanical noise generation: Mechanical noise originates from the relative motion of mechanical components and the dynamic response among them. Source of such noise

includes gearbox, generators, yaw drivers, auxiliary equipment. Since the emitted noise is associated with the rotation of mechanical and electrical component, it tends to be tonal (of a common frequency) and low contributor to the wind turbine noise.

Aerodynamic noise generation: Aerodynamic noise originates from the flow of air around the blades. Aerodynamic noise generally increases with rotor speed. Aerodynamic noise is generally the major source of wind turbine noise.

Aerodynamic noise generation is very sensitive to the speed of translation at the very tip of the blade. To limit the generation of aerodynamic noise, modern wind turbines limit the rotor rotation speeds. Large variable wind turbines in general rotates at slower speeds in low winds and its rotational speeds increases with increase in wind speed until the limiting rotor speed reached. This resulted in much quieter operation in low winds than a comparable constant wind speed turbine. Recent improvement in mechanical design of wind turbines have resulted in significantly reduced mechanical noise from both broadband and pure tones. Thus the noise emission from modern wind turbines is dominated by broadband aerodynamic noise (Fegeant, 1999). The aerodynamic noise is detectable when it is greater than the background noise, generally at wind speed greater than 8 meters per second.

Considering the result of noise modeling as carried out in above section for a source of 102 dB(A) and reduction in noise intensity during propagation, impact on receiver at a distance of 200 m will be insignificant. However, in the proposed project, some households and villages are observed at a distance of 100 m or less therefore impact of noise on these locations may be significant. To assess the significant noise impacts due to operation of wind turbines, noise modeling has been carried out for the proposed project.

Noise Propagation – Noise modeling.

Considering the cumulative noise impact due to cluster of proposed wind turbines and locations where settlements (individual and cluster of households) are close to the WTG (within 100 m), noise modeling has been carried out. The estimation of cumulative noise propagation in a complex terrain using mathematical equations will limit the accuracy therefore detailed noise modeling has been carried out.

Analysis of Noise Modeling Results

The ability to hear wind turbines noise depends on the ambient noise level. When the background noise level and wind turbine noise are of the same magnitude, the wind turbine noise gets masked by the background noise. Therefore wind turbine noise level of lower magnitude than background noise level can be considered as insignificant.

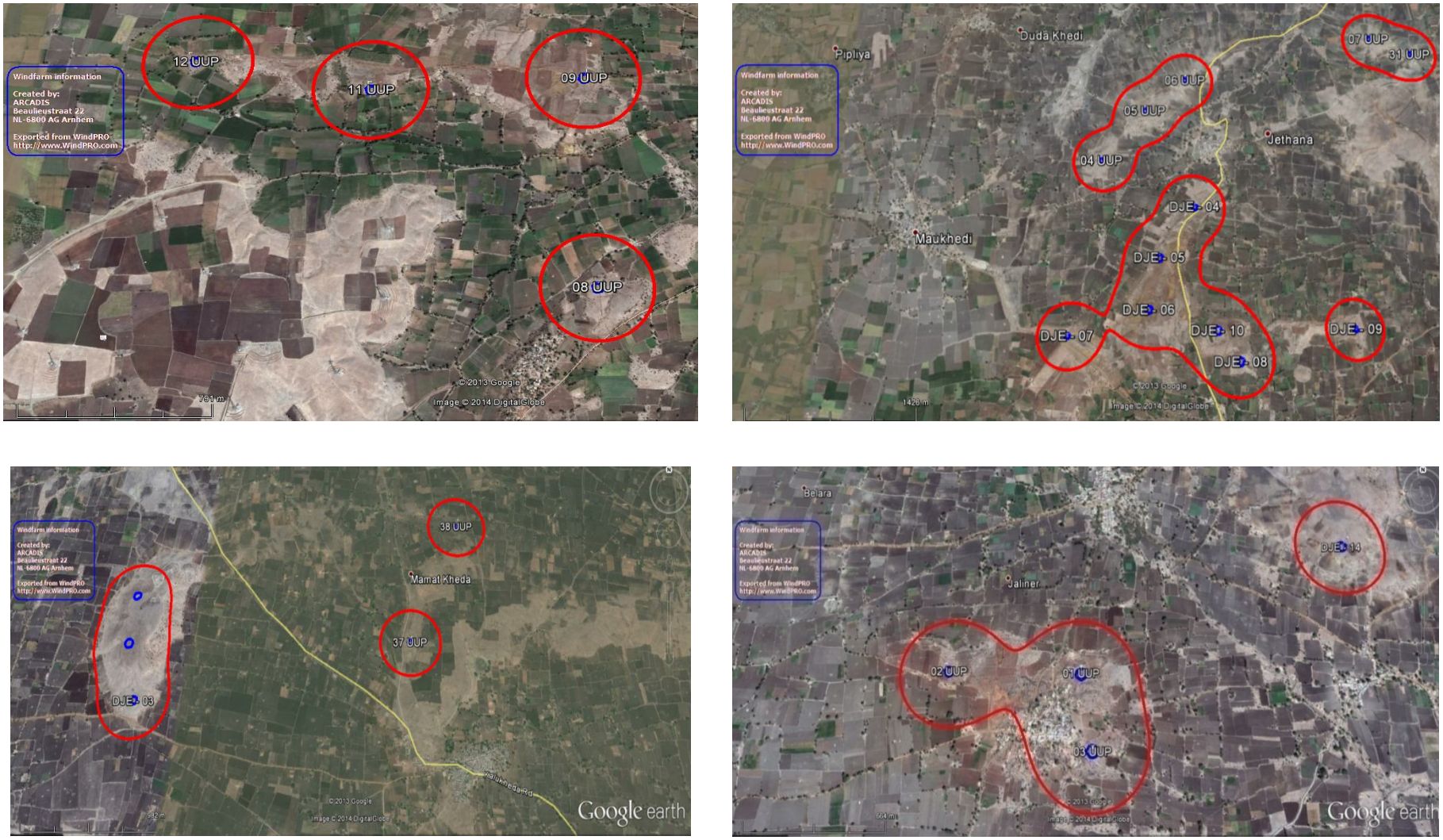
The impact zone assessed from noise modeling is shown in **Figure-25** .Analysis of modeling result reveals that some of the villages could be impacted by cumulative noise. However, considering the distance between WTG and nearby settlements, reduction in noise during propagation and background ambient noise level, impacts are insignificant at most of the

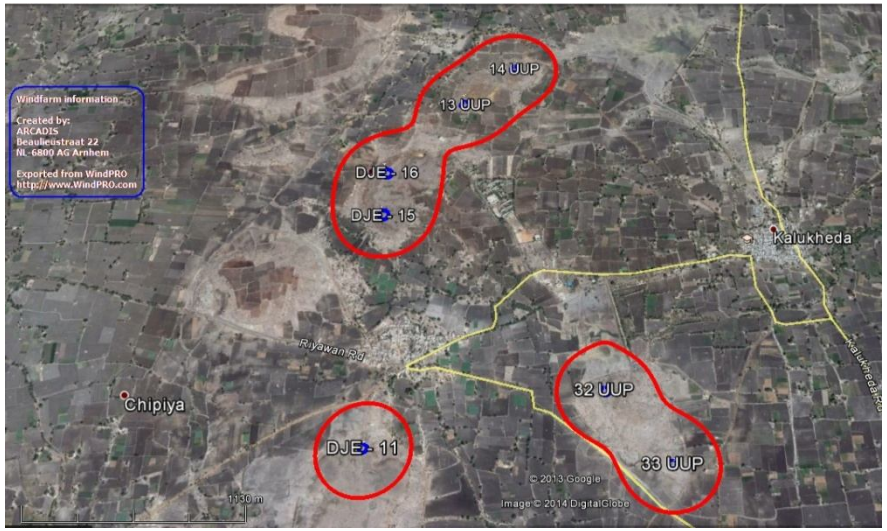
locations whereas at some locations these impacts are mitigable. Details of the possible impacted locations (UUPL 29, UUPL26, DJE 24 and DJE 36) and mitigation measures are given in Annexure -1.

Mitigation Measures

The impact of individual WTG noise on ambient noise level during operational phase will be very low and insignificant at a distance of 100 m. However, individual and cluster of houses located at a less than 100 m may be impacted due to cumulative noise. To reduce the cumulative noise on the sensitive receptors, artificial noise barrier and plantation along the boundary of these receptors will be short term and long term mitigation measures respectively.

Figure 25: Noise Modeling – Impact Zone




Windfarm information
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ARCADIS
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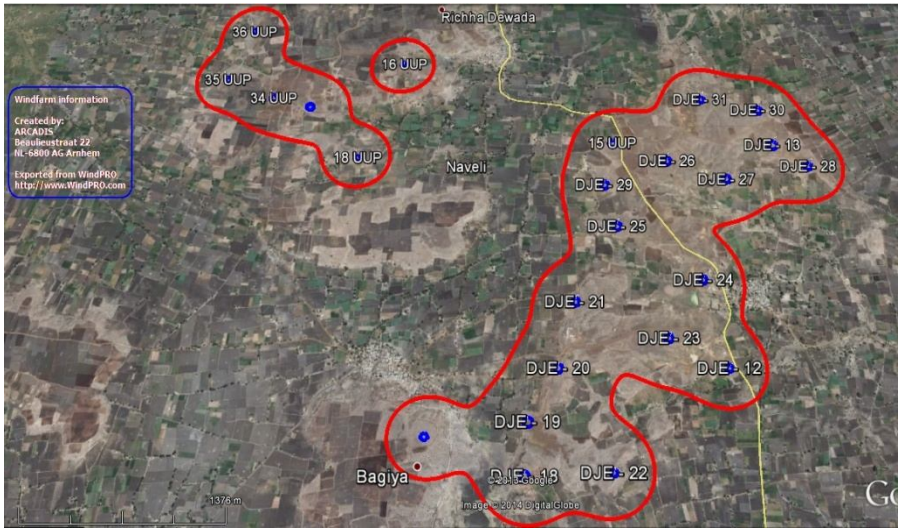
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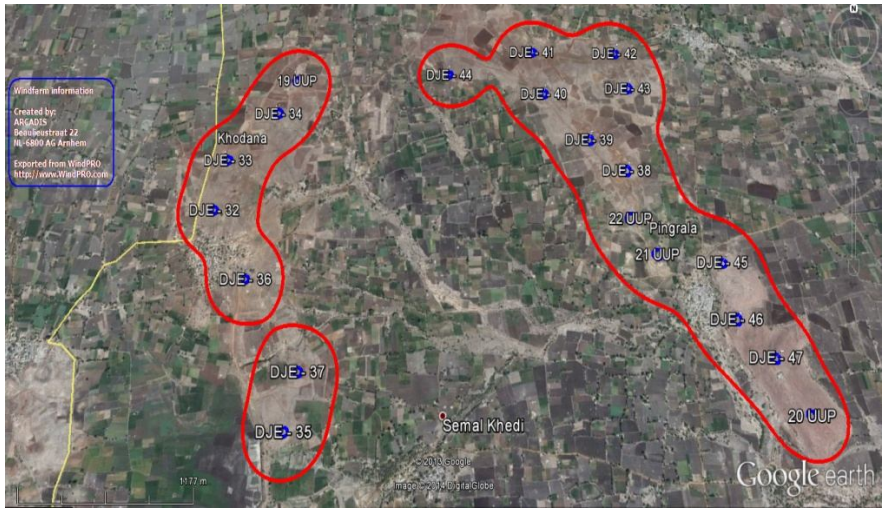
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6.2.4 Land

Impacts during construction and decommissioning phase

The range of potential project impacts on land include land disturbance (creating erosion and sedimentation), disposal of excess soil, and soil contamination.

Activities that cause land disturbance include installation of tower foundations, road preparation, excavation, and dismantling activities during decommissioning phase etc. The soil will be mainly excavated for laying foundation of towers, site leveling and road work. During installation of wind turbines, small quantity of packaging waste will be generated at the location on wind turbine which may cause community nuisance if not managed properly. Further, soil contamination may occur if fuel, used oil and sanitary waste were not stored and managed properly.

Mitigation Measures

- Excavation will be carried out to the minimum.
- The excavated earth material will be utilized on site for road soling and site leveling as per requirement.
- The roads will not be paved and only soling will be done with excavated earth & rock material, so land disturbance will be minimized.
- The cranes used for construction activities will be placed on hard, flat surface and if required, ground leveling will be done.
- Care will be taken to collect all the waste generated during installation of wind turbine at a designated place so that it does not spread and stored in the nearby areas specifically nearby agricultural lands. Installation team will ensure management of waste through vendors.
- Used oil and fuel oil will be stored in covered area on impermeable surface. Also, Waste water holding tanks / septic tank will be located at more than 200 m away from bore wells or any other underground water holding tanks in surrounding areas.

Impacts during Operation Phase

Very small quantity of solid waste will be generated by workers during project operation, and impact due to it will not be significant. Any hazardous waste like paint containers and transformer oil may cause soil contamination if not stored properly. Other waste will be disposed to local waste disposal area with permission of concerned authority/body.

Mitigation Measures

- Oil and paint container will be handed over to the vendors for proper disposal.
- Transformer oil will be stored in container. Further, impermeable surface will be provided in the storage area to prevent soil contamination due to oil spill and leakage

6.2.5 Effect on Rainfall

Wind farms by their very design do not act as a solid obstruction to cloud. Therefore, they do not induce enough vertical velocities to result in any appreciable change in precipitation. The flow computations past the windmill blades show no perceptible change in temperature field. Hence, there would be no change in cloud morphology. Thus windmills have no effect on rainfall[12].

6.2.6 Effect on Avifauna

Wind farms can harm birds in three possible ways – disturbance, habitat loss or damage (both direct and indirect), and collision. The topography of the project area is mixed type i.e. flat as well as undulating pattern due to which wind density is not uniform in the area therefore individual wind turbines located far away from each other. Enough space is available between two consecutive wind turbines andit can be used as fly way by birds. Based on Indian Bird Conservation Network's[13] the publication of Important Bird Areas in India – Madhya Pradesh and Rajasthan have Sitamata wildlife Sanctuary, Gandhi Sagar Sanctuary and SailanaKharmor Sanctuary. As per the list of Important Bird Areas in India – Madhya Pradesh and Rajasthan, these sanctuaries come under IBAs.

As the land requirement to setup the wind turbines is relatively low, it is not anticipated to being in any kind of habitat loss. Also, project area is not a designated or qualifying site of national and international importance for biodiversity. However, during the preliminary study conducted as a part of ESIA, species of migratory as well as local birds have been identified in the area, especially near the water bodies. None of the these water bodies will be impacted due to siting of these WTGs. Photographs of bird species observed in the project site area is given *here as Annex-3*

Bird study for the proposed project reveals the presence of migratory bird species at the seasonal ponds that are in proximity tho the area where WTGs are proposed. Due to the movement of migratory bird species among the three important bird areasin south west, northwest and north east of project site, these species are observed in the project site also. Presence of these species in the area specially in winter season when water bodies are in plenty with in the project site create the requirement for implementation of mitigation measuresto ensure bird safety especially for the bird sighted locations. The existence of bats and roosting site near UUPL 34 & 35 also support the requirement for identification and implementation of mitigation measures to conserve the birds and bats. Based on the result of

[12]Windmills and Rainfall, Expert Committee Report, Government of Maharashtra, July, 2004. This report contains the results of the scientific study conducted by the committee on the windmill – rainfall relationship over the Sangli region.

