

Environmental and Social Due Diligence Report

Project Number: 47083-004
April 2020

INDIA: Accelerating Infrastructure Investment Facility in India – Tranche 3 Spring ALT Energy Private Limited (Part 3 of 5)

Prepared by India Infrastructure Finance Company Limited for the India Infrastructure Finance Company Limited and the Asian Development Bank.

This environmental and social due diligence report is a document of the borrower. The views expressed herein do not necessarily represent those of ADB's Board of Directors, Management, or staff, and may be preliminary in nature.

In preparing any country program or strategy, financing any project, or by making any designation of or reference to a particular territory or geographic area in this document, the Asian Development Bank does not intend to make any judgments as to the legal or other status of any territory or area.

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

Table 6-9: Impact Significance - Ecology

Aspect	Scenario	Spread	Duration	Intensity	Overall
Ecology	Without Mitigation	Local	Short	Moderate	Minor
	With Mitigation	Local	Short	Moderate	Insignificant

6.3.6 Traffic and Transport

Impact

The construction phase shall involve transportation of construction materials like the components of, Wind Turbines. The 197.5 MW plant site is accessible by a two lane undivided black top Kageshree-Kutiyana road along with SH 23 and NH 94. The project construction activities will lead to additional traffic and increased risk of traffic related accidents and injuries to local on activities community and to workers. The increase in traffic due to the project is however going to be marginal. The traffic density along the approach road is low and the additional traffic due to the construction activities will not have any significant impact on the traffic density.

Mitigation

For minimising the impacts due to the increased traffic, it is recommended that only trained drivers are recruited. Envision shall conduct training programs for all the drivers for raising awareness about road safety and adopting best transport and traffic safety procedures once in every six months. SPRNG ALT Energy also organises eye checkups for all the drivers on a yearly basis.

Mitigation measures such as emphasizing on safety amongst drivers, adopting limits for trip duration and arranging driver roster to avoid overtiredness and avoiding dangerous routes and times of day to reduce risk of accident shall also be implemented.

Significance of Impact

The impact due to traffic and transport will have moderate intensity with a medium spread for a short duration which will result in an overall moderate impact without mitigation. However with proper implementation of suggested mitigation the impact will be reduced to minor.

Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 193

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

Table 6-10: Impact Significance: Traffic and Transport

Aspect	Scenario	Spread	Duration	Intensity	Overall
Traffic/ Transportation	Without Mitigation	Medium	Short	Moderate	Moderate
	With Mitigation	Medium	Short	Low	Minor

6.3.7 Atmospheric Emissions

Impacts

Construction activities will lead to generation of dust due to excavation works for foundations, mixing of construction materials in batching plant, contact of construction machinery with bare soil, and exposure of bare soil and soil piles to wind.

A secondary source of emissions includes exhaust from diesel generator sets. Other sources of atmospheric emissions during construction phase will include emissions from diesel engines of earth moving equipment, as well as from open burning of solid waste on-site. The increase in traffic volumes during the construction will also generate dust. Improper storage of soil and construction material can also increase dust emission from the site.

Mitigation

Envision shall ensure reduction and control of air emissions from construction activities by minimising dust from material handling sources. Sprinkling of water is being carried out to suppress dust from construction, stock piles and transport movement.

SPRNG ALT Energy shall ensure that all stock piles are covered and storage areas provided with enclosures to minimise dust from open area source. Stock piling and storage of construction material will be oriented after considering the prominent wind direction.

The scale of construction being small will require only a limited number of construction machinery and for limited duration, therefore emissions from heavy machinery are considered to be insignificant. Open burning of solid waste or packaging material will be strictly prohibited and all such activity will be permitted at site.

Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 194

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

Operation of DG sets will be limited and timely maintenance of the units shall be undertaken to prevent unwanted emissions. Vehicles engaged for the project will be required to obtain “Pollution Under Control” certificates.

Significance of Impact

The impact on ambient air quality will have a local spread, moderate intensity and will last for a short duration primarily limited to construction related activities which will result in an overall minor impact without mitigation. However with proper implementation of suggested mitigation the impact will be reduced to insignificant.

Table 6-11: Impact Significance - Ambient Air Quality

Aspect	Scenario	Spread	Duration	Intensity	Overall
Ambient Air Quality	Without Mitigation	Local	Short	Moderate	Minor
	With Mitigation	Local	Short	Low	Insignificant

6.3.8 Noise and Vibration

Impacts

Noise and vibration will be caused by the operation of earth moving and excavation equipment, concrete mixers, cranes and the transportation of equipment, materials and people. There is potential for disturbance to habitations in proximity of construction site. Movement of traffic during night hours can also disturb the local community.

Mitigation

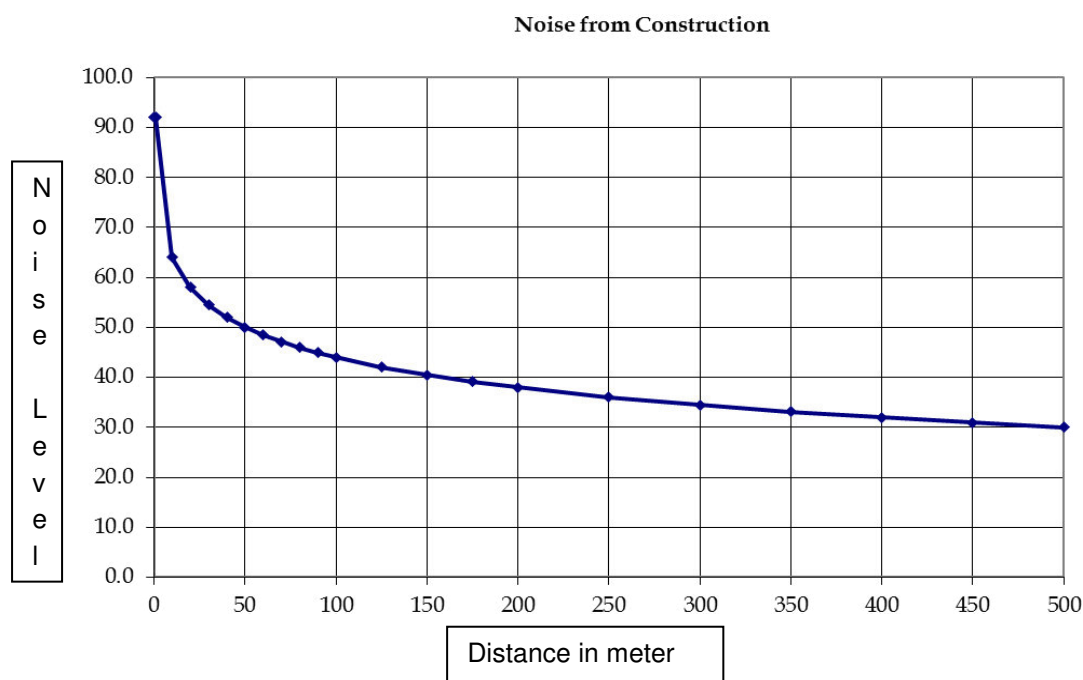
Most of the construction activities involving excavation and foundation for Wind Turbine will be done manually and therefore will have limited noise. Mobile noise sources such as cranes, earth moving equipment and HGVs shall be routed in such a way that there is minimum disturbance to receptors. Envision shall be instructed to arrange for inherently quiet construction equipments and machines to maintain the noise level to minimum. Only limited construction activities shall be carried out during night-time. Construction activity generates noise level in the range of 90-92 dB(A) which reduces to 45dB(A) at a distance of 80 m from the source which is the limit of noise level prescribed for the night time. The nearest habitation is located at a distance of over 2 km.

Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 195

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

Figure 6-1: Noise Attenuation with Distance



All loud and sudden noises will be avoided wherever possible and fixed noise sources to be located at least 50m away from the site boundary. Rubber padding/noise isolators will be used for equipment/machinery used for construction. Temporary noise barriers shall be provided surrounding the high noise generating construction equipments. The personnel involved in high noise generating activities shall be provided with personal protective devices to minimise their exposure to high noise levels. Construction vehicles and machinery will be well maintained and not kept idling when not in use.

Significance of Impact

The impact due to noise and vibration will have moderate to minor intensity with a local spread for a short duration which will result in an overall minor impact without mitigation. However with proper implementation of suggested mitigation the impact will be reduced to insignificant.

Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 196

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

Table 6-12: Impact Significance - Noise and Vibration

Aspect	Scenario	Spread	Duration	Intensity	Overall
Noise and Vibration	Without Mitigation	Local	Short	Moderate	Minor
	With Mitigation	Local	Short	Low	Insignificant

6.3.9 Health and Safety Hazards

Impacts

During construction works, physical injury can result due to road accidents, construction accidents and other occupational hazards. Overexertion and ergonomic injuries and illness are potentially the most common health hazards associated with construction activities. Further there is potential for slips and fall on the same elevation associated with poor housekeeping, such as excessive waste debris, loose construction material, liquid spills and uncontrolled use of electrical cords and ropes on ground, which results in injuries and time loss during construction.

Hazards associated with fall of construction material or tools, as well as collapse of constructed slabs, walls, roofs etc. can result in injury to head, eyes and extremities. Transportation and movement of vehicles are associated with road accidents and related hazards, which can lead to injuries and fatalities.

Mitigation

The Contractor has developed an Occupational Health and Safety Manual and is adopting OHS procedures for the construction works at site. It has further formulated an Emergency Preparedness and Response Procedure and an On-Site Emergency Procedure. The On-Site emergency procedure provides details of the anticipated emergencies, the emergency organisation, facilities, emergency procedures and roles and responsibilities. Envision shall ensure that adequate training is provided to staff about raising awareness about use of PPEs and emergency response measures.

Envision shall introduce administrative controls into work processes such as job rotation, rest and stretch breaks etc to reduce overexertion. Work site layout will be well planned to avoid manual transfer of heavy loads. Envision shall ensure good housekeeping at the construction site to avoid slips and falls. Excessive waste debris and liquid spills will be

Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 197

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

cleaned up regularly, while electrical cords and ropes will be placed along identified corridors marked for attention of everyone at site. Use of personal fall arrest system, such as full body harnesses as well as fall rescue procedures to deal with workers whose fall has been successfully arrested.

Dropping/lowering of construction material or tool will be restricted and undertaken only under strict supervision, if required. Personal Protection Equipment (PPE) such as safety glasses with side shields, face shields, hard hats and safety shoes shall be mandatory at construction site. Ear plugs shall be provided for workers placed at high noise areas.

Significance of Impact

The health and safety impacts will have high intensity with a local spread for a short duration which will result in an overall moderate impact without mitigation. However with proper implementation of suggested mitigation the intensity can be reduced to low and the overall impact will be insignificant.

Table 6-13: Impact Significance - Health and safety

Aspect	Scenario	Spread	Duration	Intensity	Overall
Health and Safety	Without Mitigation	Local	Short	High	Moderate
	With Mitigation	Local	Short	Low	Insignificant

6.3.10 Socio-Economic Impacts

The project will have potential socio-economic impacts on the community and the surrounding areas. Such impacts have been identified and assessed in this section:

Impacts due to Land Acquisition

The land procured for the project comprises of only revenue land. No physical or economic displacement is anticipated due to the project.

The low voltage transmission lines for both the plants are aligned along the roads, with single/double poles structures which require lesser space as compared to pylon towers. The lines pass through both private and revenue land. Due permission has been obtained from the district collector for revenue land for installation of poles. No land procurement has been undertaken and no loss of land or livelihood is expected.

Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 198

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

Mitigation

Although the community expressed satisfaction over the compensation of land and functioning of the project there is a need for a documented and structured Grievance Redressal Mechanism. A defined Grievance Redressal Mechanism shall be formulated and communicated to community to express their concerns associated with the project.

Access to Common Property Resources

The land procured for the project does not interfere with Gauchar.

Increased Community Expectations

The project area is predominantly rural. The advent of the project has created several expectations among the local community which centres on employment opportunities and improvement of infrastructure facilities.

The consultation undertaken with the community indicate that the community expects:

- Jobs for local villagers in the construction and operation phases of the project,
- business for local contractors and traders
- improvement of power situation in the area

Mitigation

Envision to engage local villagers as labour in the project construction activities. The employment opportunities can be long term and extended for the operation phase of the project as well. SPRNG ALT Energy/Envision can simultaneously take up CSR activities in the project area through livelihood improvement schemes and training programs that will improve the skills of the local population and increase their employability or make them self employed.

Influx of Migrant Workers

The construction of the project and its associated facilities requires labour of unskilled, semi-skilled and skilled nature. The total manpower requirement for the project is about 159 during the peak construction activities and majority of the labour will be hired locally. The migrant labour are not anticipated to be hired for the project. However in case of hiring migrant labour, there might be potential conflicts amongst the migrants and the community

Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 199

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

based on cultural, religious or behavioural practices. Use of community facilities such as health centers, temples, transport facility etc. by migrant labour may lead to discontent with local community.

Influx of migrant labour can lead to introduction and spread of communicable diseases, including sexually transmitted diseases. Inadequate hygiene and sanitation facilities can lead to health issues arising from vector borne disease like malaria, viral fever, gastroenteritis etc.

Mitigation

The labour camp shall be constructed as per IFC Guidelines in case of hiring migrant labour. The contractor, Envision shall ensure that all basic facilities such as fuel wood, medical facility, water supply, etc is made available to the migrant workers without any cost. The following facilities have been provided in the campsites:

- Accommodation: It shall be ensured that a minimum space of 4-4.5 m² is allocated per person.
- Common latrines and bathing facilities duly segregated for male and female labour - Number of toilets and sanitary fittings shall be considered as 1 toilet, 1 urinal and 1 bathroom per 15 male workers. Arrangement for female workers shall be 1 toilet and 1 bathroom per 10 female workers.
- Water supply through borewells and authorized water tankers- Adequate provisions of water with about 150 litre per capita per day shall be made.
- Disposal of sewage through a septic tank – soak pit arrangement.
- Arrangements for collection of garbage in dustbins and disposal through daily collection.

Supply of fuel wood and LPG cylinders

Envision shall ensure that there is a detailed briefing on cultural background and behavioural requirement for all the migrant workers, if hired for the project. Envision shall undertake medical fitness test of all the workers on regular basis. Information and awareness of communicable diseases, AIDS etc, shall be provided to workers. The area around the labour will be kept clean with daily disposal of water and proper drainage to avoid any water logging to prevent health issues arising from insect and other vectors.

Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 200

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

Community Health and Safety

Potential health and safety impacts on the local community may include:

- Construction site health hazards and those related to increase in traffic will render the access road accident prone. Any accident or injury to local community by project vehicle can also lead to major dissent.
- Spread of communicable diseases including sexually transmitted and vector-borne infections due to higher incidences of community interactions in the project vicinity;
- Incidences of common health ailments related to poor sanitation and living conditions as well as natural environment conditions such as stagnant water resulting from labour camp leading to diseases like malaria, gastroenteritis and viral fever can increase.

Mitigation

Envision shall ensure proper training of drivers and planning for transport of construction machinery, material and manpower. The drivers of the project vehicles and those carrying construction materials to site shall be strictly instructed to adhere to the traffic management plan.

- All workers whether local or migrants will be instructed to follow strict code of conduct while at the construction site to avoid any kind of conflict. Security staff engaged at site will be trained and informed about the importance of cordial interaction with the community. Local security personnel shall preferably be engaged at site.
- To the extent possible, labour to be housed in camps, with good living conditions and access to amenities. Outside labour living in the local community should be discouraged;
- Health and safety training of the labour, raising awareness about STDs, and HIV, and maintaining behaviour standards while moving in the community should be a priority;

Any complaints or concerns with respect to labour should be addressed without delay. Local administration and police should be aware about the details of outside labourers as also a list should be provided to the Panchayat /block office.

Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 201

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

Economic Impacts

The local economy of the area is likely to be impacted from the influx of migrant workers, in case of hiring migrant labour in the following ways:

- Increase in temporary demands of daily use products and services as well as other provisions in the immediate vicinity of the project area;
- Potential income generating opportunities for the locals from local trading opportunities;
- Increase in the local wage rates for non-agricultural labour and also a marginal exchange of skill levels due to community interactions of migrant workers with local laborers.

The local shopkeepers and traders will however face decline in income after completion of construction and dismantling of labour campsite.

Impacts on adjacent land

Site clearing activities, construction of the boundary wall can impact adjacent land due to the use of heavy construction equipment, haphazard storage etc. This has the potential to result in crop loss for any standing crops. However, there is not likelihood of contamination from the same.

The construction phase may also see other people migrating into the area in search of employment opportunities such as service, trading or food providers. These people are likely to encroach upon neighbouring land in the vicinity of the project and such encroachment can become a long-term phenomenon unless actively discouraged.

Mitigation

SPRNG shall ensure that all the project activities are restricted to the existing project site boundary. The use of land outside the boundary for purposes like parking of vehicles, storage of material during construction etc. warrants prior consent of the owner of that land. The project should proactively discourage any encroachment around the project area and involve the local panchayat authorities in the same. Construction of any structures outside the site boundary shall be prohibited.

Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 202

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

Significance of Impact

The impact on socioeconomics will have moderate intensity with a medium spread for a short duration which will result in an overall moderate impact without mitigation. However, with proper implementation of suggested mitigation the impact will be reduced to minor.

Table 6-14: Impact Significance - Socio-economic

Aspect	Scenario	Spread	Duration	Intensity	Overall
Socio-economic	Without Mitigation	Medium	Short	Moderate	Moderate
	With Mitigation	Medium	Short	Low	Minor

6.3.11 Archaeological, Historic and Cultural Aspects

Impact

Based on the preliminary survey, it is observed that there are no archaeological and historical sites of importance in proximity to the site. There are no temples, religious symbols or related cultural activities in and around the site. There is potential for cultural differences due to influx of migrant labourers.

Mitigation

Envision will ensure that the workforce engaged for construction is hired locally and from the nearby villages. This would reduce any potential for cultural difference amongst the workers. The project proponent will not engage in any kind of bias on basis of religious or cultural differences and shall communicate the same to its subcontractors. Though there are reportedly no cultural or religious site in the project area, cultural/religious practices and sensitivities will be taken into consideration while undertaking activities like extraction of water, informal symbols of worship etc.

In case of any chance find during construction, all work will be stopped and relevant local offices will be informed about the same.

Significance of Impact

The impact on archaeology, historic or cultural aspect will have moderate intensity with a local spread for a short duration which will result in an overall minor impact without

Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 203

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

mitigation. However with proper implementation of suggested mitigation the impact will be reduced to insignificant.

Table 6-15: Impact Significance - Archaeology, Historic or Cultural Aspect

Aspect	Scenario	Spread	Duration	Intensity	Overall
Archaeology, Historic and Cultural	Without Mitigation	Local	Short	Moderate	Minor
	With Mitigation	Local	Short	Low	Insignificant

6.4 IMPACT ASSESSMENT-OPERATION PHASE

6.4.1 Waste Disposal

Impacts

Operation of Wind Turbine for power generation will not have any direct impact on soil. Once the plant is commissioned there will be limited disturbance to soil, however repair and maintenance of underground cables and associated utilities will lead to generation of hazardous wastes such as used transformer oil. Waste generated from the maintenance staff is expected to be about 10 kg/day and improper storage and disposal can lead to unhygienic conditions and contamination of soil.

Mitigation

- EPC Contractor should ensure that no unauthorized dumping of used oil and other hazardous waste is undertaken at the site;
- Receptacles and designated areas for daily collection should be periodically disposal in a designated municipal facility;
- Construction and Demolition Waste should be stored separately and be periodically collected by an authorized treatment and storage facility;
- Hazardous waste should be properly labelled, stored onsite at a location provided with impervious surface and in a secondary containment system; and
- Waste bins should be proper covered and protected from the elements (wind, rain, storms, etc.) and placed away from natural drainage channels.

Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 204

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

Significance of Impact

The impact on soil will have moderate intensity with a local spread for a short duration (of activity) which will result in an overall minor impact without mitigation

Table 6-16: Impact Significance- Waste Disposal

Aspect	Scenario	Spread	Duration	Intensity	Overall
Waste Disposal	Without Mitigation	Local	Short	Moderate	Minor
	With Mitigation	Local	Short	Low	Insignificant

6.4.2 Aesthetics and Visual Impact

Impacts

There will be a change of landscape due to installation of Wind Turbine and related structures. Visual impact due to shadow generated from the rotors is also a key element. The change in landscape and shadow generated from the rotors can affect the habitation as well as faunal of the area.

Shadow Flicker Modelling

Shadow flicker from wind turbines occurs when rotating wind turbine blades pass between the sun and the viewer. Shadow flicker is generally experienced in areas near wind turbines where the distance between the viewer and blade is short enough that the glare from the sunlight is insufficient to conceal the blade. When the blades rotate, this shadow creates a visual pulsing effect with the sun known as shadow flicker. From longer distances, however, the wind turbine covers an increasingly smaller portion of the sun and light rays will "recombine" to eliminate the shadow flicker effect. Shadow flicker is greatest in the winter months as the angle of the sun is low and casts a longer shadow. The effect is limited to the hours close to sunrise and sunset when the sun is near the horizon.

A number of factors influence shadow flicker on the shadow receptors. One consideration is the environment around the shadow receptor. Obstacles such as terrain, trees, or buildings between the wind turbine and a potential shadow flicker receptor significantly reduce or eliminate shadow flicker effects. Also, tropical forest and trees affect the ability of shadow

Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 205

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

flicker to reach the viewer depending on whether such trees have leaves or not. These obstacles and seasonal variations were not considered in the modelling.

Another consideration is the time of day when shadow flicker occurs. As an example, a factory or office building would not be affected if all the shadow impact occurred outside of business hours, whereas it would be more acceptable for private homes to experience shadow impact during working hours, when the family members are at work/school.

Lastly, the climate also has to be considered when assessing shadow flicker. In areas with high rates of overcast weather there would be less shadow flicker. As well, when the wind is not blowing, the wind turbine blades do not move and therefore no shadow flicker occurs. Statistics regarding the wind conditions and sunshine probability were not modeled in this study.