[13]The Indian Bird Conservation Network (IBCN) is a network of individuals, organizations and government. It was established in 1998 by the Bombay Natural History Society (BNHS) in collaboration with Bird Life International, UK and the Royal Society for the Protection of Birds (RSPB) – Bird Life Partner in the UK. The IBCN is promoting the conservation of birds and their habitats in India and strengthening the biological diversity of the region.

bird and bats study conducted for the proposed project, mitigation measures have been identified and suggested in EMP chapter of this report.

6.2.7 Traffic

National Highway (NH-79) and village roads originating from this highway will be utilized during construction and operation phase for vehicular movement.

Impacts during Construction and Decommissioning Phase

The vehicular movement in construction and decommissioning phase will be much higher in comparison to operation phase. The impacts identified due to the heavy traffic movements are as follows:

- Disturbance to the villagers in terms of increased noise level due to the heavy traffic movement
- The condition of roads which will be used for the project vehicles will be damaged due to movement of heavy trucks, cranes etc.
- Increased traffic movement may increase accidents due to rash driving

Mitigation Measures

- With low movement of population in surrounding area due to lack of industrial areas and commercial activities, low traffic was observed on village roads. Addition of construction vehicles on village will be for a shorter period of time limited to construction phase only.
- The villages roads will be developed maintaining proper slopes for the movement of vehicles. Also, tarring/ paving of roads will not be done. Flags/signs will be displayed to help smooth flow of traffic. Further, during the development of roads and site preparation, all the drainage courses will be properly channelized to maintain the drainage pattern of the area.
- All the precautions will be taken to avoid any kind of accident and damage to surroundings. As the construction and decommissioning period is limited, impact on traffic will not be significant. However, In view of movement of heavy vehicles carrying WTGs and construction and dismantled material, every lot of transportation will be pre-planned and villagers will be intimated for the same

Impact during Operational Phase

Vehicular movement in operation phase is negligible. Only maintenance staff and their vehicles will be present and hence no significant impact is envisaged.

6.2.8 Seismic Hazard

The project site is located in seismic zones III as per the seismic zoning map of India (IS 1893–1975). Accordingly, this seismic hazard has been taken into account in the design of the turbine foundations to prevent tower failure in the event of shocks.

6.2.9 Socio-Economic

In the proposed project, land requirement will be restricted to a relatively small area under WTG, project access roads, transmission lines, etc. The encroachers, who could be exposed to safety hazards from construction activities and movement of heavy vehicles, will be identified and supported by the company for temporary displacement, on a mutually agreeable basis. Similarly, the landowners from whom land will be leased or Right of Use rights will be sought will be compensated at market rates on a mutual agreement and on a willing buyer – willing seller basis. The developer is committed to providing employment to locals in the project but due to the skilled and highly skilled manpower requirements for the setting up and operation of the WTG, local labor requirement will be limited to unskilled construction work and security staff. The project will provide direct employment where ever possible in the form of casual labor, skilled labor, office staff, primarily during project construction and operation, thus helping improvement of local economic conditions. No impact on the health and culture of local residents is predicted as the scale of construction is small and for a short duration of time.

The site does not contain any archaeological monuments or sites as per the Archaeological Survey of India. However, religious structures like temples and mosques exist at some locations within the project site area and will be protected from any kind of damage from construction.

6.2.10 Aviation Hazard

No aviation hazard will be created by the Project as it is located 200 km from the nearest airport at Indore.

6.2.11 Shadow Flicker

Impacts during construction phase

Shadow flickering effect is absent during construction phase. It is limited to the operataional phase only due to movement of WTGs

Impacts during operational phase

Shadow flicker, a repetitive variation of light intensity caused by passing shadows of rotating wind turbines blades, is a potential annoyance. The light effect is caused when the sun is positioned behind a rotating wind turbine. With the sun in the background, large moving shadows can be produced which some people may find disturbing. The table below shows the approximate sensitivity to shadow flicker at different RPM for three blade turbines, according to Stankovik*et al.*

Flicker Rate (Hertz)	Human Perception	Equivalent RPM Rate for a 3-Bladed Turbine
< 2.5	Negligible Effect	<50
2.5 - 3	May Affect 0.25% of the Population	50-60
3 - 10	Effect is Perceptible	<200

10 - 25	Greatest Sensitivity	200-500
>50	Continuous Light Source	1000

Larger turbines generally operate between 18 and 45 RPM, while smaller turbines generally operate below 15 RPM (Stankovik et al., 2009, p.96). The present design of wind turbines for this project is designed with rotor speed of 15.7RPM for INOXWT2000DF. So the effect is expected to be negligible. However, some research studies and guideline sets limit on the duration of shadow flickering like 30 hrs./year and 30 min/day. It has been stated that "Flicker effects have been proven to occur only within ten rotor diameters of a turbine" (Office of the Deputy Prime Minister, 2004, p.178). The greater the distance between the turbines and the observer the less noticeable the shadow flicker will be (Office of the Deputy Prime Minister, 2004, p.177)[14]. As the villages are located at least 100-200 m from project site, the shadow flicker effect is expected but it will be weighted by detailed assessment.

Shadow Flickering Modeling

To assess the effect of shadow flickering and its impact zone due to the proposed project, shadow flickering modeling using Windpro model has been carried out and result in the form of impact zone can be seen in **Figure -26**. Within these impact zone settlements (households and villages) will get potentially exposed to the shadow flickering effect (>30 mins/day and 30hrs/year).

Scenario

The modeling has been carried out for worst case scenario assuming 100% of shunshine during daylight hours and the wind turbines always rotating and perpendicular to the receptor areas.

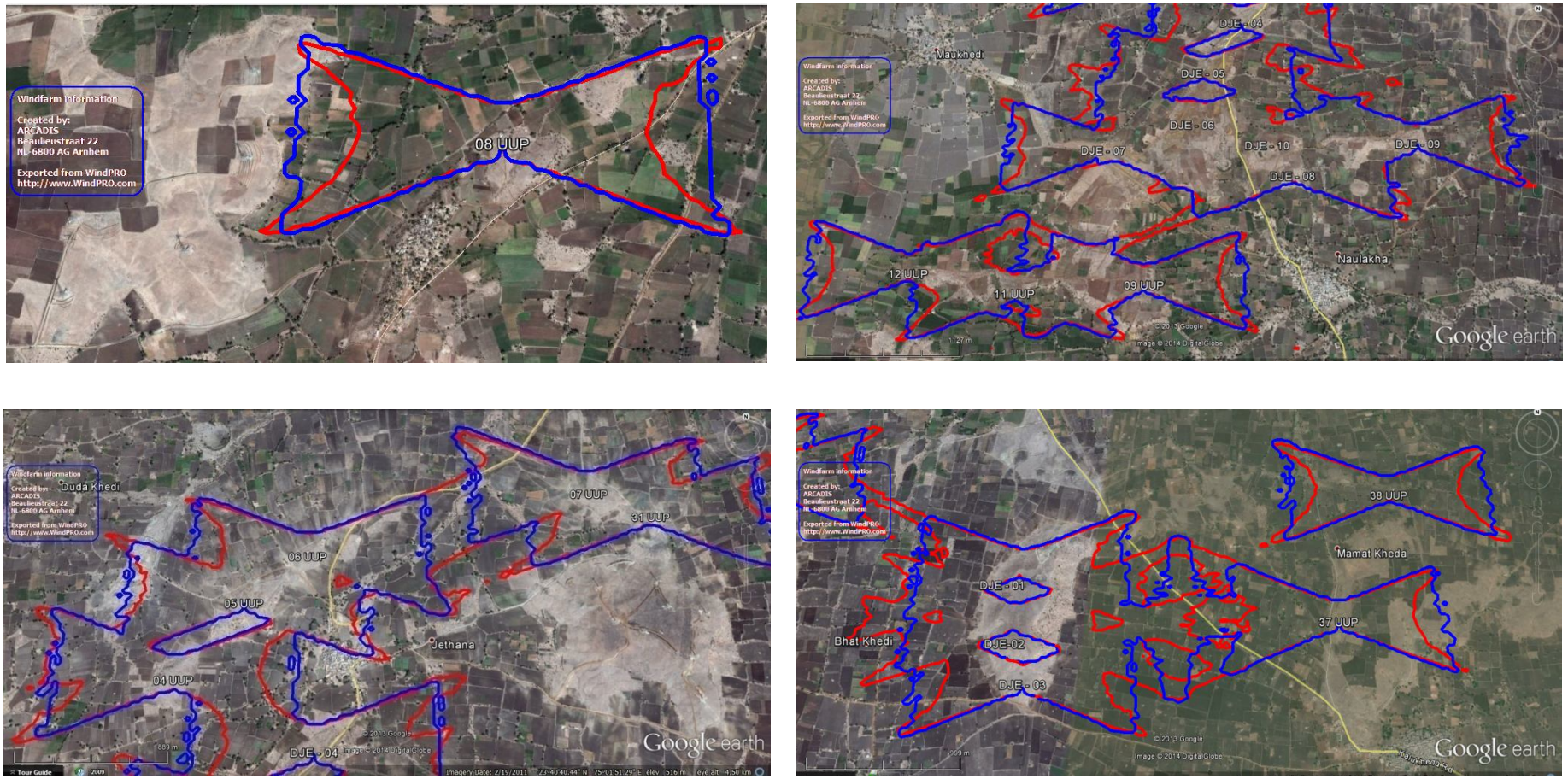
Results Analysis

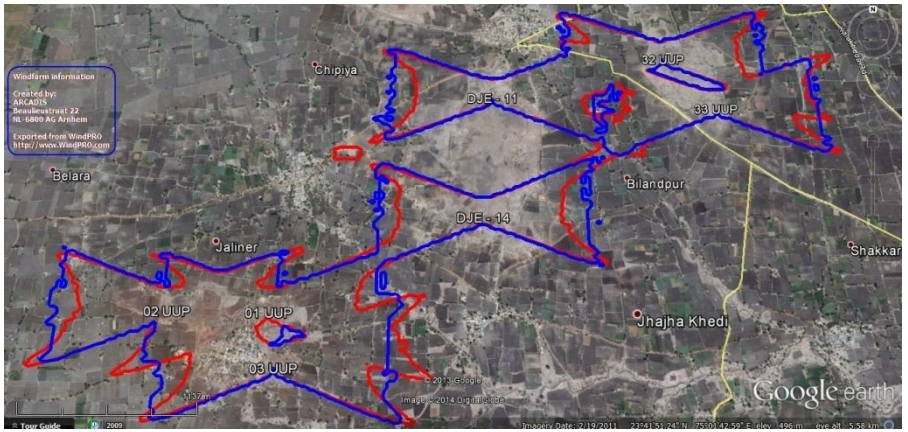
The modeling provide the cumulative impact zone of WTG. The cumulative impact zone as represented by contour line in **Figure -27** shows maximum 30 hours per year (red contour line) and 30 minutes per day (blue contour line) of astronomical maximum possible shadow duration. The modeling result analysis reveals that out of 85 WTG locations total 14 WTG locations will cause shadow flickering impact on nearby settlements (individual and cluster of households). However, considering the hilly terrain effect (for locations on hills) and existing plantation, nearby houses will be minimally affected. Further, by developing the plantation around these locations will make impact significantly low. Out of 14 WTG locations, 4 locations (UUPL 29, UUPL 26, DJE 36 and DJE 24) may have considerable effect on the nearby cluster of houses or villages and therefore mitigation measures viz., plantation, erection of blind or barrier will be explored out and if required micrositing with respect to these four

[14]The Real Truth about Wind Energy, a Literature Review on Wind Turbines in Ontario, June 10, 2011, SIERRA Club Canada.

locations will be revised. The detailed information for each WTGs with respect to shadow flickering impact is given in Annexure-1.