Methodology

Shadow flicker modelling was performed using EMD's WindPro Software version 7.2, a wind modelling software program. WindPRO is used to calculate detailed shadow flicker map across an area of interest with site-specific locations using shadow receptors. The inputs for the WindPRO shadow flicker model include the following:

- The geographic locations and characteristics of the proposed WTGs;
- The locations of identified shadow receptors within 360 m, twice the distance given in IFC guidelines (Section 6.3.1) of proposed WTGs;
- Turbine Model Specifications; and
- The WindPRO software calculates the position of the sun throughout the day in accordance to the curvature of the earth, the time of year and the project site's position. The software calculates the occurrences of shadow flicker at each of the identified receptor. Analysis was conducted to represent a *theoretical worst case* scenario, with the following conditions:
 - The sun is shining all day, from sunrise to sunset with clear skies;
 - There are no obstructing features such as trees and vegetation; and
 - The wind turbines are always operating i.e. there is continuous wind of sufficient speed and no maintenance or down time.

Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 206

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

Table 6-17:Sunshine probability S (Average daily sunshine hours)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
9.75	9.79	9.96	10.53	11.15	7.02	3.64	3.21	6.68	9.56	9.43	9.40

A ZVI (Zones of Visual Influence) calculation is performed before flicker calculation so non-visible WTG do not contribute to calculated flicker values. For the receptors, a WTG is considered to be visible if it is visible from any part of the receiver window. The ZVI calculation is based on the following assumptions:

Height contours used: Project Wizard Elevation Data Grid (SRTM: Shuttle DTM Obstacles used in calculation

SHADOW RECEPTOR LOCATION AND ELEVATION

As with wind turbine location, the elevation, distance, and direction from a wind turbine are large factors in determining the significance of shadow flicker impact. The model was performed with shadow flicker with receptors one meter high by one meter wide and the worst-case orientation which assumes all receptors face the turbine directly. Rather than facing a particular direction, shadow flicker receptors (windows) are simulated as horizontal planes, meaning they experience shadow flicker over 360°; this assumption therefore represents a worst case scenario. Simulations have been carried out with a resolution of 1 minute; if shadow flicker occurs in any 1-minute period, the model registers this as 1 minute of shadow flicker.

It is generally accepted that shadow flicker from wind turbines does not occur beyond a distance, D, from a given wind turbine. The UK wind industry considers this distance to be equivalent to 10 rotor diameters, while the Danish wind industry suggests a value of between 500 and 1000 m. TUV-SUD has adopted a conservative approach and has assumed the length, D, that a shadow can be cast on the basis of the following formula:

$$D = 10 \times (\text{hub height} + \text{rotor radius})$$

Beyond this distance, a viewer does not perceive the turbine blade to be chopping the light, but rather as an object passing in front of the sun.

Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 207

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

Shadow flicker calculations can be adjusted using an annual cloud coverage figure, which is based on historical meteorological data and statistics. According to data gathered from meteorological stations, an annual cloud cover can be estimated and applied as a percentage. Further, using the site-specific wind rose to consider the probability of the turbines being oriented in a given direction could lead to significant further reduction in the annual shadow flicker occurrence.

No attempt has been made to account for vegetation or other shielding effects around each shadow receptor in the calculations of shadow flicker duration. Similarly, turbine shut-down has not been considered.

Conservative Assumptions

Shadow flicker duration calculated in the manner described above typically over-estimates the annual number of hours of shadow flicker experienced at a specified location for several reasons, namely:

1. The modelling of the wind turbine blades as discs rather than individual blades results in an overestimate of shadow flicker duration. Turbine blades are of non-uniform thickness with the thickest part of the blade (maximum chord) close to the hub and the thinnest part (minimum chord) at the tip. Diffusion of sunlight, as discussed above, results in a limit to the maximum distance that a shadow can be perceived. This maximum distance will also be dependent on the thickness of the turbine blade and the human threshold for perception of light intensity variation. As such, a shadow cast by the blade tip will be shorter than the shadow cast by the thickest part of the blade.
2. The wind turbine will not always be yawed such that its rotor is perpendicular to the sun-turbine vector). Any other rotor orientation will reduce the area of the projected shadow, and thus the incidence of shadow flicker. Additionally, the orientation of windows on a given receptor has not been taken into account, i.e. the model assumes that a window is always facing the turbine(s). The wind speed frequency distribution, or wind rose, at the site can be used to determine probable turbine orientation in order to calculate the resulting reduction in shadow flicker duration; however this has not been done in this study.

Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 208

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

3. Aerosols (moisture, dust, smoke, etc.) in the atmosphere have the ability to influence shadows cast by a wind turbine. The length of the shadow cast by a wind turbine is dependent on the degree that direct sunlight is diffused, which in turn is dependent on the amount of dispersants (humidity, smoke and other aerosols) in the path between the light source (sun) and the receiver.
4. Modelling the sun as a point light source rather than a disc results in an overestimate of the shadow flicker duration. The fact that the light source is a disc results in a shadow which is less well defined and of lower intensity as compared to a point light source. The occurrence of cloud cover has the potential to significantly reduce the number of hours of shadow flicker. Cloud cover measurements recorded at nearby meteorological stations may be used to estimate probable levels of cloud cover, and to provide an indication of the resulting reduction in shadow flicker duration.
5. The presence of vegetation or other physical barriers around a shadow receptor location may shield the view of the wind turbine, and therefore reduce the incidence of shadow flicker.
6. Periods where the wind turbine is not in operation due to low winds, high winds, or for operational and maintenance reasons will also reduce shadow flicker occurrence. In light of the reasons listed above, it is likely that the shadow flicker durations assumed can be regarded as conservative.

Additional Factors

This analysis does not take into account the predicted wind speed and direction at each turbine, average cloud cover, and obstacles. These factors would reduce the operational time, line-of-sight, and shadow size cast by a wind turbine. These calculations also assume each residence is directly facing a wind turbine. Therefore, these estimates may be more conservative than what would likely be experienced by a given receptor. As such, it is likely receptors will be less impacted due to the following factors:

- Wind Speed: Rotors will only turn when wind speeds are above appropriate levels (typically 3.5 m/s). This analysis assumes that the wind is always blowing at a sufficient speed to turn the rotors, which results in a conservatively high estimate of shadow flicker impacts hours. Wind Direction: During operation the rotors will face into the wind and will continually orient themselves as the wind direction changes.
- The wind direction relative to the sun's location is key to whether shadow flicker impacts can occur. This analysis assumes that the wind is always oriented to

Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 209

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

produce shadow effect at a receptor location. Worst case assumes sun always shining (from sun rise to sun set), turbine always running and rotor oriented perpendicular to neighbour.

- Average Cloud Cover: Average climate conditions for the project area would decrease shadow flicker impacts due to the sporadic presence of clouds, fog, and haze. The worst case model assumes every day of the year has clear skies and perfect visibility.
- The ZVI calculation will be used for flicker map as well as the receptor calculations. The flicker map will as default be calculated for same elevation as the ZVI calculation. For the receptors, a WTG will be visible if it is visible from any part of the receiver window.

Results and Analysis

The term *theoretical worst case* means that turbine operational hours, wind direction, and local sunshine probabilities have not been accounted for. A total of 24 shadow receptors (individual structures, villages etc as identified during the site survey) were analysed, and a normal resolution shadow flicker map was generated.

Therefore, output from the model includes the following information:

- Estimated shadow-flicker time (hours per year) at receptors within 300 m of the proposed Project turbine;
- Map showing turbine locations, identified shadow-flicker receptors, and projected shadow-flicker time (hours per year).

As a result of the scenario described above, the shadow flicker calculations represent a *theoretical worst case* scenario as presented in **Table 6-18**. The shadow flicker results of each WTG are listed in **Table 6-18** with the corresponding modelling results.

Table 6-18: Results of Shadow Flicker Modeling

S.NO.	Receptors	Worst Case		Expected Values	
		Shadow hours hr/yr	Shadow days days/yr	Max shadow hours hr/day	Shadow days days/yr
A	Near Satapar Village and in proximity STP07	0:00	0	0:00	0:00

Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 210

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

B	Near Mahiki village in proximity to VDV09	15:05	78	0:18	3:05
C	Near Valvada village and in proximity to MLV05	33:49	115	0:26	6:27
D	UP wind direction located in residential area (Paradva) near PRD05 and proximity to village road	65:52	119	0:46	13:43
E	Near Balva village in proximity to BTB05	0:00	0	0:00	0:00
F	Near Chur village in proximity to CHR05	38:20	96	0:33	7:44
MIN		0:00	0.00	0:00	0
MAX		65:52	119	0:46	13.43

Based on the real time scenario based on the geographical location, there will be no exceedance of the showdown at any of the receptors. The WTG location has to be reconsidered if the threshold limit exceeds 30 hours per year on a real time scenario.

Table 6-19: Amount of Flickering on shadow receptors caused by each WTG

Total amount of flickering on the shadow receptors caused by each WTG			
No.	Name	Worst case [h/year]	Expected [h/year]
	STP 01	00:00	00:00
	STP 02	00:00	00:00
	STP 03	00:00	00:00
	STP 04	00:00	00:00
	STP 05	00:00	00:00
	STP 06	00:00	00:00
	STP 07	00:00	00:00
	STP 08	00:00	00:00
	STP 10	00:00	00:00
	STP 11	00:00	00:00
	VDV 01	00:00	00:00
	VDV 02	00:00	00:00
	VDV 03	00:00	00:00
	VDV 04	00:00	00:00

Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 211

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

Total amount of flickering on the shadow receptors caused by each WTG		
No. Name	Worst case [h/year]	Expected [h/year]
VDV 05	25:42:00	05:36
VDV06	00:00	00:00
VDV 07	00:00	00:00
VDV08	00:00	00:00
VDV 09	03:00	00:23
VDV 10	05:07	00:28
BLV 01	00:00	00:00
BLV 02	00:00	00:00
BLV 03	00:00	00:00
BLV 04	00:00	00:00
BLV 05	00:00	00:00
CHR 01	00:00	00:00
CHR 02	00:00	00:00
CHR 03	00:00	00:00
CHR 04	00:00	00:00
CHR 05	28:16:00	06:17
CHR 06	04:43	00:19
CHR 07	11:36	02:33
MHK 01	09:47	01:55
MHK 02	00:00	00:00
MHK 03	00:00	00:00
AMR 01	00:00	00:00
AMR 02	00:00	00:00
AMR 03	00:00	00:00
MLV 01	00:00	00:00
MLV 02	00:00	00:00
MLV 03	00:00	00:00
MLV 04	00:00	00:00
MLV 05	00:00	00:00
MLV 06	00:00	00:00
PTN 01	08:37	01:50
PTN 02	00:00	00:00
PTN 03	00:00	00:00
PTN 04	00:00	00:00
PTN 05	00:00	00:00
PTN 06	00:00	00:00

Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 212

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

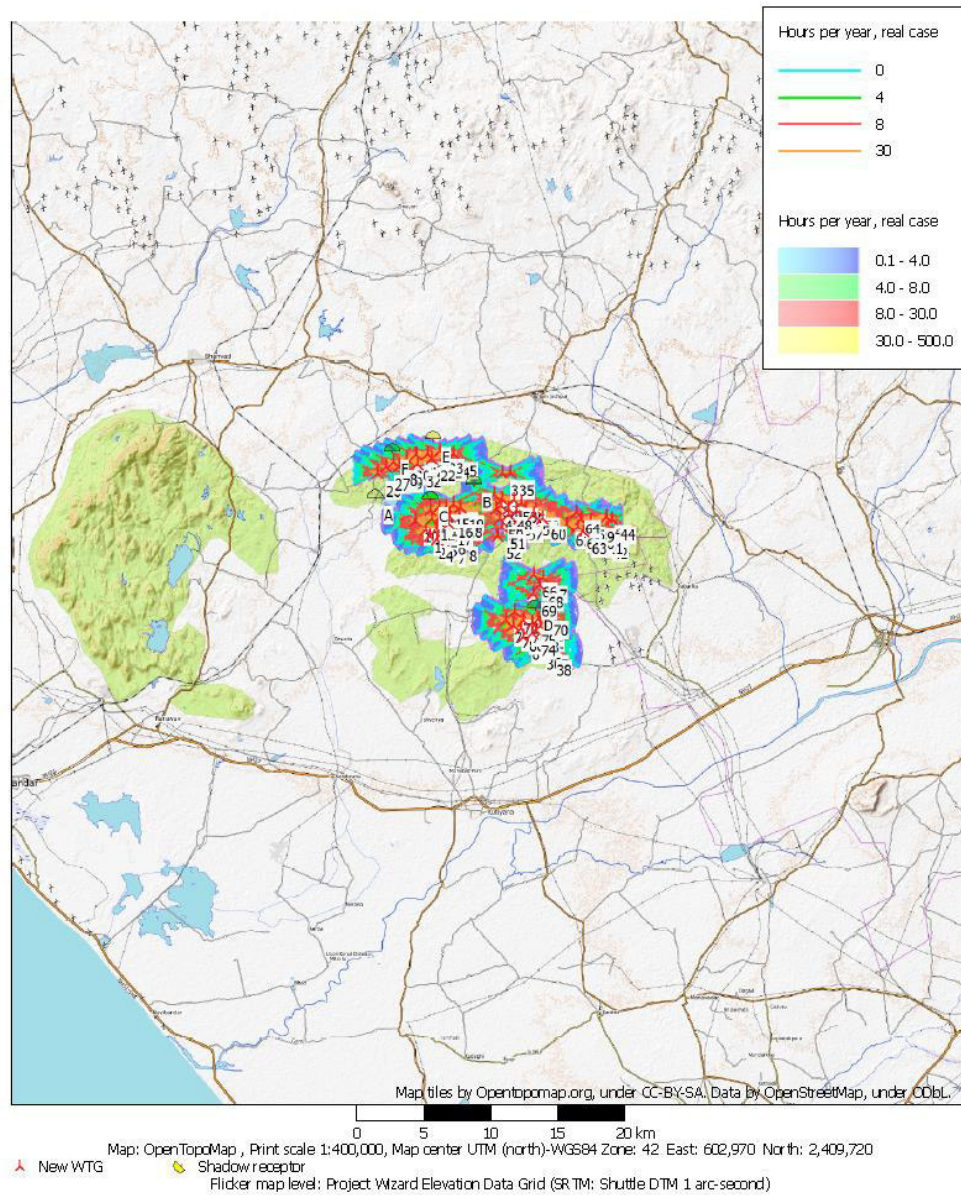
Total amount of flickering on the shadow receptors caused by each WTG		
No. Name	Worst case [h/year]	Expected [h/year]
PTN 07	00:00	00:00
PTN 08	00:00	00:00
PTN 09	00:00	00:00
PTN 10	00:00	00:00
PTN 11	00:00	00:00
PTN 12	00:00	00:00
PTN 13	00:00	00:00
PTN 14	00:00	00:00
PTN 15	00:00	00:00
PTN 16	00:00	00:00
PTN 17	00:00	00:00
PTN 18	00:00	00:00
PTN 19	00:00	00:00
PTN 20	00:00	00:00
PTN 21	00:00	00:00
PRD 01	00:00	00:00
PRD 02	00:00	00:00
PRD 03	00:00	00:00
PRD 04	00:00	00:00
PRD 05	00:00	00:00
PRD 06	00:00	00:00
PRD 07	00:00	00:00
PRD 08	00:00	00:00
PRD 09	00:00	00:00
PRD 10	00:00	00:00
PRD 11	05:52	00:30
PRD 12	02:30	00:27
PRD 13	00:00	00:00
PRD 14	00:00	00:00
PRD 15	00:00	00:00
Max	28:16:00	6:17:00

Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 213

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat
Client: SPRNG ALT Energy Pvt. Ltd.

Figure 6-2: Results of Shadow Flicker Assessment Shadow Hours per year

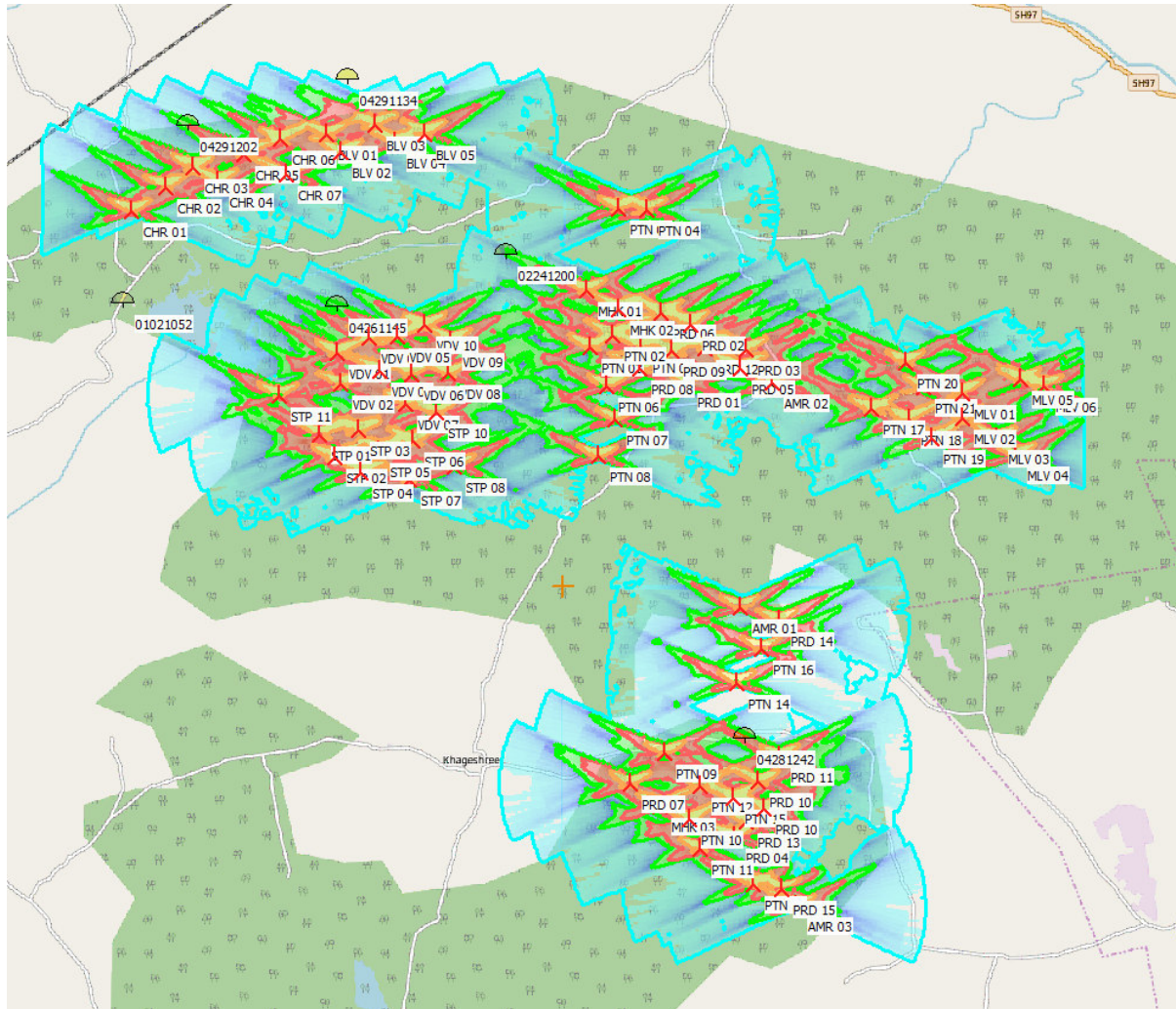
SHADOW - Map



Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 214

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat
Client: SPRNG ALT Energy Pvt. Ltd.

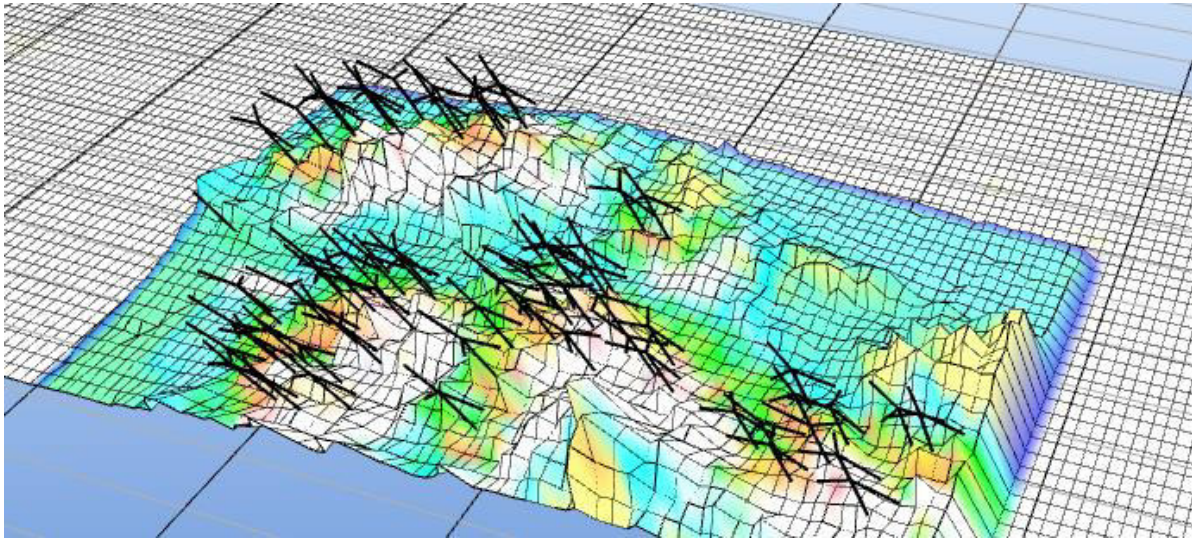
Figure 6-3: A View of WTG and Shadow Flicker Receptors



Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 215

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat
Client: SPRNG ALT Energy Pvt. Ltd.