Figure 26: Shadow Flickering – Impact Zone

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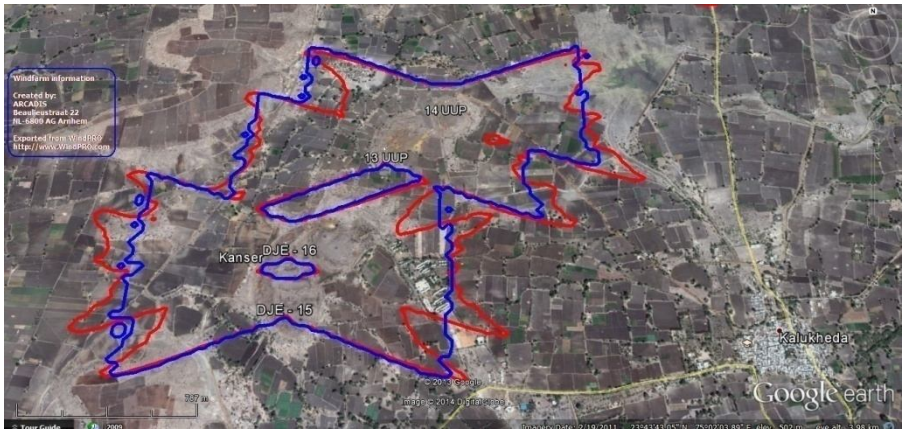
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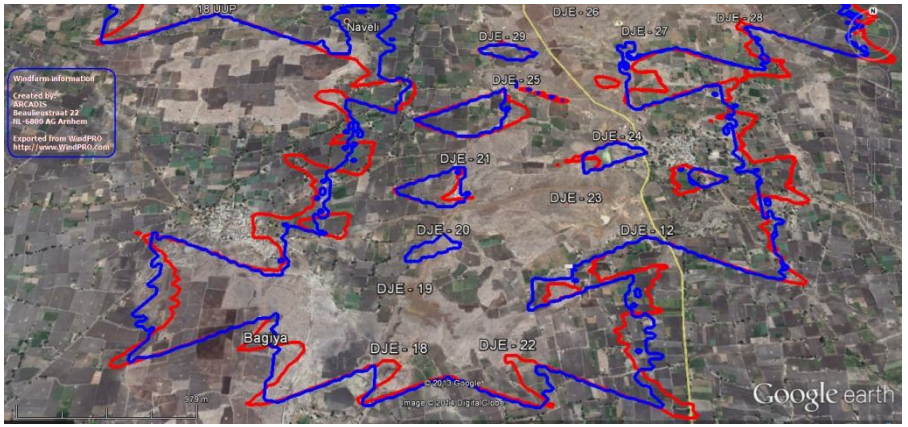
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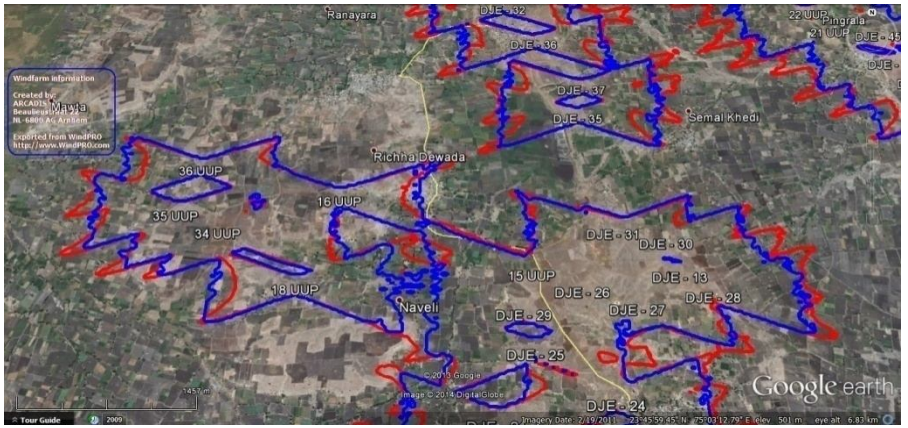
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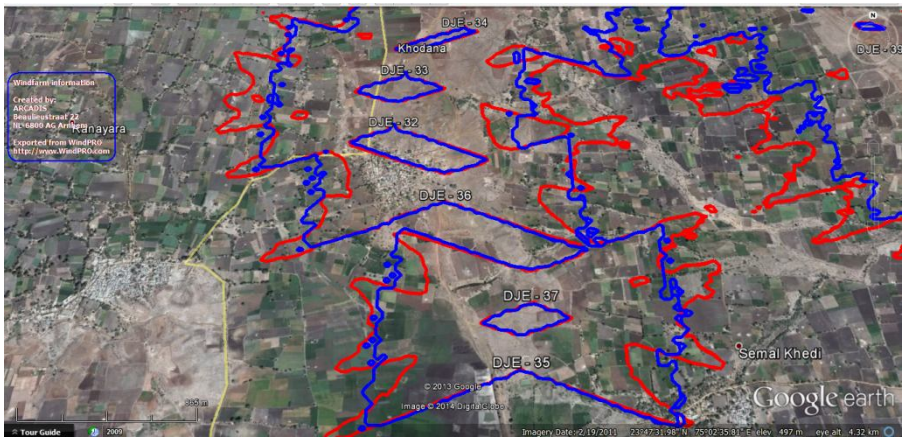
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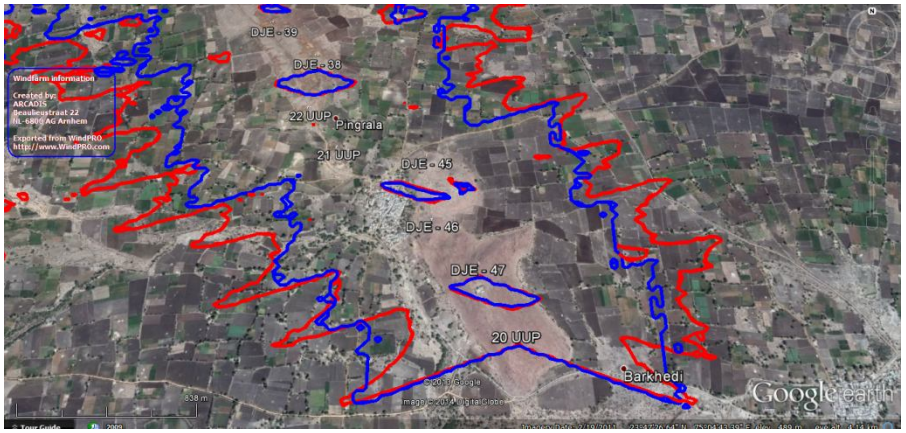
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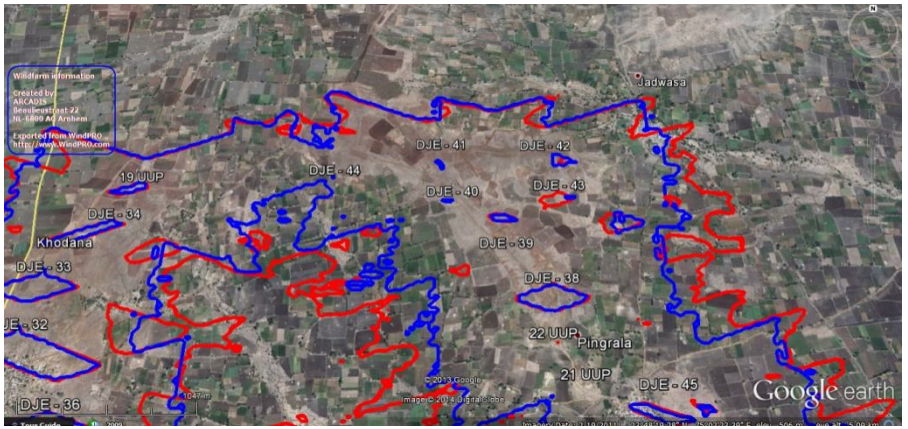
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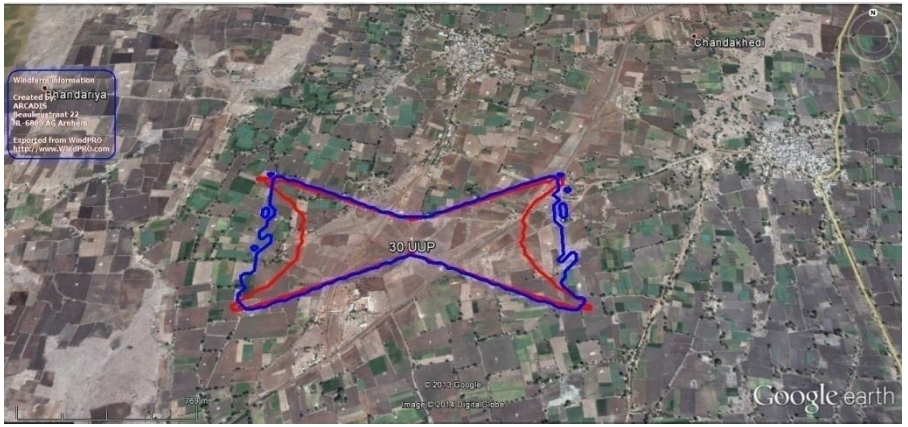
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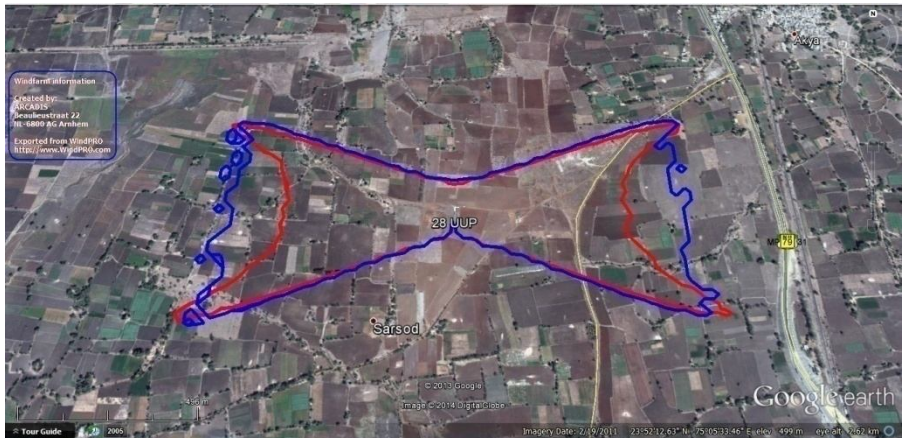
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6.2.12 Electromagnetic Field (EMF)

All electrical devices, power lines, and generating stations produce EMFs. Wind turbines convert wind energy into electricity. The electricity is carried from the turbine by a cable, either underground or overhead, to the main electricity transmission grid for distribution, creating a small magnetic field. When a charged object crosses the path of this magnetic field, a very small, momentary electric field may be created. There are four potential sources of electric and magnetic fields associated with the wind farm project. These are:

- Transmission line
- Wind turbine generator
- Generator transformer, and
- Underground cable

Though wind power produces EMFs like any other source of power and power transmission there are two major benefits to wind power in respect to safety. First, as wind turbines are ~ 65 – 90 meters above the ground the EMF created by the production of energy is generally well above any people who may be in the area. The electromagnetic fields produced by the generation and export of electricity from a wind farm do not pose a threat to public health. Grid connection is normally made at no more than 132 kilovolts (kV)[15], similar to the voltages used by utilities in existing residential distribution networks. In addition, project developers would design the entire electrical system to adhere to applicable state guidelines and industry standards to minimize EMF exposure from any new overhead transmission lines.

The grid connection lines are similar to other power lines and generate low levels of EMF, comparable to those generated by household appliances. Thus, it can be concluded that the electromagnetic fields produced by the generation and export of electricity from a wind farm do not pose a threat to public health.[16]

6.2.13 Blade Throw Hazard

One hazard possibility of wind turbines is the failure of a portion of the rotor resulting in fragments being thrown from the turbine. Reporting on turbine failures is very limited. There are few accounts of turbine failure in the literature. There are statistics in the public domain that will be discussed below[17]:

Types of rotor failures are as follows:

- Root-connection full-blade failure
- Partial-blade failure from lightning damage
- Failure at outboard aerodynamic device

[15]The Real Truth about Wind Energy, an Analysis of the Potential Impacts of Wind Turbine Development in Ontario. Sierra Club Canada, June 2010

[16]Evidence Review Wind Turbines and Health: A Rapid Review of the Evidence, National Health & Medical Research Council, Govt. of Australia

[17]Larwood, S. 2005. Permitting Setbacks for Wind Turbines in California and Blade Throw Hazard. Prepared for California Wind Energy Collaborative. Report Number CWEC-2005-01

- Failure from tower strike
- Partial-blade failure due to defect
- Partial-blade failure from extreme load buckling

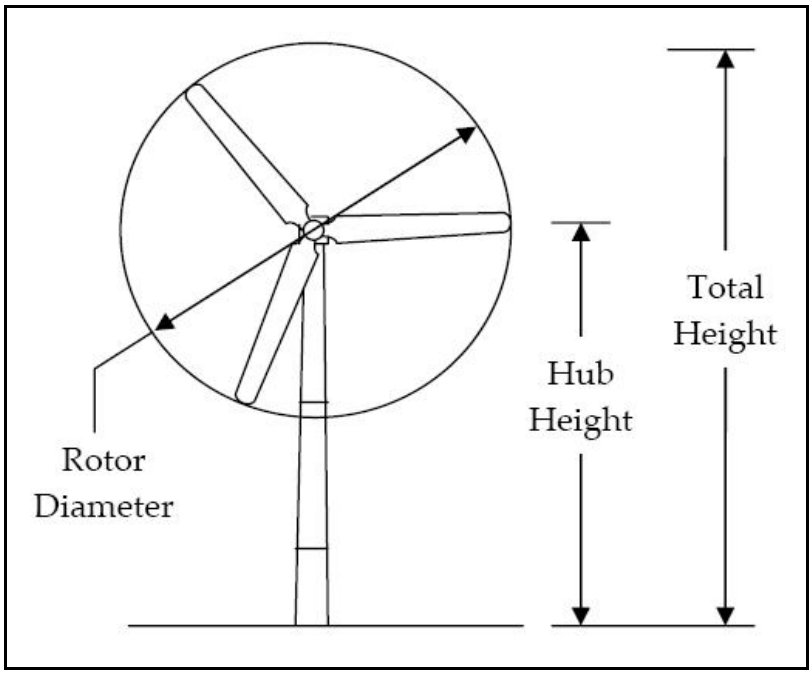
Some of the causes of rotor failures:

- Unforeseen environmental events outside the design envelope
- Failure of turbine control/safety system
- Human error
- Incorrect design for ultimate loads
- Incorrect design for fatigue loads
- Poor manufacturing quality

Most failures are a combination of these factors, which points to the complexity of the technology. The probabilities of some events are highly correlated with each other. For example, loss of grid power is highly correlated with high wind events. The potential then exists for a control system malfunction due to loss of power to coincide with a high loading event. Thus the turbine designer will plan keeping mind both events occur simultaneously.

Setbacks are established to minimize risk of damage or injury from component failure on property and personnel. The setbacks are usually a multiple of the total turbine height, from tower base to upper extreme point of the rotor (see Figure 27). Generally the setbacks can vary from 1.25 to 3 times the overall machine height. Larger setbacks are sometimes required for special areas.

Figure 27: Wind Turbine Dimension



6.2.14 Common Property Resources

The surface water ponds are the only common property resources which are close to the WTG location at some places. In the study area water ponds in Pancheva, Jethana, Kalukhera, Bhatkheda, Khodana and Bagiya villages are in proximity with WTG locations. Most of these ponds are seasonal and will be dried up during summer season but in monsoon season these ponds are a good source of water. During the site visit, it was informed by the local people that these ponds are being used by them for irrigational and domestic purpose.

Impacts during Construction Phase

- During construction phase especially, during monsoon and post monsoon season risk of water contamination exist due to improper handling of waste and chemicals on the project site
- Possibilities of using the water from the nearby ponds by workers without permission cannot be ruled out and it may cause community nuisance
- Water quality may be affected due to siltation during construction phase, especially during monsoon season

Mitigation Measures

- It will be ensured that surface water quality will not contaminate due to storage of waste and chemicals on the project site
- Usage of pond water without taking consent of community will not be allowed. The water requirement of workers will be fulfilled by water tankers.
- Silt trap will be used wherever required to avoid direct entry into surface water during monsoon season.

Impacts during operational phase

Due to very low water requirement and no civil work impact on nearby water bodies is not envisaged.

6.2.15 Cumulative Impacts

The cumulative impacts due to the presence of other wind power plants in the nearby area of proposed project are studied as follows:

(A) **Impact of Noise:** Due to the presence of multiple sources of sound i.e. wind turbines; cumulative impact of sound in terms of noise depend on noise propagation, cumulative increase in noise intensity level and distance of wind turbines with nearby settlements.

Noise propagation: During propagation, noise intensity level depends on following three factors:

- Geometrical spreading: as per the inverse square law, noise intensity level reduces by 6 dB (25%) on doubling the distance between source and receptors.

- Atmospheric effect: Atmospheric elements viz., air density and wind and temperature gradient also affect the noise propagation and intensity level by absorbing the noise energy.
- Surface Effects: Presence of barrier viz., topography and vegetation reduces the noise intensity level by providing attenuation to its propagation.

Cumulative increase in noise intensity level: considering the distance between wind turbines (5 D as per micrositing guideline) and logarithmic addition of noise from multiple sources, increase in noise intensity level due to presence of multiple sources of noise is not significant. Noise modeling also shows that at a distance of 100 m from the source noise reduces to 53.5 dB(A) from 102 dB(A)

Considering the reduction in noise intensity level during propagation, masking of wind turbines noise with ambient noise and location of wind turbines in scattered way by maintaining safe distance with nearby houses and village's settlement, cumulative impacts of noise on nearby village's settlements is not significant.

(B) Impact on Birds & Bat: The cumulative impact on birds & bats due to proposed and existing project could not be assessed because baseline data on birds and bats abundance and flying path is not available before the establishment of nearby operational plant. However, presence of birds and bat in the area indicates possibly low impact and adaptation behavior of the birds in the area. Further, to assess the cumulative impact on birds & bats in terms of mortality and behavioral change, at least four seasons monitoring for one year would be required. However, none of the protected biodiversity habitats are being allowed for diversion to set-up wind farms in the area. Considering the presence of birds and bats in the study area despite of numbers of operational wind turbines in the area indicates adaptation behavior therefore based on the study it can be say that impacts are low.