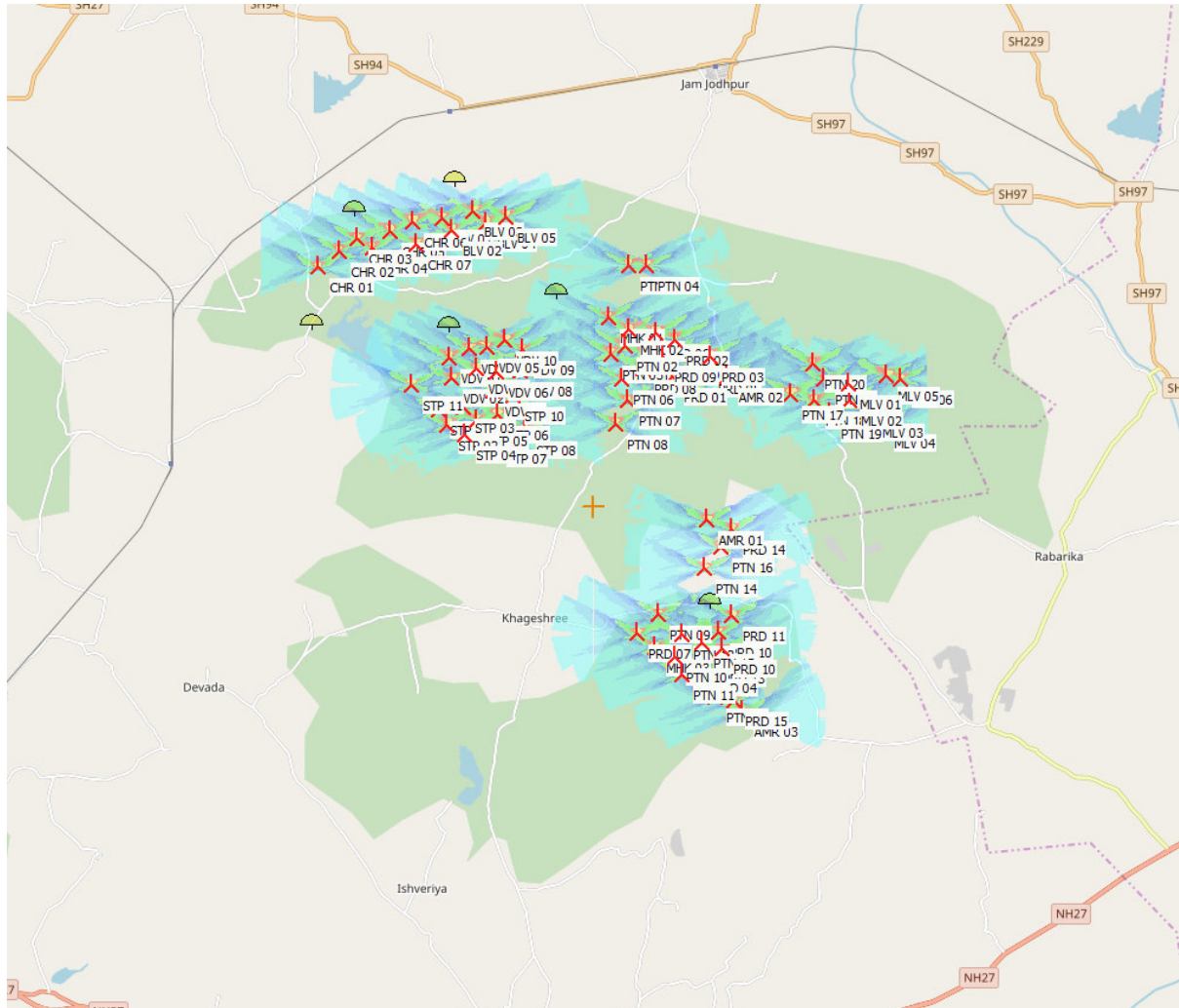
Figure 6-4: 3D image of the shadow minutes per day



Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 216

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat
Client: SPRNG ALT Energy Pvt. Ltd.

Figure 6-5: 2D image of shadow minutes per day (real case)

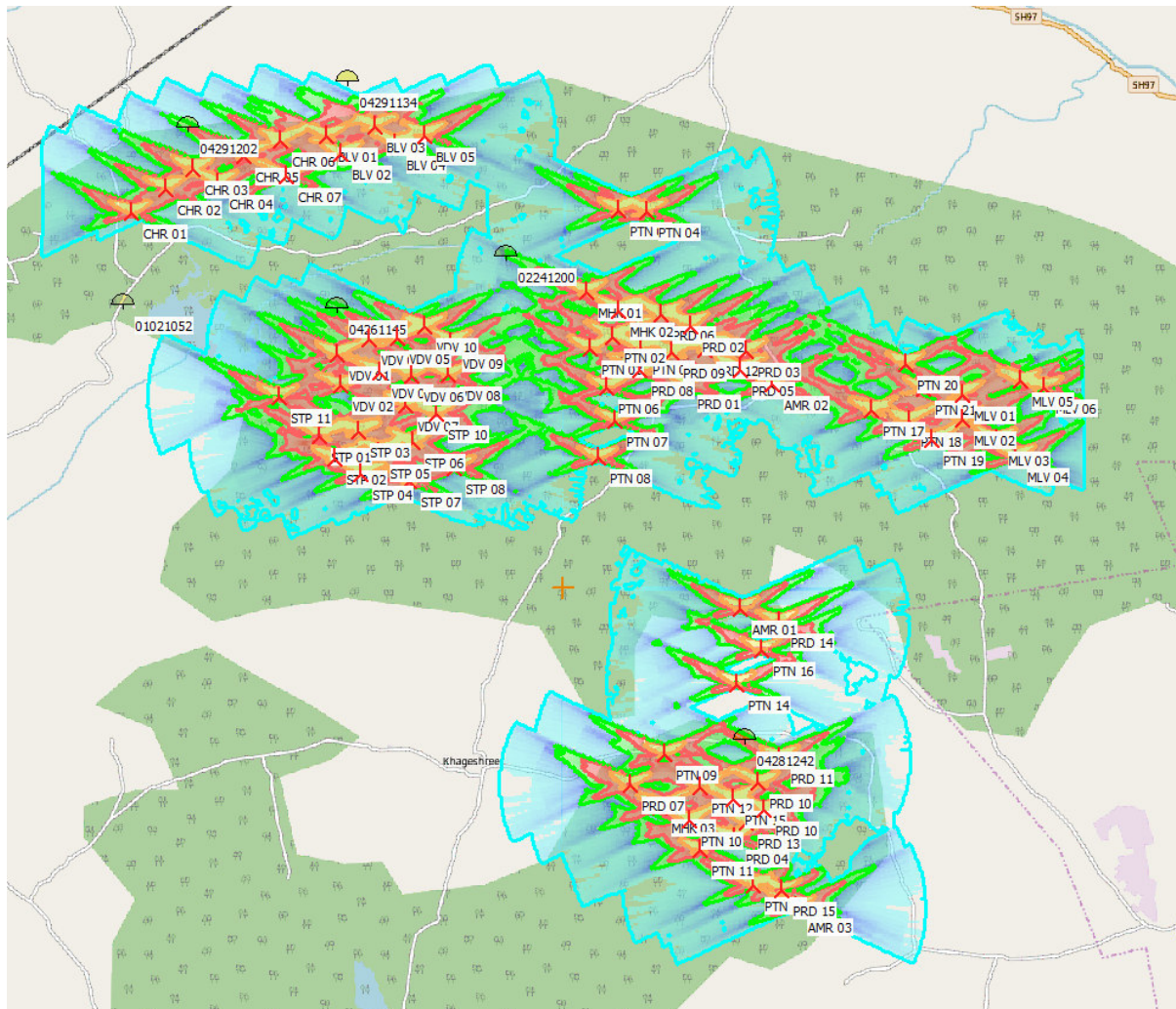


Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 217

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

Figure 6-6: A closer view of 2D image of shadow minutes per day (real case)



Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 218

Client: SPRNG ALT Energy Pvt. Ltd.

Figure 6-7: Shadow- Calendar Graphical

[illegible]Page 219

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

Mitigation

The Wind Turbine will be installed away from permanent structure and water bodies. Painting of rotor blade to be considered to provide visual signal to the raptors and the migratory birds.

In case the shifting of a WTG is not possible from close proximity of a permanent structure, plantation of tree and other obstacle to be devised to reduce the shadow flicker effect.

Significance of Impact

The impact on aesthetics and visual aspects will have low intensity with a local spread for a long duration which will result in an overall minor impact without mitigation. The residual minor impact, even after control of intensity and spread, will remain minor owing to the duration of project.

Table 6-20: Impact Significance - Aesthetics and Visual

Aspect	Scenario	Spread	Duration	Intensity	Overall
Aesthetics and Visual	Without Mitigation	Local	Long	Low	Minor
	With Mitigation	Local	Short	Low	Insignificant

6.4.3 Noise

Impacts

Noise from a wind turbine is typically made up of three distinct elements:

- a reasonably steady, broad-band noise of aerodynamic origin, which depends on the blade tip speed
- a tonal noise element from mechanical components within the nacelle
- a regular, pulsed element resulting from interaction between the mast and blades

The proposed wind farm will comprise of 79 wind turbine generators. A noise modelling exercise was carried out for the proposed project using the WindPRO software available for the design and planning of wind farms. It is to be noted that the noise modelling is

Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 220

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

undertaken for 80 WTG locations, out of which 79 locations will be selected. WindPRO contains pre-configured noise calculation models in order to calculate predicted noise levels at each noise sensitive area plus a ready built catalogue of wind turbines and noise emission data.

Table 6-21: Details of Noise Receptors Locations

No	Name of the Receptors	Baseline	
		dB(A)	
		Day	Night
A	Near Satapar Village and in proximity STP07	54.2	40.6
B	Near Mahiki village in proximity to VDV09	50.6	41.5
C	Near Valvada village and in proximity to MLV05	54.5	39.4
D	UP wind direction located in residential area (Paradv) near PRD05 and proximity to village road	49.8	40.6
E	Near Balva village in proximity to BTB05	48.3	42.9
F	Near Chur village in proximity to CHR05	47.8	43.6
	min	47.8	39.4
	max	54.5	43.6
	mean	50.9	41.4

METHODOLOGY

Noise impact due to operation of the proposed Project, was analysed using numerical calculations from EMD's WindPro Software version 7.2, which is specifically designed for wind turbine noise. WindPRO contains pre-configured noise calculation models in order to calculate predicted noise levels at each of the selected noise receptor plus a ready built catalogue of wind turbines and noise emission data. The ISO 9613-2 General noise calculation model was used which considers frequency dependant attenuation due to geometric divergence, atmospheric absorption, and ground effect. The model is valid for downwind propagation under a well-developed moderate ground based temperature inversion, which are conditions favourable to noise propagation from source to receiver.

Modelling has been undertaken to evaluate the resultant noise levels with the prescribed noise limit of 45 dB (A) for night time. Ground attenuation is mainly the result of sound reflected by the ground surface interfering with the sound propagating directly from the source to the receiver. Hard ground, such as pavement, rock, concrete, water, ice, and

Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 221

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

tamped ground, has a ground factor $G = 0$. Porous ground results in lower noise levels at the receiver.

The modelling exercise has been undertaken considering the average wind speed at the project site which is 5.8 m/s and estimated noise levels of the turbine of about 103.8dB (A) at the hub height. There are six (6) receptors within 500 m from WTG that have been taken into consideration while conducting Noise Modelling Assessment.

It is imperative to mention here that noise modelling has been carried out at ideal condition of turbine as well as wind speed calculated after wind resource assessment undertaken by Envision. The noise level may be higher during high or abnormal wind conditions and with the wear and tear of turbines; the distance range of permissible noise may increase.