(C) Landuse: Being the agricultural as the primary livelihood in the region, agricultural fields are the major landuse category in the area. Due to the low requirement per WTG and minimum restriction on the usage of land for agricultural activity after the completion of project, wind power project has fewer footprints of landuse conversion and disturbances to community. To setup one WTG, approximate 1.75 hactares of land would be required. Also, setting up of overhead transmission line requires very minimum land. Considering the small foot print of land requirement, minimum disturbance and restriction on agricultural activities in the nearby field, impacts on landuse can be considered as insignificant.

(D) Social Aspect: Ratlam and Mandsaur districts have a significant wind power potential and a number of wind farms are currently in operation. Wind power projects being non-polluting and generating considerable employment although mostly semi-skilled or unskilled, has a high acceptability among the local communities, as confirmed

during our consultations. Agriculture is the primary livelihood activity in the region, and communities in the region realize that except for minor disturbance during construction stage, farming activities as well as supporting animal husbandry activities can continue in most of their land parcels with small footprint of land lost for setting up the WTGs. Noise and shadow flicker related social impacts due to wind farms are localized and have been assessed not to cumulate across the wind farms.

Community development initiatives by the wind farm developers is recognized by the local communities, and related commitments are generally part of the process of initial negotiations between village administration and the wind farm developers. However, the cumulative impact on common property resources of the villages and land dependent communities might possibly result in shift in occupational profile. Enough studies have not yet been undertaken to understand the socio-political changes in the area, due to wind farms – as this might require an independent study with sufficient access to information on social implications of other projects.

7 Conclusion on assessment and categoristion

The adverse environment and social (E&S) risks and impacts related to this project are limited, site specific and may be readily mitigated by adhering to generally recognized performance standards, guidelines or design criteria. The Company will manage its environmental and social performance in accordance with applicable local laws and regulations and international standards, including IFC PS. This project is assessed to be categorized as Category B according to IFC's Environmental and Social Review Procedure.

Based on the detailed assessment of impacts and the mitigation measures provided, the project will be able to address all the environmental and social risks associated. The mitigation measures arrived at will be implemented using Environmental & Social Management Plans. The baseline environmental and social conditions studied as part of the ESIA process will be used to ensure that the plans are specific, effective, and their outcomes are monitored.

8 ENVIRONMENTAL & SOCIAL MANAGEMENT PLAN

The outcomes of the Environmental and Social Impact Assessment of the proposed project have been used to formulate a Social and Environmental Management & Monitoring Plan for the project, presented in ***Table 8.1***.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 delineated. Social and Environmental Management Action Plan for the project, presented in **Table 8-1**.

TABLE 8-1: ENVIRONMENT AND SOCIAL MANAGEMENT ACTION PLAN

S. No.	Environmental/ Social Aspect	Mitigation Measures	Time frame/Phase	Responsibility	Remarks / Outcome
1	Water Pollution	Leak-proof holding tanks for sanitary waste water will be constructed to protect the ground water level. Waste water holding tanks / septic tank will be located at more than 500 m away from bore wells or any other underground water holding tanks. It will be ensured that the waste water is not finding its way into surface waters or water wells. Silt traps will be provided at WTG locations near to the water body to prevent the siltation in nearby water ponds and adjoining agricultural lands	During project development/ Operation phase	Project Developer/ Contractor	The ground and surface water sources will not be contaminated.
2	Soil Pollution	Waste disposal grounds that are in use by the local people will be identified and permission from local administration for use of the same will be obtained. Hazardous wastes, when accumulated, will be disposed off to facilities registered with the Central Pollution Control Board.	During project development/ Operation phase	Project Developer/ Contractor	Though solid waste generation is expected to be very negligible, care will be taken that no solid or liquid waste will contaminate site and surrounding areas.

S. No.	Environmental/ Social Aspect	Mitigation Measures	Time frame/Phase	Responsibility	Remarks / Outcome
		Spillage of hazardous materials e.g. paints, solvents, transformer oil, diesel on soil will be prevented by placing these materials on impermeable liners during storage, handling and use. Construction debris shall be reused in paving on site approach road to prevent dust generation due to vehicular movement.			
3	Air Pollution	Wherever unpaved roads are used, they will be sprinkled with water, at least once a day, to control fugitive dust emissions. It will be ensured that exhaust emissions of construction equipment adhere to emission norms as set out by MoEF/CPCB . Diesel generator sets used will adhere to emission norms asset out by MoEF/CPCB.	During project development	Project Developer/ Contractor	Fugitive dust and emissions will be minimized to the extent possible.

S. No.	Environmental/ Social Aspect	Mitigation Measures	Time frame/Phase	Responsibility	Remarks / Outcome
4	Noise Pollution	Local communities will be informed about the vehicular movement before start of heavy vehicle carrying materials and machines to site. Sensitive locations such as schools will be identified and avoided from the route, and if unavoidable, drivers will be informed to particularly restrict speed at those locations. It will be ensured that noise emissions of construction equipment adhere to emission norms as set out by MoEF/CPCB. Diesel generator sets used will adhere to noise standards of MoEF/CPCB. Noise barrier should be provided at the batching plant and material yard locations	Planning, construction and operational phase	Project Developer/ Contractor	Any nuisance due to vehicular movement and construction activity to villagers and sensitive locations such as schools will be minimized.
5	Traffic Safety	Traffic safety will be ensured during construction and operational phase. All the necessary measures as provision of barricades, signs, markings, and flags, light, as required, will be taken. A traffic Management Plan is prepared to ensure safety	During construction / operation	Project Developer/ Contractor	All the precautions will be taken to avoid any traffic accidents.

S. No.	Environmental/ Social Aspect	Mitigation Measures	Time frame/Phase	Responsibility	Remarks / Outcome
		with regards to road accidents and community safety. Local communities will be informed before initiating heavy vehicle movements carrying materials and machines to site. Sensitive locations such as schools as indicated in the ESIA shall be identified and drivers informed to restrict speed at those locations.			
6	Change in drainage pattern of area	Site preparation activities will be designed to avoid any significant elevation of the land or blocking or altering natural drainage channels in the project site. Site preparation and development shall be planned only after a drainage plan has been prepared for site.	During construction	Project Developer/ Contractor	The drainage patterns of the area will be maintained.
8	Health & safety of workers	Safety manual including plans and procedures has been prepared by DJE and UUPL to ensure the elimination of safety related potential hazard. Mitigations measures given in the manual will be implemented through out the project.	During construction and operation	Project Developer	Workers health & safety will be ensured.

S. No.	Environmental/ Social Aspect	Mitigation Measures	Time frame/Phase	Responsibility	Remarks / Outcome
9	Accidents & Emergency	Emergency Preparedness Plan have been included in the safety manual to be followed by DJE and UUPL with an objective to deal with emergencies such as natural disasters, community protests, fire, blade throw etc., display emergency numbers (viz. nearest police station, health centre) at the site for use by staff. Guidelines will be issued to the security guards on restricted use of force and arms.	During construction and operation	Project Developer/ Contractor/Operator	Workers will be trained for all emergencies and procedural responsibilities.
10	Social welfare	Maximum employment will be provided to local people, especially as construction workers and security guards wherever possible. A Community Development Plan shall be prepared to address community needs and improve social conditions of the local.	During construction and operation	Project Developer/ Contractor/Operator	Local bodies such as Panchayat will be involved for employment of interested villagers.
11	Health & Sanitation	Construction workers will be provided with requisite shelter, drinking water and sanitation in accordance with the requirements of the Building and other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996 and the guidelines published jointly by International Finance Corporation (IFC) and the European	During construction	Project Developer/ Contractor	Temporary shelters will be provided in construction as well as operation phase for workers.

S. No.	Environmental/ Social Aspect	Mitigation Measures	Time frame/Phase	Responsibility	Remarks / Outcome
		Bank for Reconstruction and Development (EBRD).			
12	Prevention of hazards to communities in proximity to the WTG sites during construction and operations	Exposure of local communities toblade throw, noise, and shadow flicker related hazards is minimized due to micro-siting, with slightly enhanced exposure levels at few locations. This risk exposure is however limited to very few locations(<5%). The developer commits to engage with the local communities and also seek the support of state government (if required) to further minimize exposure of local communities to these hazards. Disclosure on exposure of these risks to the local communities will also be initiated, with appropriate engagement mechanisms.	Planning and during construction, operations	Project Developer	Engagement of communities and safeguarding them from potential health / safety risks
13	Prevent encroachments in the near vicinity of wind turbine	Regarding the encroachments issues following mitigation measures are suggested: • Provide awareness to the community about the possible safety risk near the wind turbines • Pay negotiated compensation to the people who are already living at the sites even before the proposed project • Inform the Govt. about the post project encroachment issues in the near vicinity of WTG and possible safety risk on the encroacher. Request	Before Construction	DJE & UUPL	

S. No.	Environmental/ Social Aspect	Mitigation Measures	Time frame/Phase	Responsibility	Remarks / Outcome
		to Govt. for evacuation of encroachments on nearby Govt revenue land which are already existing before the proposed project, DJE and UUPL should make aware on			
14	Avian or bat collision risks	The rapid ecological survey and desktop assessment does indicate very limited risks of bird collision, as the overall area with the proposed WTG locations is in proximity to Important Bird Areas (IBAs), but as no specific migratory route identified passing through the area. Operating wind farms in the adjacent area have also not reported any kind of bird or bat collisions. Seasonal ponds have also been surveyed and found to be a habitat for birds for limited periods only. The developer commits to painting the blade of turbines with bright colour (like orange / yellow) to minimize the collision risks. Grass/bush carpeting in the wind farm could also be a possible mitigation measures for bird impact, in case the company observes a significant rodent movement in the area. As a precautionary measure, the developer also commits to detailed monitoring of bird / bat collisions after one year of the full commissioning of project in winter season. In case risks are identified,	Planning, and initial operation phase	Project Developer	Minimize risk of bird/bat collision due to operation of wind turbines.

S. No.	Environmental/ Social Aspect	Mitigation Measures	Time frame/Phase	Responsibility	Remarks / Outcome
		additional mitigation measures will be explored and assessed for their feasibility.			

8.1 ENVIRONMENTAL MANAGEMENT ACTION PLANS

The management plans given in further section of this report provide basic information and can be considered as outline to develop detailed management plans if required. The detailed CSR initiatives and operational activities specific to Standard Operating Procedures (SOPs) will be prepared by DJE & UUPL or third party consultants under project level ESMS.

8.1.1 Pollution Prevention and Abatement Plan

The purpose of the plan is to manage potential impacts on environmental components that may result from both construction and operational activities viz. operation of construction equipments and machineries, vehicular movement, storage and handling of sub-soil, fuel and chemicals etc. The mitigation measures identified as part of the plan has been outlined below:

- Vehicles delivering raw materials like soil and fine aggregates will be covered to prevent fugitive emissions.
- Storage and handling of raw material and debris is to be carefully managed to prevent generation of fugitive dust.
- Sprinkling of water on earthworks, material haulage and transportation routes on a regular basis during dry season.
- All vehicles, equipment and machinery used for construction will be subjected to preventive maintenance as per manufacturer norms.
- All vehicles utilized in transportation of raw material and staffs will have valid Pollution under Control Certificate (PUC). Vehicular exhaust will be complying with the CPCB specified emission norms for heavy diesel vehicles.
- Exhausts of DG sets will be positioned at sufficient height to ensure dispersal of exhaust emissions; engines will not be left running unnecessarily.
- Preventive maintenance of DG sets will be undertaken as per manufacturers schedule to ensure compliance with CPCB specified generator exhaust.
- Selection and use of low noise generating equipments- powered with engineering controls viz. mufflers, silencers etc
- Periodic preventive maintenance of vehicles as per manufacturers' schedule to ensure compliance with vehicular noise limits specified by CPCB
- All high noise generating equipments will be identified and subjected to periodic preventive maintenance.
- Debris and excavated material generated during construction activities will be stockpiled in designated areas within the site. No sludge will be disposed in adjacent land surrounding the site boundary.

8.1.2 Solid Waste Management

Management of Solid Waste during Construction and Operation Phase

The EPC contractor will manage the waste generated during construction phase like construction debris, packing material, paint containers and filters.

The management measures of the aforementioned solid wastes and the hazardous wastes are discussed in details below:

- The recyclable and non-recyclable non-hazardous solid waste generated onsite should be collected and stored in a temporary waste storage facility from where all wastes will be sent for recycling and disposal to appropriate facilities.
- The reusable wastes like wooden waste and cardboards from packing materials, empty cement bags, construction debris, etc can also be given to locals for their use or give it back to original equipment manufacturer (OEM)

8.1.3 Liquid Waste Management

Liquid Waste Management during Operation

The liquid wastes likely to be generated during the operational phase include:

Domestic Waste Water – Domestic Waste Water likely to be generated from toilets/urinals within the proposed plant and associated facilities will be treated in combined septic tank-soak pit system.

8.1.4 Storm Water Management Plan

The Storm Water Management Plan (SWMP) refers to the proper management of surface run-off generated during monsoon from project site area. The purpose of Storm Water Management Plan (SWMP) is to ensure prevention and control of any adverse impact caused by un-regulated storm water runoff from the construction site to the nearby natural drainage channels, surface water bodies, public and private properties. Following measures will be taken as part of the Storm Water Management Plan:

- All cross drainage structures within the site will be designed and constructed to handle maximum rainfall.
- The peripheral drains will be provided outside the material yard boundary during construction phase, which will prevent the silt contaminated surface run-off from site to enter into the adjoining lands and ponds
- No surface run-off from the site will be directly discharged into any *nallah*/water body.

8.1.5 Occupational Health & Safety Management Plan

A safety manual has been prepared by DJE and UUPL to address all the safety related aspects associated with the development of wind power projects. In the safety manual various plans

and procedures have been included to facilitate the implementation of safety related mitigation measures.

Purpose

The purpose to implement the safe practices as given in safety manual is to eliminate or minimize the potential hazard and to avoid accidents involving injury to personnel or damage to property.

Scope of Applicability

The applicability of this plan covers all those activities within project work areas that are associated with construction, operation and decommissioning of wind energy projects. This plan delineates measures that should be adopted to identify and address EHS issues both temporary and permanent in nature during various stages. It shall be administered by the site manager deployed by the project developer with the help of contractor.

To ensure occupational health and safety, following plans and procedures have been formulated and included in the safety manual:

- Electrical safety
- Welding and cutting operations
- Clearance permits
- Safety procedure during outage
- Safety procedure for hand tools and special tools
- Safety precautions in material handling
- Safety precautions for other lifting tackles and accessories
- Safety precautions during work on hazardous locations
- Safety precautions for chemical, fuels and lube oil
- Instruction for medical emergency and first aid
- Safety precautions for fire protection and extinction

Project proponent will review the safety related aspect and adequacy of management plans in safety meeting over a regular monthly interval.