The incremental noise at any receptor is a function of its distance and presence of other noise sources (which may be another turbine). The Incremental values indicate the additional noise at the RECEPTOR LOCATION due to the WTGs and is hence dependent on the distance of the receptor from the proposed turbine/turbines;

The resultant values have been calculated by taking the logarithmic addition of the incremental noise from WTG/WTGs and the baseline noise level. The additional exposure has thereafter been calculated as the absolute difference between the resultant and the baseline value. Since the night time baseline noise levels are generally lower than the incremental, the logarithmic addition tends to be higher as compared to the values for daytime.

The formula for calculating resultant noise level is:

$$\text{Resultant Noise Level} = 10 \log (10^{(\text{Baseline noise}/10)} + 10^{(\text{Incremental Noise}/10)})$$

The calculated immission level of the proposed Wind Turbines at a height of 4 m were calculated and the based on the assessment the noise levels of maximum 60 dBA would be observed at the ground level closer to the wind turbine when in operation at the maximum operating capacity. The 55 dBA would be observed within 10 m from the WTG and MOEF regulated noise level of 55 dBA is to be observed within 20-25 m of the WTG.

Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 222

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

It can be seen from the figures below that the predicted turbine immission levels for Kageshree Wind Turbines are below the noise limits derived following the guidance of MOEF and ETSU-R-97 for both day time and night time periods. The overall sufficient uncertainty is built into the predictions to ensure the noise limits will not be breached in practice.

ASSUMPTIONS:

- Noise calculation model: ISO 9613-2 General
- Wind speed: 4.0 m/s - 12.0 m/s, step 1.0 m/s
- Ground attenuation: General, fixed, Ground factor: 0.5
 - Valley effect, Penalty: 3.0 dB
- Topographic screening, Reduction: 2.0 dB
- Meteorological coefficient, C0: 0dB
- Type of demand in calculation: 3: WTG noise is compared to ambient noise plus margin (UK, AT etc.)
- Noise values in calculation: All noise values are 90% exceedance values (L90)
- Pure tones: Fixed penalty added to source noise of WTGs with pure tones: 5.0 dB(A)
- Height above ground level, when no value in NSA object: 4.0 m

Results and Analysis

It is to be observed that the contribution of the noise level from the WTG will be below the CPCB guideline value of 55 dBA during day time and 45 dBA during nighttime. the above locations are based on the setback distance given by IFC. The noise modelling results are based on noise from operation of the WTG at rated windspeed of 10m/s.

Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 223

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

Six (6) locations closer to the WTG with high density receptors were selected for noise monitoring. The reference night and day time noise level was taken from the nearest monitored locations.

Table 6-22: Noise Monitoring locations and resultant noise level

No	Name of the Receptors	Baseline		Incremental	Resultant		Additional Exposure	
		dB(A)		/From WTG	dB(A)		dB(A)	
		Day	Night	dB(A)	Day	Night	Day	Night
A	Near Satapar Village and in proximity STP07	54.2	40.6	35.5	54.3	41.8	0.1	1.2
B	Near Mahiki village in proximity to VDV09	50.6	41.5	41.4	51.1	44.5	0.5	3
C	Near Valvada village and in proximity to MLV05	54.5	39.4	45.5	55	46.5	0.5	7.1
D	UP wind direction located in residential area (Paradva) near PRD05 and proximity to village road	49.8	40.6	46	51.3	47.1	1.5	6.5
E	Near Balva village in proximity to BTB05	48.3	42.9	35.4	48.5	43.6	0.2	0.7
F	Near Chur village in proximity to CHR05	47.8	43.6	44.4	49.4	47	1.6	3.4
	min	47.8	39.4	35.4	48.5	41.8	0.1	0.7
	max	54.5	43.6	46	55	47.1	1.6	7.1
	mean	50.9	41.4	41.4	51.6	45.1	0.7	3.6

Main results detailing out additional exposure and resultant noise level at each receptor have been provided in **Figure 6-22**.

Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 224

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat
Client: SPRNG ALT Energy Pvt. Ltd.

Figure 6-8: Noise Modelling Assessment Results

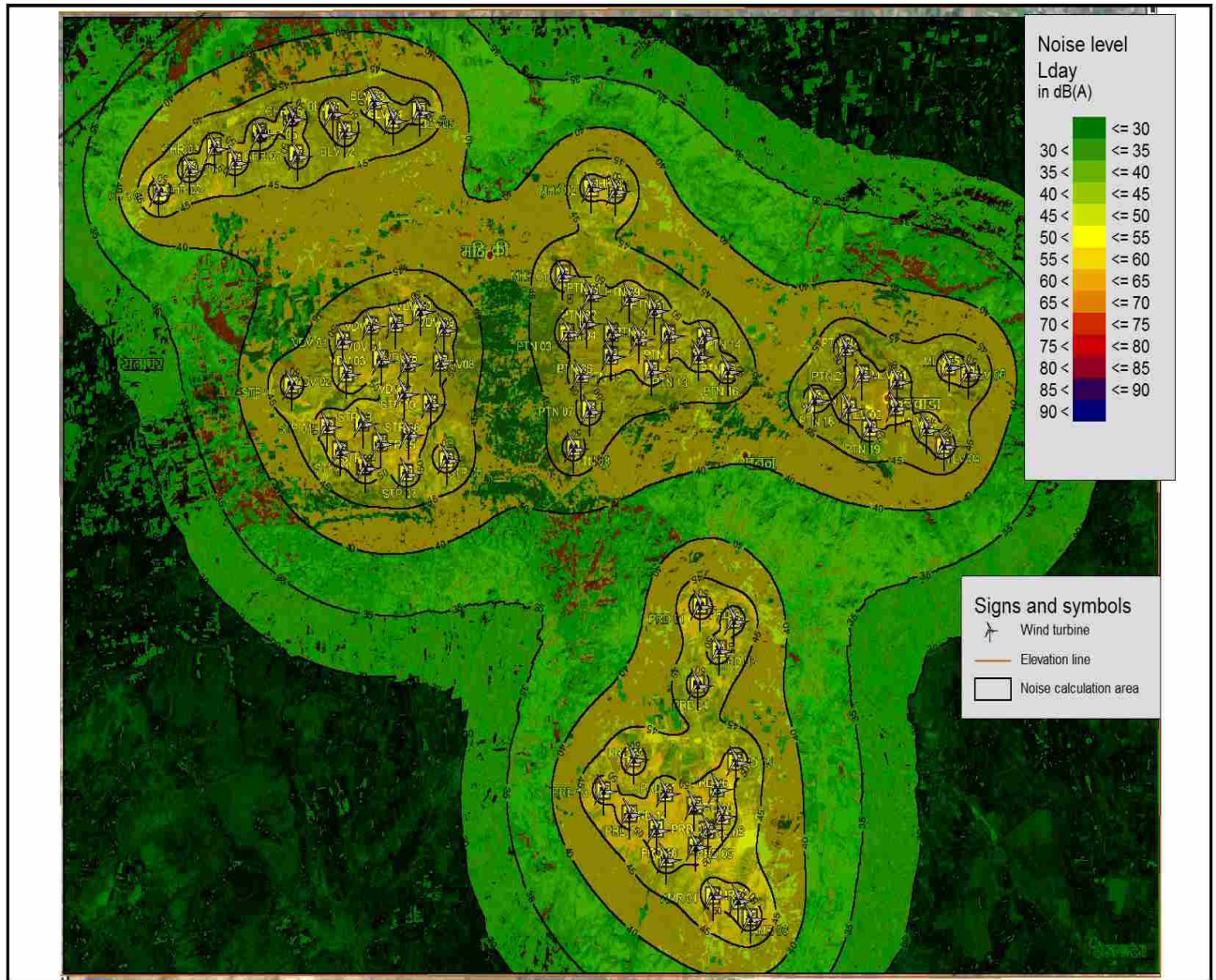


Table 6-23: Computation of Results during Noise Modelling

Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 225

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

Wind speed [m/s]	A	B	C	D	E	F
	[dB(A)]					
4	35.5	41.4	45.5	46	35.4	44.4
5	36.3	42.2	46.3	46.8	36.2	45.2
6	37.2	43.1	47.2	47.7	37.1	46.1
7	38.4	44.3	48.4	48.9	38.3	47.3
8	39.5	45.4	49.5	50	39.4	48.4
9	40	45.9	50	50.5	39.9	48.9
10	39.9	45.8	49.9	50.2	39.8	48.8
11	39.8	45.7	49.8	50.4	39.7	48.7
12	39.7	45.6	49.7	50.3	39.6	48.6

Mitigation Measures

To mitigate operational noise impacts, if any during the operation phase, following measures are proposed:

- Regular maintenance of WTGs;
- Periodic monitoring of noise near to the sources of generation to ensure compliance with design specification; and
- Half yearly monitoring of ambient noise levels (during day and night time) at identified residential receptors for determination of actual impact due to operation of WTGs.

Impact Significance

It is evident from **Table 6-22** that during daytime and night time, predicted noise levels at identified noise sensitive areas are well within the applicable standards and therefore the impact magnitude will be negligible. Therefore, the impact significance of noise on identified receptors due to operation of WTGs during day time is considered as **negligible**.

Table 6-24: Impact Significance - Noise and Vibration

Aspect	Scenario	Spread	Duration	Intensity	Overall
Noise and Vibration	Without Mitigation	Local	Short	Moderate	Minor
	With Mitigation	Local	Short	Low	Insignificant

Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 226

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

6.4.4 Water Resource and Quality

Impacts

The receptor sensitivity has been assessed as low for environmental criteria but high for social criteria. The nearby water body, Satapar Reservoir has some migratory and protected bird species and is located close to one of the proposed wind turbines STP11. The groundwater resources vary from safe to critical in the taluk. The receptor sensitivity for ground water resources has therefore been assessed as high taking into account the chances of a critical/overexploited source of water, general scarcity of water in the region.

Mitigation

Local water sources including ground water sources and irrigation canals leading to the nearby villages should be avoided in area. The water requirement during operation phase will be considerably lesser and only limited to domestic and drinking water consumption. In the operation phase, water should be sourced from Public Health and Engineering Department (PHED) or Water Resources Department for firm source of water allocation for the project.

Significance of Impact

The impact on water resources will have moderate intensity with a local spread for a long duration which will result in an overall moderate impact without mitigation. Utilisation of ground water will leave a minor residual impact on the water resources even after control of intensity

Table 6-25: Impact Significance - Water Resources

Aspect	Scenario	Spread	Duration	Intensity	Overall
Water Resources and Quality	Without Mitigation	Local	Long	Moderate	Moderate
	With Mitigation	Local	Long	Low	Minor

Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 227

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

6.4.5 Ecology

Impacts on Birds

The wind farms are known to affect birds particularly when they are placed in important bird breeding or nesting areas, bird sanctuaries or large waterbodies known to harbour large populations of birds. Birds are affected in following ways by wind turbines.

- Birds are displaced due to construction of wind turbines in their habitats and their habitats are destroyed or fragmented.
- Birds are known to collide with operational wind turbine blades and die.
- The bird's mortalities are reported due to collision with power lines. Birds get electrocuted on power lines while attempting to sit on power lines or poles.

The project core area does not have presence of any rare, endangered and important birdlife. Further, the migratory pathway of birds does not coincide with project site. However, the study area in buffer zone has reported number of threatened bird species. Moreover, there are major water bodies in Satapur and Malvada in the study area and located close to the project site particularly near STP 11 and VDV01, the impact of this project on water bird and migratory birds could be of some concern. The water bodies located near the project site are known to support large population of water birds in winter and sometime in summer.