Onsite implementation of OHS Management Plan

It is the responsibility of site manager with the help of contractor workforce to implement plans and procedures given in safety manual for identified aspects associated with development of wind power project. Necessary monitoring measures need to be followed to adhere to the legal requirements. Primary responsibility lies with EPC contractor/ Development contractor and its workforce to administer all the necessary mitigation measures. Site manager will monitor the activities and operations on fortnightly basis in concurrence with applicable local/national regulations, IFC Performance Standards and IFC EHS Guidelines. DJE, UUPL& its contractor needs to comply with all the conditions according to IFC and Equator Principle guidelines.

8.1.6 Road Safety & Traffic Management Plan

Scope and Purpose

DJE and UUPL will implement the traffic safety plan as given in their safety manual to ensure the safety of employee and community. As already mentioned in safety manual, overall responsibility to implement the plan lies with site manager whereas all employees are responsible for the implementation of this plan. In order to strong the community safety, some provisions are suggested additionally in this plan. These provisions will ensure the addressal of community safety related impacts that may arise from the increased vehicular traffic due to movement of heavy equipment/machineries and vehicles along the site access and approach roads particularly during construction phase.

During Construction Phase

The following mitigation measures will be implemented during this phase:

- Project vehicular movement will be restricted to defined access routes.
- Proper signage will be displayed at important traffic junctions along the vehicular access routes to be used by construction phase traffic. The signage will serve to prevent any diversion from designated routes and ensure proper speed limits are maintained near residential areas.
- Any road diversions and closures will be informed in advance to the project vehicles accessing the above route. Usage of horns by project vehicles will be restricted near sensitive receptors viz. schools, settlements etc.
- Traffic flows will be timed wherever practicable during period of increased commuter movement in the day.
- Temporary parking facilities shall be provided within the work areas and the construction sites to avoid road congestion.
- Vehicular movement to be controlled near sensitive locations viz. schools, colleges, hospitals identified along designated vehicular transportation routes.
- Routine maintenance of project vehicles will be ensured to prevent any abnormal emissions and high noise generation.
- In line with the safety manual adequate training will be provided to the vehicles driver and employee on traffic and road safety operations

During Operational Phase

Since limited vehicular movement is anticipated during operational phase considering only the daily movement of project personnel any impacts arising from the same can be effectively addressed through implementation of safety manual of DJE and UUPL. In addiction following measures will be emphasised:

- The speed limit in the internal roads shall be restricted to 20 km/hr.
- The drivers shall be given an induction on road safety and traffic management plan as per the safety manual.

- Use of seat belts for both drivers and passengers shall be made compulsory to minimize death & injuries in the event of an accident.

8.1.7 Emergency Preparedness Plan

Purpose

DJE and UUPL have developed an Emergency Preparedness Plan for implementation at the proposed site in the event of an emergency situation so that the loss of life and damage to the properties & natural resources are minimized. The emergency preparedness plan of DJE and UUPL included civil unrest and terrorist attack as emergency situation. In order to cover emergency situation more effectively, some additional emergencies and mitigations measures have been suggested here.

The implementation of this plan is the responsibility of site manager, safety officer and employees.

Definition(s)

Emergency - Any unplanned situation, which presents a threat to the safety of workers and/or damage to the properties and other natural resources deemed valuable at the project site.

Emergencies

The emergency situations that are probable to occur at the site and the probable causes are listed below:

- Fire at site during temporary construction phase which cannot be doused by fire extinguishers; Also fire due to short circuit at the plant and equipment during both construction & operation phase.
- Collapse of any structure
- Outbreak of endemic disease among a large section of construction workers due to contaminated drinking water, unhygienic conditions that have developed at workplace etc.;
- Protests by the local community or other stakeholders at any point of the project lifecycle due to grievances;
- Flood at the project site stranding staff or contracted workers at the site and earthquake in the region; and
- Serious injury or death of employee or sub-contracted worker at work, due to non-work related illness or work-related accident.

Emergency Management

The following steps shall be taken to ensure proper management of emergency or crisis situations:

- The nearest civil hospitals, private health care centers or practitioner clinic shall be identified and a agreements shall be made with the aforesaid medical

centers/practitioners to provide prompt health care services (including ambulance services) in the event of an emergency situation at site.

- A list of important telephone numbers such as fire brigade, health care facility/practitioner, police station, EHS and Social Coordinator, project office, head offices etc. shall be displayed at all the prime locations at site & the worker's camp (during construction phase).
- Regular liaising with the police, Gram Panchayat, district administration shall be carried out to ensure that prompt assistance is readily available in the event of an emergency.
- An Emergency Management (including Disaster Management) team comprising of 4-6 professionals both from client and contractors' side, during construction phase and 2-3 professionals during operation of the proposed project; shall be formed to combat any emergency situation arising at site and the labour camp (during construction phase only) and ensure safety of the life and property at site. for this purpose 2-3 personnel employed in the plant during operation phase shall be trained on Emergency scenarios and their management measures including their roles and responsibilities in case of an emergency situation.
- The workers (staff & contractual workers from both DJE, UUPL & Contractors) shall be trained on their duties and emergency preparedness during an emergency.

In case of an emergency, all site personnel shall be trained to follow the communication lines given below:

a) Personnel at site affected by the emergency situations immediately inform the project office and the external agencies (such as police, fire brigade, ambulance services); In case, project office cannot be reached, the Coordinator will be informed directly;

b) The site manager on being informed about the emergency by project offices or by the employee directly; reaches site if necessary, and also follows-up with the aforesaid external agencies for aid;

c) The site manager takes charge of the emergency response and direct further action and co-ordination, including escalating the matter to the CEO or other top-level managers as required.

8.1.8 Community Engagement Plan

Objective:

The objectives of this plan is to outline a process for

- Communicating the affected communities about the grievance redressal mechanism.
- Identification of the needs of the community to be implemented vide the community development plan

Background

The communication on the risks of shadow flickering, noise and blade throw will be done to the identified communities at risk, through a stakeholder meeting.

Action plan on communication of the risks

The communication is planned along with implementation of the first activity of community development plan. The following process is proposed to be followed for the activity.

- Invitation to all habitants for the program through printed pamphlets. This will have details of hearing to be organized by the Company
- Communication about the Project including details on number of locations and benefits of the Project to the local communities.
- Communication of the 3 risks – shadow flickering, noise and blade throw to the present audience.
- Preparation of Attendance Sheet to record details of all the people who have attended the camp and their segregation based on their relationship with the Project – land seller, general community and those who reside in structures within 300 meters from each of the WTGs.
- Ascertain the needs of the community. This will be done by verbally asking each of the persons available at the hearing at the time of recording their name.
- Documentation with respect to this activity such as photographs, attendance records and minutes of meeting to be prepared and shared with lenders.

8.1.9 Stakeholder Engagement Plan

Stakeholder engagement is about building and maintaining constructive relationships over time. It is an ongoing process between the company and its project stakeholders that extends throughout the life of the project and encompasses a range of activities and approaches, from information sharing and consultation, to participation, negotiation, and partnerships. The nature and frequency of this engagement reflects the level of project risks and impacts.

Purpose

The purpose of Stakeholder Engagement Plan is to describe a company's strategy and program for engaging with stakeholders in a culturally appropriate manner. The goal is to ensure the timely provision of relevant and understandable information. It is also to create a process that provides opportunities for stakeholders to express their views and concerns, and allows DJE and UUPL to consider and respond to them.

Scope of Applicability

This plan delineates methodology to engage Stakeholders during various phases of the project. Overall responsibility of this plan rests with EHS specialist in collaboration with Project Manager during construction phase and Asset Manager during O&M phase with the help of DJE and UUPL's Management including various internal teams.

Engagement Measures

Engagement methods that will be used to consult with each of the stakeholder groups identified in above section are as provided below:

- DJE & UUPL will interact with Local Panchayat at an early stage through meeting the Panchayat officials to secure permission for strengthening the approach road, to lay electrical poles, transmission lines, build storage yard and electrical sub-station in the village.

- In cases where the permission is being taken by third party contractor (land development contractor) then DJE and UUPL will meet Panchayat officials with the support of third party contractors. DJE and UUPL will take feedback from Local Panchayat on its strategy for development of the project and sensitive locations (if any) close to the project site (WTG location, approach road, route of T-line, storage yard and sub-station).

- DJE and UUPL will engage land sellers at the stage of land development process through personal meetings. In cases where the land is purchased by land aggregator, DJE and UUPL will meet the land sellers with the support of land aggregators.

- DJE and UUPL will engage with State Electricity Board during the procurement of approvals which are required to connect the Project to the grid and sell the power. In cases where the approvals are procured in the name of third party contractor, DJE and UUPL will meet SEB officials with the support of third party contractor.

- DJE and UUPL will meet Chief Electrical Officer to Government and secure approval for technical design and safety before commissioning of the project.

- DJE and UUPL will secure commissioning clearance before commissioning the WTG and connecting it to the grid.

- DJE and UUPL will engage with local communities throughout the project lifecycle starting from project conceptualization stage with the support of land aggregators who are engaged in land purchase process. DJE and UUPL will conduct community consultation and record their comments, objection and suggestion. Also, inform the community about project specific Grievance Redressal Mechanism including contact details of project proponent and communication line.DJE and UUPL's engagement with the local communities will also be guided by Community Engagement & Development Plan, and Community Communication plan.

- DJE and UUPL will engage with lenders on regular basis based on the commitment provided to lenders and provide periodic updates (as per the requirement of the lenders involved) on financial, environmental and social performance of the project. This will include visits to the project site.

- DJE and UUPL will engage with contractors and their subcontractors at various stages both at site level and corporate office level. Contractors and subcontractors being key stakeholders for technical delivery of project requirements, the engagement would be on a continuous basis.

- DJE and UUPL will engage with State Pollution Control Board officials to secure the Consent to Establish & Consent to Operate, and also demonstrate compliance to the conditions of these consents.

Information Disclosure

A **Project Information Booklet** will be prepared and distributed in the project affected villages in local language i.e. Hindi. The booklet in addition to containing the salient features of the project will have a map depicting the boundaries of the plant and its ancillary facilities. The important landmarks e.g. the settlement, schools and the roads, etc. will also be demarcated so that it becomes easy for the people in the villages to relate to the ground conditions. In addition to the project information the booklet will also highlight the impacts on the community as presented in the ESIA document and the commitments for the safeguards. To ensure wide circulation of the Project Information Booklet the booklet will be made available at all the schools, Anganwadi centres, and other public facilities in the project affected villages.

To ensure continuity of the flow of information to the communities a quarterly **Community Information Booklet** will be published. During the construction phase the booklet will contain the information about the progress of the project and also information which are pertinent to community e.g. disruption of the transportation links, outcome of consultation process on community development etc. It will be used to share information with the communities e.g. achievement of a particular member of the community or any worker can be published in this booklet.

Information disclosure to various Government Departments will be done in their respective "Forms" based on the requirement.

As part of its reporting commitment with lenders, DJE and UUPL will disclose information to lenders within agreed timeframe. This information disclosure will have summary of environmental and social impact assessment study including project description, environmental and social issues, proposed mitigation for environmental and social issues, environmental and social management and monitoring plan. In addition to that DJE and

UUPL will prepare Environmental and Social Performance Annual Monitoring Report (AMR) to be submitted to the lenders at the end of each financial year.

Review

The implementation status of this plan will be reviewed on a monthly basis by the EHS specialist with the support from all the responsible persons at both corporate level and site level. This will be accompanied by physical site visits by the EHS specialist once every 1 months. The audit by HSE Head shall be performed for the purpose of monitoring of stakeholder engagement plan and any improvement required in the plan.

8.1.10 Community Development Plan

DJE and UUPL have procured a majority of the land from the government, with a very minor amount of land purchased / leased directly from private land owners. As the land required for the project is in patches and not contiguous the developer has avoided areas that have structures, irrigated patches and those containing cultural and infrastructure. The land procured will only be part of the land transferred by the state government. The rest of the land will be returned back to the government.

The primary responsibility of planning, implementing financing of the community development would rest with DJE and UUPL, but will also be supplemented with OEM Contractor's community development activities. However it would ensure (through the implementing agency) that the community in these villages is involved in the planning process. Project proponent would need to initiate an on-going process to engage stakeholders in meaningful consultations. The main stakeholders for the project include:

- Local communities, both directly and indirectly affected by the project:
- The Gram Sabha
- The Land Revenue Department
- District Administration
- For joint or collaborative programme concerned Line Departments

The detailed plan for each of the community development activities will be planned through a participative process. Even though DJE and UUPL would be primarily responsible for the implementation of the plan there shall be involvement of the community in monitoring the implementation and also operating the same.

8.1.11 Community Property Replacement Plan

Introduction

In addition to the land requirement and associated direct impacts due to the project there could be some community properties/resources[18] which may get impacted either directly or indirectly due to the project during the construction activities. DJE and UUPL will take responsibility of all such damages to community property and will replace/ repair such property.

[18] Common Property Resources cover all types of natural resources which are shared by a group of people or communities,

Objective

The Community Property Replacement Plan is directed towards replacing property which has already been identified to be affected due to this project and also lay down a guideline for replacement of all community property which might be affected due to the project.

Plan for Replacement of Community Property

During the development of project, some of village roads might be getting affected due to use for project. DJE and UUPL has planned and is in process of development of roads in consultation with concerned villages so that the community will not get affected. There would also not be much change in distance that the villagers of these villages have to commute on the new/temporary road and it would be open to public access. Further, it is suggested that the plans for the proposed road will be developed through a participatory process with the involvement of villagers.

Common Property Resource:

During the project construction phase there might be some sharing of resources by the villagers and the workers working on the project. To the extent feasible this will 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 will be repaired/replaced to normal conditions, at the earliest. An account of the damage to the community resource will be documented and the root cause analysis carried out. The findings of the root cause analysis will also be documented and discussed with the agency/agencies found responsible for the incident. No water will 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, will not be used for storage of fill/construction material, wastes, etc

Responsibility

DJE and UUPL would take responsibility for construction of the road before the existing road is diverted / closed for use by villagers. Project Proponent (through the implementing agency) will start the process of dialogue with the community to decide on the alignment of the road and also fix up the likely time line for the construction. All cost of construction of the alternative road would also be borne by Project Proponent/contractor

DJE and UUPL and its contractors would 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 DJE and UUPL (including Contractors) would have an agreement with the Gram Sabha for the sharing of the resource. In case of damage to community property Project Proponent including its contractors would ensure that it is repaired or replaced to the satisfaction of the community at the earliest. Project Proponent would maintain documentation of all incidents of damages to the community property. All cost for repair/replacement would be borne by Project Proponent/Contractor.

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

8.1.12 Cultural Heritage Protection Plan

Introduction

The Performance standards PS 8 recognizes the importance of cultural heritage and aims to protect irreplaceable cultural heritage and those projects protect the cultural heritage in the course of their business operations. So far no place of significant cultural importance has been identified in project land, excepting a couple of religious structures. In case such place comes up, then DJE, UUPL will follow the basic plan as listed below.

Protection and Development of Cultural Property: DJE and UUPL (through the implementing agency) would carry out consultation with the community to formulate and finalize different options which would ensure access to cultural property. Project Proponent will initiate dialogue primarily with the community in the affected village, where such property belongs and those who visit the place, to identify the options and select feasible alternatives.

In case of the development of these cultural properties DJE and UUPL will prepare a detailed plan for the development activities proposed in consultation with the Community Priest. Once the plans have been developed the consultation will also be held with the broader community. During this consultation DJE and UUPL will develop pictographic representation of the proposed development plan so that it is easier for the community to comprehend the proposed development. The plan will then be finalized by incorporating suggestion of the community.

In all the above cases DJE and UUPL will ensure the financial resources required for Planning and implementing the development are made available.

8.1.13 Chance Find Procedure

Purpose:

The purpose of this chance find procedure is to provide for a set of instructions, and to assign responsibilities to identify, manage and communicate in the event of a chance find of cultural/archaeological significance, including restrictions/modifications to the execution of the site construction activities.

This procedure aims to fulfill IFC performance standard 8 on cultural heritage which aims to protect irreplaceable cultural heritage and to guide DJE & UUPL on protecting cultural heritage in the course of their project execution.

Responsibilities:

It is the responsibilities of EPC contractor or site supervisor to inform to DJE & UUPL about any find area immediately. DJE & UUPL will be responsible to inform to district administration on finding of any cultural heritage. Further, DJE & UUPL is also accountable for the filling of chance find reporting form.

Procedure:

Prior to commencement of site construction activities, geographic areas of possible heritage impacts should be marked out and communicated to contractor.

Appropriate training on identification to be provided to the contractor workforce.

Following set of actions, in case of find, to be communicated and implemented by the concerned

- In case of find, contractor site supervisor to be informed immediately
- Contractor site supervisor to inspect location and find and regulate work if required
- Contractor site supervisor to notify contractor site in-charge about find
- Contractor site in-charge to determine significance and requirement of appropriate action in consultation with local Panchayat
- Contractor construction head informs DJE & UUPL and based on significance also informs local authorities
- Chances find procedure documentation to be duly filled out by DJE & UUPL.
- DJE & UUPL and contractor to ensure that all directions given by the district administration or any other regulatory body is complied with.

Chance Find Reporting Form

S.no	Particulars	Details
1	Title	
2	Date and time of discovery	
3	Location (Site name and co-ordinates)	
4	Description of find	
5	Estimated weight and dimensions	
6	Found by	
7	Who was contacted (e.g. District administration, archeological survey of India, any other)? Record the name, date and contact details	
8	Any protection measures to be implemented	
9	Moveable or immovable	
10	If moved, location	
11	Further action required	
12	Date and time work in area recommended	
13	Printed name and signature of site contractor	

14	Date submitted	

8.2 ENVIRONMENTAL MONITORING PROGRAMME

Monitoring is one of the most important components of a management system. Continuous monitoring needs to be carried out for regulatory requirements, to monitor the environmental quality and to determine performance of proposed mitigation measures. Monitoring indicators have been developed for each of the activity considering the mitigation measures proposed. Indicators have been developed for ascertaining the environmental quality and the performance of the EMP implementation through Environmental Quality Indicators (EQI's) and Environmental Performance Indicators (EPI's) respectively which focus not only on quantifying or indexing activity-environment interactions that may potentially impact the environment but at the same time also help in comparing different components of environmental quality against previously established baseline values. Monitoring results would be documented, analysed and reported internally to Head - HSE. Monitoring requirements (including monitoring frequency) have been presented in the following **Table 8.2.**

TABLE 8-2: PROPOSED MONITORING REQUIREMENTS FOR THE PROPOSED PROJECT

A. Environmental Performance Monitoring

EPI No.	Environmental Performance Indicator (EPI)	Monitoring Parameter	Location	Period & Frequency	Responsibility
A.	**CONSTRUCTION PHASE**				
A1	Air emissions from vehicles and machineries including DG sets stack emissions	PM, SOx, NOx CO based on emission factors % of vehicles possessing valid PUC Certificates	Exhausts of vehicles and machinery including DG sets stack emissions	Weekly during the construction phase	Contractor
A2	Dust generated from site clearance / levelling	Visual observation of dust generation and community complaints regarding dust emission	Site & approach road	Weekly during site preparation	Contractor
A3	Sourcing of water	Volume of water sourced and consumed	Sourcing and usage areas	Daily during construction phase	Contractor
A4	Fugitive emissions from handling and storage of raw materials	Visual observation	Material stockpiles	Daily during construction phase	Project Developer/ Contractor
A5	Community health and safety	Complaints by the local communities and No. of. Accidents during construction phase	Grievance Records Safety Records	As Reported. Weekly during construction	Project Developer/ Contractor

EPI No.	Environmental Performance Indicator (EPI)	Monitoring Parameter	Location	Period & Frequency	Responsibility
				phase	
A6	Occupational health and safety	Health surveillance of workers	Medical records	Monthly during construction phase	Project Developer/ Contractor
		Sanitation status of labour camps and canteen premises	Labour camp maintenance records	Daily during construction phase	Project Developer/ Contractor
		Potable nature of drinking water viz. coliform, pH, TSS, Residual chlorine	Drinking water storage tanks	Daily during construction phase	Project Developer/ Contractor
		Usage of proper PPEs Safety performance indicators viz. LTIs. Near misses, fatalities etc.	Construction site	Daily during construction phase	Project Developer/ Contractor
A7	Disposal of sewage	Visual observation of leaks overflows etc. Odour	Septic tank and soak pits	Daily during construction phase	Project Developer/ Contractor
A8	Surface run-off discharge	Visual observation of water logging due to drainage disruption	Areas abutting construction site	One representative storm event every year	Project Developer/ Contractor
A9	Domestic waste generation, storage, handling and disposal	Quantity of waste generated and recycled Visual observation of waste segregation and storage conditions viz. usage of labelled and covered bins, insect repellents etc.	Waste generating areas viz. canteen, labour camps etc.	Weekly during construction phase	Contractor
		Awareness level of onsite workers	Workers involved in waste handling and storage		Contractor
A10	Hazardous chemicals and waste storage, handling and disposal	Quantity of fuel consumed Visual observation of fuel and chemical storage conditions viz. presence of spill kits, drip trays, fire extinguisher, etc.	Chemical and fuel storage and consumption areas	Daily during construction phase	Project Developer/ Contractor
		Quantity of waste oil and other hazardous waste generated and recycled to registered recyclers Awareness level of onsite workers	Hazardous waste storage areas Workers involved in waste handling	As applicable during construction phase	Project Developer/ Contractor

EPI No.	Environmental Performance Indicator (EPI)	Monitoring Parameter	Location	Period & Frequency	Responsibility
			and storage		
A11	Construction waste generation, storage, handling and disposal	Quantity of waste generated and recycled Visual observation of waste handling and storage.Community complaints regarding construction waste	Waste generating areas viz. construction site, raw material storage yard etc.	Weekly during construction phase	Contractor
		Awareness level of onsite workers	Workers involved in waste handling and storage		Contractor
B.	**OPERATIONAL PHASE**				
B1	Noise generated from operation of wind mill	Noise pressure level in dB(A)	Noise receptors – village settlements	Six Monthly during operational phase	Project Developer
		Maintenance parameter check with respect to noise attenuation and control	Noise generating equipment	As per supplier manual	Project Developer
B2	Water sourcing and consumption	Volume of water sourced and consumed	Water usage areas	Batch wise for supplied water for drinking during operational phase	Project Developer
B3	Surface run-off discharge	Visual observation of water logging due to any possible drainage disruption	Areas abutting plant site	One representative storm event every year	Project Developer
B4	Domestic waste generation, storage, handling and disposal	Quantity of waste generated and recycled Visual observation of waste segregation and storage conditions viz. usage of labelled and covered bins, insect repellents etc.	Waste generating areas viz. canteen, labour camps etc.	Daily during operational phase	Project Developer
		Awareness level of operational workforce	Workforce involved in waste handling and storage		
B5	Hazardous chemicals and waste storage, handling and	Visual observation of chemical storage conditions viz. presence of spill kits, drip trays, fire	Chemical and fuel storage and consumption	Daily during operational phase	Project Developer

EPI No.	Environmental Performance Indicator (EPI)	Monitoring Parameter	Location	Period & Frequency	Responsibility
	disposal	extinguisher, display of MSDS etc.	areas		
		Quantity of waste oil and other hazardous waste generated and recycled to registered recyclers. Awareness level of operational workforce	Hazardous waste storage areas Workforce involved in waste handling and storage	As per pollution control board guidelines.	Project Developer
B6	Community health and safety	Complaints registered by the local communities No. of. Accidents	Grievance Records Safety Records	Yearly during operational phase	Project Developer
B7	Occupational health and safety	Health surveillance of workers	Medical records	Monthly during operational phase	Project Developer
		Sanitation status of onsite office building and canteen	Office building maintenance records		
		Potable nature of drinking water viz. coliform, pH, TSS, Residual chlorine	Drinking water storage tank		
		Usage of proper PPEs Safety performance indicators viz. LTIs. Near misses, fatalities etc.	Operational sites	Daily during operational phase	
B8	Bird and Bat collision assessment	Undertake site specific bird and bat monitoring during operational phase	Around project area.	Initially for 1 years for all seasons to capture seasonal variation	Project Developer
B9	Landscape Development	No of saplings planted	Landscape area (village boundary, settlement, school etc)	As applicable during construction phase	Project Developer/ Contractor

B) Environmental Quality Monitoring

EQI No	Environmental Quality Indicator (EQI)	Monitoring Parameter	Location	Period & Frequency	Responsibility

A.	**CONSTRUCTION PHASE**				
A1	Ambient Air Quality	Measurement of PM_{10}, $PM_{2.5}$, SOx, NOx, CO	Representative Sampling locations as per the ESIA	Monthly during construction phase	Project Developer
A2	Ambient Noise quality	Measurement of Noise Pressure Level in dB(A)	Representative Sampling locations as per the ESIA	Monthly during construction phase	Project Developer
A3	Surface Water quality	As measured during ESIA study	construction site near to the water bodies i.e. pond	Monthly during construction phase	Project Developer
A4	Soil Quality	Soil parameters viz. pH, SAR, Water holding capacity, Conductivity, Organic Carbon, NPK	Representative Sampling locations as per the ESIA	Prior to construction phase	Project Developer
B.	**OPERATIONAL PHASE**				
B1	Ambient Noise quality	Measurement of Noise Pressure Level in dB(A)	Representative Sampling locations as per the ESIA Around project area.	Yearly during operational phase	Project Developer
B2	Surface Water quality	Depth of ground water table. Quality of drinking water as per IS 10500 parameters	Representative Sampling locations as per the ESIA Around project area.	Yearly during operational phase	Project Developer

ANNEXURE

Annex-1

WTG locations Analysis

Sl No	WTG No	Noise concern	Shadow flicker (30 min/day)	Shadow flicker (30 hrs/year)	Mitigation Measures	Village	Tehsil	District	Khasra no	Land allotted by Govt. (Ha)	Required land for per WTG	Land Type	Landuse as per Govt. Record	Landuse based on Satellite map	Land use verified on Ground	Photographs
1	DJE - 1	NO	NO	NO	Not Required	Bathkhedi	Piploda	Ratlam	108	16.74	1.75	G	KA.KA.KA	Open scrub on hill	Barren land on Rocky terrain	
2	DJE - 2	NO	NO	NO	Not Required	Bathkhedi	Piploda	Ratlam			1.75		KA.KA.KA	Open scrub on hill	Barren land on Rocky terrain	
3	DJE - 3	NO	NO	NO	Not Required	Bathkhedi	Piploda	Ratlam	109	11.21	1.75	G	Charnoi	Open scrub on hill	Barren land on Rocky terrain	

Sl No	WTG No	Noise concern	Shadow flicker (30 min/day)	Shadow flicker (30 hrs/year)	Mitigation Measures	Village	Tehsil	District	Khasra no	Land allotted by Govt. (Ha)	Required land for per WTG	Land Type	Landuse as per Govt. Record	Landuse based on Satellite map	Land use verified on Ground	Photographs
4	DJE - 4	5-6 houses in NE direction and 10-15 houses towards SW and school towards NW	Some houses in SW is likely to be affected	Some houses in SW is likely to be affected	Due to hilly terrain shadow length at down the hill will be short. However, if houses will get effected then mitigation measures in terms of blind/barrier may be provided	Jethana	Piploda	Ratlam	1139	20.83	1.75	G	Magra	Open scrub and nearby village settlements	Barren Land with adjoining agricultural field.	 
5	DJE - 5	No	No	No	Not Required	Jethana	Piploda	Ratlam	1140	9.61	1.75	G	Magra	Open scrub	Non cultivated land currently being used for grazing purpose	
6	DJE - 6	No	No	No	Not Required	Pancheva	Piploda	Ratlam	346/1	27.43	1.75	G	Charnoi	Open scrub	Non cultivated land currently being used for grazing purpose	

Sl No	WTG No	Noise concern	Shadow flicker (30 min/day)	Shadow flicker (30 hrs/year)	Mitigation Measures	Village	Tehsil	District	Khasra no	Land allotted by Govt. (Ha)	Required land for per WTG	Land Type	Landuse as per Govt. Record	Landuse based on Satellite map	Land use verified on Ground	Photographs
7	DJE - 7	No	No	No	Not Required	Pancheva	Piploda	Ratlam			1.75		Charnoi	Open scrub nearby agricultural land	Barren Land	
8	DJE - 8	No	No	No	Not Required	Pancheva	Piploda	Ratlam	354/2	22.93	1.75	G	Charnoi	Open scrub and cultivable land	Non cultivated land currently being used for grazing purpose	
9	DJE - 9	No	No	No	Not Required	Pancheva	Piploda	Ratlam			1.75		Charnoi	Open scrub on hill	Barren land on Rocky terrain	
10	DJE - 10	No	No	No	Not Required	Pancheva	Piploda	Ratlam			1.75		Charnoi	Open scrub and cultivable land	Non cultivated land currently being used for grazing purpose	
11	DJE - 11	No	No	No	Not Required	Kanser	Piploda	Ratlam	118	10.00	1.75	G	Hill	Open scrub on hill	Barren land on Rocky terrain	

Sl No	WTG No	Noise concern	Shadow flicker (30 min/day)	Shadow flicker (30 hrs/year)	Mitigation Measures	Village	Tehsil	District	Khasra no	Land allotted by Govt. (Ha)	Required land for per WTG	Land Type	Landuse as per Govt. Record	Landuse based on Satellite map	Land use verified on Ground	Photographs
12	DJE - 14	No	No	No	Not Required	Bilandpur	Piploda	Ratlam	25/1	6.58	1.75	G	Charnoi	Open scrub on hill	Barren land on Rocky terrain	
13	DJE - 15	No	Considering the terrain effect and presence of vegetation near the Jawahar Navodaya Vidyalaya in Kalukhera (SE of WTG location), impact is not anticipated.	Considering the terrain effect and presence of vegetation near the Jawahar Navodaya Vidyalaya in Kalukhera (SE of WTG location), impact is not anticipated.	Not Required	Bagiya	Piploda	Ratlam	466	23.50	1.75	G	Hill	Open scrub on hill nearby settlements	Barren land on Rocky terrain	
14	DJE - 16	NO	Considering the terrain effect and presence of vegetation near the Jawahar Navodaya Vidyalaya in Kalukhera (SE of WTG location), impact is not	Considering the terrain effect and presence of vegetation near the Jawahar Navodaya Vidyalaya in Kalukhera	Not Required	Bagiya	Piploda	Ratlam			1.75		Hill	Open scrub on hill	Barren land on Rocky terrain	