Most of the time local farmers lift water from these water bodies and the water level decreases drastically from winter to summer months. However, during winter months, water remains in these water bodies and there is considerable population of migratory water birds reported in winter (Li et al 2009). These birds include Demoiselle crane, Common Crane, Great White Pelicans, migratory ducks etc. Since the present study carried out in dry and non migratory season, these species were not reported during present study. Since during winter period wind speed is low, the wind turbines do not rotate to its maximum speed and most of the time the wind turbines rotate at non-electricity generation speed. Such slow speed rotation in winter is not harmful to birds as they could easily spot the wind turbines, which they avoid during the flights. However, during the summer and monsoon period wind turbines rotate to its maximum speed. Fortunately, during summer and months the water levels in the water bodies is low or almost empty and therefore the large flocks of migratory

Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 228

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

waterbirds area absent. Therefore, the presence of migratory birds in wetlands and the high wind speed are contrary to each other and this situation circumvents large scale bird mortalities by wind turbines. However, apart from the wind turbine rotation, the transmission lines if laid near waterbodies can cause frequent collision of birds and their mortalities.

In the present project some of the WTG points are to be laid nearer the water bodies i.e.STP 11 near Satapur Dam catchment at a distance of 0.35 km and VDV 01 at 0.45Km. It is predicted that in absence of proper mitigation measures, these power lines could cause collision and or electrocution of birds. During ecological study the bird collision especially that of peafowl was identified as a potential area of concern therefore significant measures needs to be taken on powerline and bird collision mitigation issue by SPRNG.

Analysis to Predict the Potential Impacts on Birds

An important study and comprehensive literature reviewed by Langston & Pullan 2004, has listed out several impacts of wind farm on the bird groups. Keeping these known impacts as reference for the present study, a matrix has been developed where observations of the present study were juxtaposed against the known impacts (Langston & Pullan 2004) on bird groups. Langston & Pullan 2004, based on extensive literature survey, has listed 4 major threats on several bird groups.

These threats are

- 1) Disturbance leading to displacement of bird groups,
- 2) Barrier to movements
- 3) Collision with turbine blades, and
- 4) Direct habitat loss.

In order to predict the impacts of proposed project with respect to the above listed threats, all the bird species recorded in the study area were classified by their species groups. The spatio-temporal distribution of these species groups were seen against the known threats to predict the impacts of proposed project. Using known impacts (Langston & Pullan 2004) of windfarm on various bird groups, the impacts have been predicted as Low, Moderate and High. The analysis of information on birds/groups collected during the field visits in a matrix form were carried out and to predict the impacts of wind farm project. The information on

Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 229

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

abundance, spatio-temporal distribution, status, habits, habitats of various bird groups were used for predicting level of impacts and their reasons.

A total of 103 species belonging to 16 orders were made into 10 groups for identification of overall impact on bird species. During assessment, it was observed that birds belong to order Passeriformes, were at moderate risk, where as birds belonging to all other orders were at lower level of risk. This is because majority of the bird groups were occurring at very low abundances, there were very few species representing some of the bird groups, and some groups were either absent in the project area or their species number were low in the project area. Moreover, majority of water birds and grassland birds would be at very low risk as there are no major wetlands and grasslands present inside or in the close periphery of the project area. Some of the known impacts (Langston & Pullan 2004) predicted in reference to the proposed project are described as follow.

Table 6-26: Order wise predicted impacts on Avian fauna of the study area

Group ID	Order	Taxa recorded from Primary and secondary sources	Habit	Habitat	Core zone Habitats	Buffer zone Habitats	Predicted Level of Impacts on Birds	Disturbance leading to displacement	Barrier to movements	Collision with turbine blades	Direct habitat loss
A	Falconiformes (Kite, Vultur)	11	Diurnal	Scrub land		✓	Nil			✓	

Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 230

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

B	Columbiformes (Doves)	3	Diurnal	Scrubland, Human habitations,	✓	✓	Low				✓
B	Coraciiformes (kingfishers)	4	Diurnal	Agricultural, Open forest	✓	✓	Nil				✓
B	Cuculiformes (Koel)	3	Diurnal	Agricultural, Open forest	✓	✓	Nil	✓			✓
B	Psittaciformes (Parakeet)	1	Diurnal	Agricultural, Open forest	✓	✓	Nil				✓
B	Piciformes (Woodpeckers)	2	Diurnal	Scrubland, Human habitations,		✓	Nil			✓	✓
C	Passeriformes (Crow, Munia)	40	Diurnal	All habitats	✓	✓	Med	✓		✓	✓
C	Zosteropidae (buntings)	5	Diurnal	Agricultural, Open forest		✓	Nil	✓			✓
D	Strigiformes (Owl)	1	Nocturnal	Grassland, Scrubland		✓	Nil				
E	Caprimulgiformes (night jar)	2	Nocturnal	Grassland, Scrubland		✓	Nil				
F	Apodiformes (Swifts)	2	Diurnal	Water bodies, Grasslands	✓	✓	Low			✓	
G	Charadriiformes (Stilt)	4	Diurnal	Water bodies, Grasslands	✓	✓	Low		✓	✓	
G	Ciconiiformes (Egrets, Herons)	10	Diurnal	Water bodies, Agricultural and	✓	✓	Low		✓	✓	

Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 231

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

				Grasslands							
H	Galliformes (Coot, Peafowl)	9	Diurnal	Water bodies, Agricultural and Grasslands	✓	✓	Low		✓	✓	
I	Podicipedi- formes (Cormorants)	5	Diurnal	Water bodies,	✓	✓	Low		✓	✓	
J	Phoenico- pteriformes (flamingo)	1	Diurnal	Water bodies,		✓	Low			✓	
	Total	103									

Disturbance leading to displacement of bird groups

Since not many species are found to breed in the project area, the disturbance leading to displacement of birds would be very low. The data given in **Table 6-26** suggests that only 3 orders are likely to be affected by the project. All these 2 orders are most common species which are abundant throughout the region. All of the species reported common and listed as Schedule-IV in the Indian Wildlife Protection Act 1972, and as Least Concerned by IUCN.

Barrier to movements

The impact is more prone to the water birds and water dependent species, it includes Ducks & Geese, Waders and Cranes. These bird groups are generally known to fly in large flocks or move near wetlands. However, in case of the present project, there are no wetlands in and around project site and therefore, the project may not pose significant threat to these bird groups. Only 4 orders are reported in this group, and all are solitary and diurnal in their habits therefore the project is less likely to be barrier to their movements.

Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 232

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

Collision with turbine blades

Majority of the bird groups are prone to collision with the turbines (except Waders, Cormorants and Grebes). Total 9 orders are known to be affected by the collision in our analysis. However, many of the species are solitary, diurnal, having low flights during local movements, and their major habitats are being away from the project site, they are likely to be less affected. Moreover, no rare, endangered, endemic or threatened species are listed in this group.

Direct habitat loss

Majority of the resident birds such as order Passeriformes are likely to experience gross loss of their habitat worth the project area. All the species in this order are considered as Least Concerned by IUCN and in Schedule-IV in the Wildlife Protection Act in India.

Analysis to evaluate overall impacts.

Based on the collected information and data on various aspects, an effort was made to draw general inferences from each of the aspects that are listed in the following **Table 6-27**. This information is used for making conclusions as following.

Table 6-27: General inferences drawn from the baseline status on various aspects of the study

S.No.	Parameter studied	Impacts		Reasons
		Birds	Bats	
1	Status of the birds and Bats	Low	Very low	No endemic or threatened species, no major habitat found in and around project area
2	Interview survey	Very low	Very low	No presence of endangered species such as Great Indian Bustard etc. due to disturbances, poaching, development pressure

Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 233

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

3	Desert National Park/Natural habitats	Very low	Low	Located at 11 Km distance hence no impactson this habitat
4	Endangered species	Low		Vultures are observed in Barda Wildlife Sanctuary
5	Important Bird Areas/ bird receptors	Very low		Barda wildlife Sanctuary is11 km away from project site, no major wetlands and grasslands in and around project
6	Roosting colonies of bats& their mortalities	Very low		Located at 11 km away from project site
7	Migratory water bird routes	Very low		Routes are broad and are not restricted overproject site, no wetlands in and around project site
8	Literature review	Very low	Very low	No significant impacts are envisaged

Impacts on Mammals

One of the major and direct impacts of wind farm on mammals is on bats. Although bat collisions can occur, recent scientific studies indicate that barotrauma may be a significant cause of bat deaths at wind farms. Baratrauma occurs as bats chase the turbine blade (their echolocation detects a moving object). As the bat gets close to the blade, it is pulled into a low pressure area immediately behind the blade. This low pressure area causes the bat's lungs to expand into its body cavity, exploding the blood capillaries in the bat's lungs.

Wind turbines are not known to directly affect terrestrial mammals such as Nilgai species. However, construction activities, road and infrastructure development may sometime indirectly affect the mammal populations particularly if they are placed near important wildlife habitats.

Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 234

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

Temporary and small scale construction activities in the proposed core area and related to foundation construction would involve movement of vehicle and people, digging of soil, material loading, etc. Therefore, the impact on mammals due to this project is likely to be temporary and insignificant. However, it is suggested that maximum precautions during construction phase should be taken so that the surrounding reserve forest areas are not disturbed and the power lines are placed away from the forests and water bodies.

Analysis to predict the potential impacts on Bats

The fruit bats are less known to be affected by wind turbines as they do not use eco-location or chase moving objects.

Since only one species i.e. Greater Mouse-tailed Bat is a species of micro-chiropteran bats are found in the buffer area and not in the core areas of the project site, the impact of wind turbines on this bat species is likely to be negligible. The species of micro chiroptera reported from the buffer area of project site is common and reported as Least Concerned by IUCN. Therefore, impact of the wind farm on this species at population level would be negligible.

As per observations it is evident that there are only 3 species of bats present in the vicinity of the project. Majority of the bat species hotspot/roosting sites are away from project site i.e. near Barda Wildlife sanctuary (11 km). *Pteropus giganteus* (fruit bats) are found near the village premises. The fruits of three species, namely *Ficus recemosa*, *Carica papaya* and *Mangifera indica* were available to bats throughout the year. Other plant species that had a long fruiting season were *Ziziphus jujuba*, *Ricinus communis*, *Psidium guajava*. *Mangifera indica* was found abundantly in the study area and was a dominant food source for *P.giganteus* in the months of April, May, June and July, which was the major local fruiting season. The project site does not fall near to their roosting sites or movement path of *Pteropus giganteus* (fruit bats) suggests that the impacts of proposed wind farm project could be very low on bats.

Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 235

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

Cumulative impact assessment

Definition of cumulative effects

Cumulative effects may be defined as the additional changes caused by a proposed development in conjunction with other similar developments 1 or as the combined effect of a set of developments, taken together.

Although the term “cumulative impact” is often used to refer only to landscape and visual effects, cumulative effects of wind energy development can relate to a wider range of natural heritage effects, including impacts on birds and habitats, as well as social and economic effects.