Sl No	WTG No	Noise concern	Shadow flicker (30 min/day)	Shadow flicker (30 hrs/year)	Mitigation Measures	Village	Tehsil	District	Khasra no	Land allotted by Govt. (Ha)	Required land for per WTG	Land Type	Landuse as per Govt. Record	Landuse based on Satellite map	Land use verified on Ground	Photographs
			anticipated.	(SE of WTG location), impact is not anticipated.												
15	DJE - 17	NO	NO	NO	Not Required	Naveli	Piploda	Ratlam	322	19.98	1.75	G	Hill	Open scrub and cultivable land	non cultivated land on hill	
16	DJE - 18	No	No	No	Not Required	Bagiya	Piploda	Ratlam	167	16.19	1.75	G	Hill	Open scrub on hill and nearby waterbody	Barren land (Location is surrounded by agricultural land	
17	DJE - 19	No	No	No	Not Required	Bathkheda	Piploda	Ratlam	469	100.00	1.75	G	Magra	Open scrub	Barren land (Location is surrounded by agricultural land	

Sl No	WTG No	Noise concern	Shadow flicker (30 min/day)	Shadow flicker (30 hrs/year)	Mitigation Measures	Village	Tehsil	District	Khasra no	Land allotted by Govt. (Ha)	Required land for per WTG	Land Type	Landuse as per Govt. Record	Landuse based on Satellite map	Land use verified on Ground	Photographs
18	DJE - 20	No	No	No	Not Required	Bathkheda	Piploda	Ratlam			1.75		Magra	Open scrub	Barren land on Rocky terrain	
19	DJE - 21	No	No	No	Not Required	Bathkheda	Piploda	Ratlam			1.75		Magra	Open scrub and cultivable land	Barren land (Location is surrounded by agricultural land)	
20	DJE - 22	No	No	No	Not Required	Bathkheda	Piploda	Ratlam			1.75		Magra	Open scrub on hill	Barren land (Location is surrounded by agricultural land	
21	DJE - 23	NO	NO	NO	Not Required	Bathkheda	Piploda	Ratlam			1.75		Magra	Open scrub	barren land	
22	DJE - 12	NO	NO	NO	Not Required	Bathkheda	Piploda	Ratlam			1.75		Magra	Open scrub on hill	Barren land on Rocky terrain	

Sl No	WTG No	Noise concern	Shadow flicker (30 min/day)	Shadow flicker (30 hrs/year)	Mitigation Measures	Village	Tehsil	District	Khasra no	Land allotted by Govt. (Ha)	Required land for per WTG	Land Type	Landuse as per Govt. Record	Landuse based on Satellite map	Land use verified on Ground	Photographs
																
23	DJE - 24	Cumulative impact on Bathkheda village	Cumulative impact on Bathkheda village	Cumulative impact on Bathkheda village	Blind/barrier/Plantation should be provided to reduce shadow flickering effect on nearby settlements. If required, micrositing will be revised	Bathkheda	Piploda	Ratlam			1.75		Magra	Open scrub and nearby village settlements	Barren land • 5-6 permanent houses located from the WTG site hardly 50 to 100 m in S-SW-E- N • Village settlements located from the WTG site hardly 150 to 200 m in E • One water body located from the WTG site hardly 20-30 m west	
																
24	DJE - 25	No	No	No	Not Required	Bathkheda	Piploda	Ratlam	38	4.05	1.75	G	Grazing Land	Open scrub on hill	barren land on hill (Location is surrounded by agricultural land)	

Sl No	WTG No	Noise concern	Shadow flicker (30 min/day)	Shadow flicker (30 hrs/year)	Mitigation Measures	Village	Tehsil	District	Khasra no	Land allotted by Govt. (Ha)	Required land for per WTG	Land Type	Landuse as per Govt. Record	Landuse based on Satellite map	Land use verified on Ground	Photographs
25	DJE - 13	No	No	No	Not Required	Bathkheda	Piploda	Ratlam	2	45.09	1.75	G	Magra	Open scrub on hill	Barren land on hill	
26	DJE - 26	No	No	No	Not Required	Bathkheda	Piploda	Ratlam			1.75		Magra	Open scrub and cultivable land	barren land on hill (Location is surrounded by agricultural land)	
27	DJE - 27	No	No	No	Not Required	Bathkheda	Piploda	Ratlam			1.75		Magra	Open scrub	barren land on hill (Location is surrounded by agricultural land)	
28	DJE - 28	No	No	No	Not Required	Bathkheda	Piploda	Ratlam			1.75		Magra	Open scrub on hill	barren land (Location is surrounded by agricultural land)	
29	DJE - 29	No	No	No	Not Required	Richadevra	Piploda	Ratlam	742	2.52	1.75	G	Hill	Open scrub on hill	barren land on hill (Location is surrounded by agricultural land)	

Sl No	WTG No	Noise concern	Shadow flicker (30 min/day)	Shadow flicker (30 hrs/year)	Mitigation Measures	Village	Tehsil	District	Khasra no	Land allotted by Govt. (Ha)	Required land for per WTG	Land Type	Landuse as per Govt. Record	Landuse based on Satellite map	Land use verified on Ground	Photographs
30	DJE - 30	No	No	No	Not Required	Richadevra	Piploda	Ratlam	985	8.50	1.75	G	Magra	Open scrub nearby agricultural land	barren land (Location is surrounded by agricultural land)	
31	DJE - 31	No	No	No	Not Required	Richadevra	Piploda	Ratlam	984	5.81	1.75	G	Magra	Open scrub on hill	barren land (Location is surrounded by agricultural land)	
32	DJE - 32	No	No	No	Not Required	Khodana	Dalouda	Mandsaur	289	21.73	1.75	G	Charnoi	Open scrub near y agricultural land	non cultivated agricultural land	
33	DJE - 33	No	No	No	Not Required	Khodana	Dalouda	Mandsaur			1.75		Charnoi	Open scrub	non cultivated agricultural land	

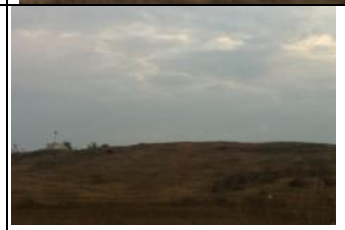
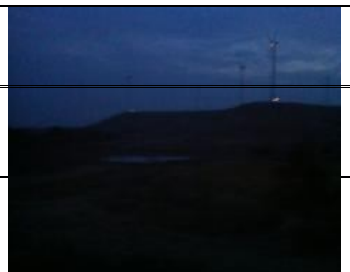
Sl No	WTG No	Noise concern	Shadow flicker (30 min/day)	Shadow flicker (30 hrs/year)	Mitigation Measures	Village	Tehsil	District	Khasra no	Land allotted by Govt. (Ha)	Required land for per WTG	Land Type	Landuse as per Govt. Record	Landuse based on Satellite map	Land use verified on Ground	Photographs
34	DJE - 34	No	No	No	No	Khodana	Dalouda	Mandsaur	294	3.5	1.75	G	Bardi	Open srcrub	Non cultivated agricultural land	
35	DJE - 36	Cumulative impacts on Khodana village	Cumulative impacts on Khodana village	Cumulative impacts on Khodana village	Blind/barrier/plantation would be effective measures to prevent shadow flickering effect during operational phase. If required, micrositing will be revised	Khodana	Dalouda	Mandsaur	765	8.46	1.75	G	Bardi	Open scrub nearby temple settlement	Barren land	
36	DJE - 37	No	No	No	Not Required	Khodana	Dalouda	Mandsaur	1069	14.94	1.75	G	Bardi	Open scrub on hill	non cultivated land on hill	

Sl No	WTG No	Noise concern	Shadow flicker (30 min/day)	Shadow flicker (30 hrs/year)	Mitigation Measures	Village	Tehsil	District	Khasra no	Land allotted by Govt. (Ha)	Required land for per WTG	Land Type	Landuse as per Govt. Record	Landuse based on Satellite map	Land use verified on Ground	Photographs
37	DJE - 35	No	No	No	Not Required	Khodana	Dalouda	Mandsaur			1.75		Bardi	Open scrub nearby agricultural land	barren land (Location is surrounded by agricultural land) Old Masjid 100m in NW	
38	DJE - 38	No	No	No	Not Required	Jadwasa	Piploda	Ratlam	387	22.12	1.75	G	Bardi	Open scrub on hill	barren land (Location is surrounded by agricultural land)	
39	DJE - 39	No	No	No	Not Required	Jadwasa	Piploda	Ratlam			1.75		Bardi	Open scrub on hill	barren land (Location is surrounded by agricultural land)	
40	DJE - 40	No	No	No	Not Required	Jadwasa	Piploda	Ratlam	376	40	1.75	G	Charnoi	Open scrub and cultivable land	Non cultivated agricultural land.	
41	DJE - 41	No	No	No	Not Required	Jadwasa	Piploda	Ratlam			1.75		Charnoi	Open scrub	Barren land	

Sl No	WTG No	Noise concern	Shadow flicker (30 min/day)	Shadow flicker (30 hrs/year)	Mitigation Measures	Village	Tehsil	District	Khasra no	Land allotted by Govt. (Ha)	Required land for per WTG	Land Type	Landuse as per Govt. Record	Landuse based on Satellite map	Land use verified on Ground	Photographs
42	DJE - 42	No	No	No	Not Required	Jadwasa	Piploda	Ratlam			1.75		Charnoi	Open scrub on hill	barren land (Location is surrounded by agricultural land)	
43	DJE - 43	No	No	No	Not Required	Jadwasa	Piploda	Ratlam			1.75		Charnoi	Open scrub nearby agriculture land	non cultivated agricultural land.	
44	DJE - 44	No	No	No	Not Required	Jadwasa	Piploda	Ratlam	241	2.1	1.75	G	Bardi	Open scrub and cultivable land	Non cultivated agricultural land	
						Khodana	Dalouda	Mandsaur	573	6.12	1.75	G	Kabilkast			
45	DJE - 45	Insignificant impact on Pingrala village	Insignificant impact on Pingrala village	Insignificant impact on Pingrala village	Due to hilly terrain shadow length at down the hill will be short. However, if houses will get effected	Pingrala	Piploda	Ratlam	140/1	10.79	1.75	G	Hill	Open scrub	barren land (Location is surrounded by agricultural land)	

Sl No	WTG No	Noise concern	Shadow flicker (30 min/day)	Shadow flicker (30 hrs/year)	Mitigation Measures	Village	Tehsil	District	Khasra no	Land allotted by Govt. (Ha)	Required land for per WTG	Land Type	Landuse as per Govt. Record	Landuse based on Satellite map	Land use verified on Ground	Photographs
					then mitigation measures in terms of blind/barrier may be provided											
46	DJE - 46	Insignificant impact on Pingrala village	Insignificant impact on Pingrala village	Insignificant impact on Pingrala village	Due to hilly terrain shadow length at down the hill will be short. However, if houses will get effected then mitigation measures in terms of blind/barrier may be provided	Pingrala	Piploda	Ratlam	347	20.92	1.75	G	Hill	Open scrub on hill and nearby village settlements	Rocky terrain on hill	
47	DJE - 47	Impact on Pingrala devi temple	yes due to DJE 47 only on Pingrala Devi Temple	yes due to DJE 47 only on Pingrala Devi Temple	Plantation/blind should be provided along the boundary of temple to prevent	Pingrala	Piploda	Ratlam			1.75		Hill	Open scrub on hill	Rocky terrain on hill • One temple 150m in south	

Sl No	WTG No	Noise concern	Shadow flicker (30 min/day)	Shadow flicker (30 hrs/year)	Mitigation Measures	Village	Tehsil	District	Khasra no	Land allotted by Govt. (Ha)	Required land for per WTG	Land Type	Landuse as per Govt. Record	Landuse based on Satellite map	Land use verified on Ground	Photographs
					shadow flickering effect in operational phase											
48	1 UUP	No	Cumulative Impact on some houses of village	Cumulative Impact on some houses of village	Blind/barrier/Plantation should be developed	Jaliner	Piploda	Ratlam	221	3.39	1.75	G	Grazing Land/ Magra	Open scrub and nearby village settlements	Non cultivated land currently being used for grazing purpose • Settlement of Jaliner village is located from the WTG site hardly 100 m in SW •	
									222	1.91		G				
49	2 UUP	No	No	No	Not Required	Jaliner	Piploda	Ratlam	130	4.60	1.75	G	Charnoi	Open scrub and cultivable land	Non cultivated land currently being used for grazing purpose	
									134	2.02		G				
50	3 UUP	Cumulative Impact on entire village settlements	Cumulative Impact on some houses of village	Cumulative Impact on some houses of village	Blind/barrier/ Plantation should be developed	Jaliner	Piploda	Ratlam	424	1.80	1.75	G	Grazing land/ Magra	Open scrub and cultivable land, nearby settlement	Non cultivated land currently being used for grazing purpose	

Sl No	WTG No	Noise concern	Shadow flicker (30 min/day)	Shadow flicker (30 hrs/year)	Mitigation Measures	Village	Tehsil	District	Khasra no	Land allotted by Govt. (Ha)	Required land for per WTG	Land Type	Landuse as per Govt. Record	Landuse based on Satellite map	Land use verified on Ground	Photographs
									425	5.45		G				
51	4 UUP	NO	No	No	Not Required	Jethana	Piploda	Ratlam	187	4.60	1.75	G	Magra/Other	Open scrub on hill	Barren land on Rocky terrain	
									125	2.59		G				
	5 UUP	NO	NO	NO	Not Required	Jethana	Piploda	Ratlam	155	10.97	1.75	G	Other	Open scrub on hill	Barren land on Rocky terrain	
53	6 UUP	NO	No	No	Not Required	Jethana	Piploda	Ratlam	415	3.74	1.75	G	KA. KA.	Open scrub	Barren land on Rocky terrain	
54	7 UUP	NO	NO	NO	Not Required	*Jethana*	Piploda	Ratlam	975/1	28.07	1.75	G	Charnoi	Open scrub on hill	Barren land on Rocky terrain	

Sl No	WTG No	Noise concern	Shadow flicker (30 min/day)	Shadow flicker (30 hrs/year)	Mitigation Measures	Village	Tehsil	District	Khasra no	Land allotted by Govt. (Ha)	Required land for per WTG	Land Type	Landuse as per Govt. Record	Landuse based on Satellite map	Land use verified on Ground	Photographs
55	31 UUP	NO	NO	NO	Not Required						1.75		Charnoi	Open scrub on hill	Barren land on Rocky terrain	
56	8 UUP	NO	NO	NO	Not Required	Pancheva	Piploda	Ratlam	156/1	4.20	1.75	G	Bardi	Open scrub	Non cultivated land currently being used for grazing purpose	
57	9 UU	No	No	No	Not Required	Pancheva	Piploda	Ratlam	113/1	12.85	1.75	G	Bardi	Open scrub	Barren Land with adjoining	

Sl No	WTG No	Noise concern	Shadow flicker (30 min/day)	Shadow flicker (30 hrs/year)	Mitigation Measures	Village	Tehsil	District	Khasra no	Land allotted by Govt. (Ha)	Required land for per WTG	Land Type	Landuse as per Govt. Record	Landuse based on Satellite map	Land use verified on Ground	Photographs
	P														agricultural field	
58	10 UUP	No	No	No	Not Required	Pancheva	Piploda	Ratlam			1.75		Bardi	Open scrub and cultivable land	WTG site is on non cultivated land and surrounded by encroached land	
59	11 UUP	No	No	No	Not Required	Pancheva	Piploda	Ratlam	85/1	12.65	1.75	G	Bardi	Open scrub	Non cultivated land currently being used for grazing purpose	

Sl No	WTG No	Noise concern	Shadow flicker (30 min/day)	Shadow flicker (30 hrs/year)	Mitigation Measures	Village	Tehsil	District	Khasra no	Land allotted by Govt. (Ha)	Required land for per WTG	Land Type	Landuse as per Govt. Record	Landuse based on Satellite map	Land use verified on Ground	Photographs
60	12 UUP	No	No	No	Not Required	Pancheva	Piploda	Ratlam	43/1	6.85	1.75	G	Bardi	Open scrub and cultivable land	Non cultivated land currently being used for grazing purpose	
61	13 UUP	No	Based on the modeling result, impact on house of Bagiya village is anticipated. However, considering the existing plantation near the houses, impact is expected as insignificant	Based on the modeling result, impact on house of Bagiya village is anticipated. However, considering the existing plantation near the houses, impact is expected as insignificant	Not Required	Bagiya	Piploda	Ratlam	380	11.94	1.75	G	Hill	Open scrub	Barren land on Rocky terrain	

Sl No	WTG No	Noise concern	Shadow flicker (30 min/day)	Shadow flicker (30 hrs/year)	Mitigation Measures	Village	Tehsil	District	Khasra no	Land allotted by Govt. (Ha)	Required land for per WTG	Land Type	Landuse as per Govt. Record	Landuse based on Satellite map	Land use verified on Ground	Photographs
62	14 UUP	No	Based on the modeling result, impact on house of Bagiya village is anticipated. However, considering the existing plantation near the houses, impact is expected as insignificant	Based on the modeling result, impact on house of Bagiya village is anticipated. However, considering the existing plantation near the houses, impact is expected as insignificant	Not Required	Bagiya	Piploda	Ratlam			1.75		Hill	Open scrub	Barren land on Rocky terrain	
63	15 UUP	No	No	No	Not Required	RichaDevra	Piploda	Ratlam	792	1.22	1.75	G	Magra	Open scrub	barren land (Location is surrounded by agricultural land)	
64	16 UUP	No	No	No	Not Required	RichaDevra	Piploda	Ratlam	48/1	7.48	1.75	G	Grazing Land	Open scrub cultivable land	non agricultural land (Location is surrounded by agricultural land	

Sl No	WTG No	Noise concern	Shadow flicker (30 min/day)	Shadow flicker (30 hrs/year)	Mitigation Measures	Village	Tehsil	District	Khasra no	Land allotted by Govt. (Ha)	Required land for per WTG	Land Type	Landuse as per Govt. Record	Landuse based on Satellite map	Land use verified on Ground	Photographs
65	17 UUP	No	No	No	Not Required	RichaDevra	Piploda	Ratlam	113	0.38	1.75	G	Grazing Land	Open scrub	non cultivated agricultural land	
									114	1.36		G				
66	18 UUP	No	No	No	Not Required	RichaDevra	Piploda	Ratlam	165	0.91	1.75	G	Magra	Cultivable land	non cultivated agricultural land	
67	19 UUP	No	No	No	Not Required	Khodana	Dalouda	Mandsaur	355/1	3.69	1.75	G	Wind energy project	Cultivable land	non cultivated agricultural land	

Sl No	WTG No	Noise concern	Shadow flicker (30 min/day)	Shadow flicker (30 hrs/year)	Mitigation Measures	Village	Tehsil	District	Khasra no	Land allotted by Govt. (Ha)	Required land for per WTG	Land Type	Landuse as per Govt. Record	Landuse based on Satellite map	Land use verified on Ground	Photographs
68	20 UUP	No	No	No	Not Required	Barkhedi	Piploda	Ratlam	317	6.53	1.75	G	Rock	Open scrub on hill	barren land (Location is surrounded by agricultural land)	
69	21 UUP	No	No	No	Not Required	Pingrala	Piploda	Ratlam	25	11.09	1.75	G	Charnoi	Open scrub	Barren land on hill	
70	22 UUP	No	No	No	Not Required	Pingrala	Piploda	Ratlam			1.75		Charnoi	Open scrub	Barren land on hill	
71	23 UUP	No	No	No	Not Required	Kachnara	Dalouda	Mandsaur	71/1	3.86	1.75	G	Wind Energy Project	Open scrub	barren land on hill (Location is surrounded by agricultural land)	

Sl No	WTG No	Noise concern	Shadow flicker (30 min/day)	Shadow flicker (30 hrs/year)	Mitigation Measures	Village	Tehsil	District	Khasra no	Land allotted by Govt. (Ha)	Required land for per WTG	Land Type	Landuse as per Govt. Record	Landuse based on Satellite map	Land use verified on Ground	Photographs
72	24 UUP	No	No	No	Not Required	Kachnara	Dalouda	Mandsaur	45/1	2.07	1.75	G	Wind energy project	Open scrub	barren land (Location is surrounded by agricultural land)	
73	25 UUP	No	No	No	Not Required	Sarsodh	Dalouda	Mandsaur	1380	3.00	1.75	G	Wind energy project	Open scrub	barren land (Location is surrounded by agricultural land)	
74	26 UUP	Cumulative impact due to UUPL 26 & 27 on 12-15 houses of Sarsod village (possibly encroached)	Cumulative impact due to UUPL 26 & 27 on 12-15 houses of Sarsod village (possibly encroached)	Cumulative impact due to UUPL 26 & 27 on 12-15 houses of Sarsod village (possibly encroached)	Continuum to do plantation to reduce shadow flicker effect. If required, micrositing will be revised	Sarsodh	Dalouda	Mandsaur	1353/1/1	3.00	1.75	G	Wind energy project	Open scrub	barren land (Location is surrounded by agricultural land)	

Sl No	WTG No	Noise concern	Shadow flicker (30 min/day)	Shadow flicker (30 hrs/year)	Mitigation Measures	Village	Tehsil	District	Khasra no	Land allotted by Govt. (Ha)	Required land for per WTG	Land Type	Landuse as per Govt. Record	Landuse based on Satellite map	Land use verified on Ground	Photographs
75	27 UUP	No	No	No	Not required	Sarsodh	Dalouda	Mandsaur	1328/2	3.00	1.75	G	Wind energy project	Open scrub and cultivable land and nearby village settlement	Non cultivated agricultural land	 
76	28 UUP	No	No	No	Not Required	Sarsodh	Dalouda	Mandsaur	386	3.00	1.75	G	Wind energy project	Open scrub	non cultivated agricultural land	

Sl No	WTG No	Noise concern	Shadow flicker (30 min/day)	Shadow flicker (30 hrs/year)	Mitigation Measures	Village	Tehsil	District	Khasra no	Land allotted by Govt. (Ha)	Required land for per WTG	Land Type	Landuse as per Govt. Record	Landuse based on Satellite map	Land use verified on Ground	Photographs
77	29 UUP	Impact on big temple & Ashram in NE direction	Impact on big temple & Ashram in NE direction	Impact on big temple & Ashram in NE direction	Continuum is currently re-visiting the micrositing of the locations	Sarsodh	Dalouda	Mandsaur	1192	3.00	1.75	G	Wind energy project	Open scrub	non cultivated agricultural land • One big temple located at 80 m in SE • Village settlement at 900 m in SE	
78	30 UUP	No	No	No	Not Required	Chandakhedi	Dalouda	Mandsaur	933	3.00	1.75	G	Wind energy project	Open scrub	barren land (Location is surrounded by agricultural land)	
79	32 UUP	No	No	No	Not Required	KaluKheda	Piploda	Ratlam	313/1	5.00	1.75	G	Charnoi	Open scrub	Barren land on Rocky terrain	
80	33 UUP	No	No	No	Not Required						1.75		Charnoi	Open scrub	Barren land on Rocky terrain	

Sl No	WTG No	Noise concern	Shadow flicker (30 min/day)	Shadow flicker (30 hrs/year)	Mitigation Measures	Village	Tehsil	District	Khasra no	Land allotted by Govt. (Ha)	Required land for per WTG	Land Type	Landuse as per Govt. Record	Landuse based on Satellite map	Land use verified on Ground	Photographs
81	34 UUP	No	No	No	Not Required	Mawata	Piploda	Ratlam	2582/5	2.87	1.75	G	Grazing land	Open scrub and cultivable land	adjoining non cultivated agricultural land	
82	35 UUP	No	No	No	Not Required	Mawata	Piploda	Ratlam	2418/1	4.56	1.75	G	Grazing land	Open scrub and cultivable land	non cultivated agricultural land	
83	36 UUP	No	No	No	Not Required	Mawata	Piploda	Ratlam	2396	5.90	1.75	G	Magra	Open scrub and cultivable land	non agricultural land (Location is surrounded by agricultural land	
84	37 UUP	NO	NO	NO	Not Required	Mamatkheda	Piploda	Ratlam	387	4.63	1.75	G	Charnoi	Open scrub on hill	Barren land on Rocky terrain	

Sl No	WTG No	Noise concern	Shadow flicker (30 min/day)	Shadow flicker (30 hrs/year)	Mitigation Measures	Village	Tehsil	District	Khasra no	Land allotted by Govt. (Ha)	Required land for per WTG	Land Type	Landuse as per Govt. Record	Landuse based on Satellite map	Land use verified on Ground	Photographs
85	38 UUP	NO	NO	NO	Not Required	Mamatkheda	Piploda	Ratlam	221	14.53	1.75	G	Charnoi	Open scrub on hill	Barren land on Rocky terrain	

Annex-2

Floral species recorded in the study area

No.	Tree
1	*Adina cordifolia*
2	*Adinsonia digitata*
3	*Aegle marmelos*
4	*Albizzia lebbek*
5	*Anogeissus latifolia*
6	*Anthocephalus kadamba*
7	*Azadirachta indica*
8	*Boombax ceiba*
9	*Boswellia serrata*
10	*Daibergia paniculata*
11	*Eucalyptus lanceolatus*
12	*Feronia limona*
13	*Ficus bengalensis*
14	*Ficus glomerulata*
15	*Ficus lacor*
16	*Hardwickia binata*
17	*Holoptelia integrifolia*
18	*Linnea grandis*
19	*Madhuca indica*
20	*Mangifera indica*
21	*Maninkara hexandra*
22	*Miluisa tomentosa*
23	*Ougenia oogenensis*
24	*Phoenix sylvestris*
25	*Pterocarpus marsupium*
26	*Schleicherea oleosa*

27	*Sterculia urens*
28	*Syzygium cuminii*
29	*Tamarindus indica*
30	*Tectona grandis*
31	*Terminalia arjuna*
32	*Terminalia belerica*
33	*Terminalia tomentosa*
34	*Acacia catechu*
35	*Acacia ferruginea*
36	*Acacia leucophloea*
37	*Acacia nilotica*
38	*Delonix regia*
39	*Cassia siamea*
40	*Albizzia amara*
41	*Borasus flabellefer*
42	*Emblica officinalis*
43	*Prosopis juliflora*
44	*Dalbergia sissoo*
45	*Butena monosperma*
46	*Gmelina arborea*
47	*Kydia calycina*
48	*Wrightia tinctoria*

Shrubs

No.	**Shrubs**
1	*Adhatoda vasica*
2	*Carissa spinarum*
3	*Gymnosporia spinosa*
4	*Helicteres isora*

5	*Jatropha curcas*
6	*Lantana camera*
7	*Nyctanthes arbortristis*
8	*Tinospora cardifolia*
9	*Woodfordia fruticosa*
10	*Ziziphus nummularia*

Herbs

No.	**Herbs**
1	*Abelmoschus esculantus*
2	*Argemones mexicana*
3	*Cassia obtusifolia*
4	*Cassia occidentalis*
5	*Cassia tora*
6	*Chlorophytum tuberosum*
7	*Ocimum basilicum*
8	*Ocimum sanctum*
9	*Solamum nigrum*
10	*Thesphesia lampas*

Climber

No.	**Climber**
1	*Abrus precatorias*
2	*Tinospora cordifolia*
3	*Smilax macrophylla*
4	*Vallaris solanaceae*
5	*Ventilago denticulata*

Annex-3

List of Avifauna in the Study Area

No.	**Common Name**	**Scientific Name**
1	Little Grebe	*Tachybaptus ruficollis*
2	Little Cormorant	*Phalacrocorax niger*
3	Little Egret	*Egretta garzetta*
4	Cattle Egret	*Bubulcus ibis*
5	Indian Pond-Heron	*Ardeola grayii*
6	Brahminy Kite	*Haliastur indus*
7	Shikra	*Accipiter badius*
8	Red-wattled Lapwing	*V. indicus*
9	Common Sandpiper	*Actitis hypoleucos*
10	Spotted Dove	*S. chinensis*
11	Blue Rock Pigeon	*Columba livia*
12	Alexandrine Parakeet	*Psittacula eupatria*
13	Rose-ringed Parakeet	*P. krameri*
14	Plum-headed Parakeet	*P. cyanocephala*
15	Indian Cuckoo	*Cuculus micropterus*
16	Asian Koel	*Eudynamys scolopacea*
17	House Swift	*Apus affinis*
18	White-breasted Kingfisher	*H. smyrnensis*
19	Indian Roller	*Coracias benghalensis*
20	Common Hoopoe	*Upupa epops*
21	Indian Grey Hornbill	*Ocyceros birostris*
22	Common Swallow	*Hirundo rustica*
23	Red-vented Bulbul	*P. cafer*
24	Indian Robin	*Saxicoloides fulicata*
25	Common Babbler	*Turdoides caudatus*
26	Common Tailorbird	*Orthotomus sutorius*
27	Purple Sunbird	*Nectarinia asiatica*

28	House Sparrow	*Passer domesticus*
29	Common Myna	*Acridotheres tristis*
30	Jungle Myna	*A. fuscus*
31	Eurasian Golden Oriole	*Oriolus oriolus*
32	Black Drongo	*Dicrurus macrocercus*
33	Indian Treepie	*Dendrocitta vagabunda*
34	House Crow	*Corvus splendens*
35	Jungle Crow	*C. macrorhynchos*
36	Storked Billed Kingfisher	*Halcyon capensis*
37	Oriental Magpie Robin	*Copsychus saularis*
38	Tree Pie	*Dendrocitta vagabunda*
39	Blackbird	*Turdus mercula*
40	Black shouldered kite	*Elanus caeruleus*
41	Paddy field pipit	*Anthus rufulus*