Cumulative effects may be complex. They require clear and detailed assessment to identify and distinguish the overall cumulative effects which may arise from a group of projects and the contribution of each individual project to these. A transparent assessment process is therefore essential to understand the potential additional changes which may be brought about by any given proposed development in the context of those already existing, consented or at application stage.

Cumulative impact is sometimes loosely described as ‘positive’ or ‘negative’, but this use is discouraged as there is room for ambiguity. It is preferable to refer to ‘an additional cumulative effect’, that is additional to the impact to be expected from the developments taken individually.

An assessment of cumulative effects may be undertaken either:

- in strategic planning, as part of the preparation of a strategic framework for the future planning of windfarms within a particular geographic area; or
- in development management, in the context of a site specific assessment, usually in support of a planning application as part of an ESIA.

Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 236

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

Although the two forms of cumulative assessment share common principles it is important to distinguish between the two distinct processes. An assessment of cumulative effects associated with a specific development proposal should be limited to the effects of the proposal in combination with:

- existing development, either built or under construction;
- approved development, awaiting implementation; and
- proposals awaiting determination within the planning process, and thus for which design information is in the public domain.

Cumulative landscape effects

Cumulative effects on landscape character arise from two or more windfarm developments. Windfarms introduce new features into the landscape. In this way, they can change the landscape character to such an extent that they can create a different landscape character type, in a similar way to large scale afforestation. That change need not be adverse; some derelict or degraded landscapes may be enhanced as a result of such a change in landscape character. The cumulative effects on landscape character may include other changes, for example trends or pressures for change over long time periods, which should form part of any consideration of a particular project.

Windfarms may also have a cumulative effect on the character of landscapes that are recognised to be of special value. These landscapes may be recognised as being rare, unusual, highly distinctive or the best or most representative example in a given area. This recognition may take the form of local or national designations, citations in development plans, community plans or other documents, or be less formally recognised, such as search areas for wild land

Cumulative effects on visual amenity

Cumulative effects on visual amenity consist of combined visibility and sequential effects. Combined visibility occurs where the observer is able to see two or more developments from one viewpoint. When considering the cumulative effects arising from combined visibility, it is necessary to consider, for each of the viewpoints within the ZTV of the windfarm concerned,

Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 237

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

the combined effect of all windfarms which are (or would be) visible from these viewpoints. Combined visibility may either be in combination (where several windfarms are within the observer's arc of vision at the same time) or in succession (where the observer has to turn to see the various windfarms).

Sequential effects occur when the observer has to move to another viewpoint to see different developments. Sequential effects should be assessed for travel along regularly-used routes like major roads or popular paths. The occurrence of sequential effects may range from frequently sequential (the features appear regularly and with short time lapses between, depending on speed of travel and distance between the viewpoints) to occasionally sequential (long time lapses between appearances, because the observer is moving very slowly and / or there are large distances between the viewpoints.)

Cumulative visual effects will vary in degree with

- the sensitivity of visual receptors in terms of the context (For example, a vast open landscape with wide panoramic views will be different to a small-scale, intimate landscape with enclosed views), activity and number of receptors;
- the magnitude of cumulative change in terms of the scale, nature, duration, frequency of combined and sequential views (glimpses or more prolonged views; oblique, filtered or more direct views; time separation between sequential views); and
- the relative impact of each individual windfarm, with regard to visual amenity.

Sequential visual assessment and selection of routes for analysis

Sequential cumulative effects on visibility occur when the observer would see the proposed windfarm with other developments, either simultaneously or in succession, when moving through the landscape.

Importance of Cumulative scoping assessments

They should be carried out where the proposed wind turbine development may be seen in conjunction with other wind turbine developments. These developments will include existing,

Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 238

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

under construction and consented wind turbines and those 'in planning' i.e. at planning application stage.

Detailed cumulative impact assessments are only required where it is considered that the proposal could result in significant cumulative impact which could affect the eventual planning decision. The scale and complexity of assessments should be proportionate to the impacts.

The number of small and medium sized turbines proposed in rural parts of the area may have limited landscape and visual effects on their own but together they are starting to have significant cumulative effects on landscape character as well as on visual amenity, particularly in sensitive areas such as the Reserve forests.

Cumulative impact of Windfarms on the birds of the study area:

The standard parameters such as Collision Mortality, Displacement Effects, Barrier Effects and Habitat loss have been assessed in the study area. The proposed study area is marked tentatively as three clusters for the present study. They are Chur, Mahiki and Parvada cluster. The cluster wise predicted impacts of WTG points on recorded species of the study area are given in **Table 6-28**.

Table 6-28: Cluster wise predicted impacts of WTG points on recorded species of the study area

S.No	Species Name	Cluster			Type of Impact				WTG point	
	Common Name	Chur	Mahiki	Parvada	Habitat loss	Collision risk %	Displacement Effects	Barrier Effects	Typical Turbine number	Turbine cluster Area
1	Red-wattled Lapwing	Yes	Yes		Low	10.00	Low	Low	CHR6 & BLV1	Chur Cluster
2	House Swift	Yes			Nil	25.00	Nil	Nil	STP 11	Satapur
3	House Crow	Yes	Yes	Yes	Low	33.33	Nil	Nil	VDV1	Vadvala
4	Black Drongo	Yes	Yes		Low	33.33	Nil	Low	PRD10	Parvada
5	Rose-ringed Parakeet			Yes	Nil	33.33	High	Low	CHR5	Chur Village

Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 239

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

6	Oriental Magpie Robin	Yes			Low	40.00	Medium	Nil	PTN18	Patan, Malvada
7	Common Babbler	Yes	Yes	Yes	Medium	41.18	Medium	Nil	MLV6	Patan, Malvada
8	Rock Pigeon			yes	Medium	50.00	Medium	Nil	PRD9. AMR2	Parvada
9	House Sparrow				Low	50.00	Low	Nil	CHR4,5 BLV1	Chur Village
10	Indian Robin	Yes	Yes		Medium	52.94	Medium	Nil	PTN11	Patan, Malvada
11	Common Myna	Yes	Yes	Yes	Medium	57.14	Medium	Low	MLV1	Patan, Malvada
12	Red-vented Bulbul	Yes	Yes	Yes	Medium	57.14	Medium	Low	AMR1& 2	Patan, Malvada
13	Purple Sunbird	Yes	Yes	Yes	Medium	60.00	Medium	Nil	CHR5 BLV1	Chur Village
14	Baya Weaver	Yes			High	60.00	High	Nil	PTN15	Patan, Malvada
15	Spotted Dove			yes	Low	100.00	Low	Nil	MLV5	Patan, Malvada
16	Indian Roller	Yes			Low	100.00	Nil	Nil	PRD13	Parvada
17	White-breasted Kingfisher	Yes	Yes		Low	100.00	Nil	Low	CHR4,5 BLV1	Chur Village
18	Indian Blue Robin		Yes	Yes	Low	100.00	Nil	Nil	PTN11	Patan, Malvada
19	Black Kite	Yes	Yes	Yes	Nil	25.00	Nil	Nil	MLV1	Patan, Malvada
20	Indian Peafowl	Yes	Yes	Yes	Nil	50.00	Nil	High	AMR1& 2	Patan, Malvada
21	White-rumped Munia	Yes			Low	10.00	High	Low	CHR5 BLV1	Chur Village

Impact of Birds in Chur Cluster:

This cluster has 10 proposed WTG sites. All are on the top of the hillocks. And absolutely no cumulative impact on birds from these points.

Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 240

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

Mahiki cluster:

The collision mortality will be moderate comparative to other two points. The birds in the Orders Piciformes (Woodpeckers) and Passeriformes (Crow, Munia) are found in good number. The barrier due the proposed windfams in this area will not occur. But direct habitat loss can occur if proper mitigation measures have not been taken to the birds of the orders Cuculiformes (Koel), Psittaciformes (Parakeet), Piciformes (Woodpeckers), Passeriformes (Crow, Munia) and Zosteropidae (buntings).

Parvada cluster

The habitat of this cluster has similar characteristic features of Chur cluster. Hence absolutely there will be no cumulative impacts on the birds here.

The standard parameters such as Collision Mortality, Displacement Effects, Barrier Effects and Habitat loss have been assessed in the study area.

However, a detailed study has been done for few birds species as tabulated in below section. The number represents the occurrence of the bird in the WTG sites in the proposed area. The impact given here is only expected one. As per the study the cumulative impact due to collision is more compared to others.

Table 6-29: Cumulative impact assessment for Wind farm on birds observed in the study area:

Natural Habitat						Designated Sites					
Site	Date	Collision Mortality		Displacement Effects		Barrier Effects		Habitat loss		Turbine number	Turbine Area
			Σ		Σ		Σ		Σ		
Chur	24.04.2018	1	1	1	1	1	1	1	1	CHR6 & BLV1	Chur Cluster
Mahiki	24.04.2018	3	4	4	5	3	4	2	3	STP11	Satapur

Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 241

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

										VDV1	Vadvala
Parvada	24.04.2018	2	6	1	6	-	4	1	4	PRD10	Parvada
Chur	25.04.2018	3	9	2	8	-	4	1	5	CHR5	Chur Village
Mahiki	25.04.2018	5	14	1	9	1	5	1	6	PTN18 MLV6	Patan, Malvada
Parvada	25.04.2018	2	16	1	10	-	5	1	7	PRD9. AMR2	Parvada
Chur	26.04.2018	2	18	1	11	1	6	-	7	CHR4,5 BLV1	Chur Village
Mahiki	26.04.2018	4	22	1	12	1	7	1	8	PTN11 MLV1	Patan, Malvada
Parvada	26.04.2018	2	24	1	13	1	8	-	8	AMR1&2	
Chur	27.04.2018	1	25	-	13	-	8	-	8	CHR5 BLV1	Chur Village
Mahiki	27.04.2018	6	31	5	18	1	9	4	12	PTN15 MLV5	Patan, Malvada
Parvada	27.04.2018	3	33	2	20	1	10	1	13	PRD13	Parvada
Cumulative impacts			33		20		10		13		

Mitigation

Monitoring of Bird hits and Mortality:

During the present study, sampling and observation did not suggest any higher chances of mortality or damage to the birds by the proposed project. However, these observations were for a short duration, therefore, it is suggested that monitoring of bird hits and mortality may be carried out annually for a period of atleast two (2 nos.) years with a frequency of monitoring atleast once in Winter season in order to understand if there are any significant

Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 242

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

mortality of birds or disturbance to them due installation of windmills in the project area. It is important that proposed sites should be monitored properly and specifically for bird mortalities.

Also, The STP 11 and VDV01 location falls in Satapar Catchment which might pose a risk for affecting habitat of migratory birds during Winter season. After the detailed ESIA and ecological assessment and discussion of these two locations impact on avifauna SPRNG has decided to abandon these two locations and has selected alternate location which are 42 Q 597617.84 m E 2413333.92 m N for STP 11 and 42 Q 598634.39 m E 2414115.45 m N for VDV 01. This will avoid any possible interaction of avifauna near the Satpara dam with the project. Procurement of lands for alternate locations is in process for these two locations.

Precautions to avoid disturbance to wildlife

Though, endemic or threatened bird and bat species have not been reported in and around the proposed project area, prior to commencing any construction activities such as excavation etc., a thorough survey for presence of ground nesting birds, if any should be carried out. On a precautionary principle, the company staff should check for the presence of any wildlife or bird habitat. If any of the unknown / new species are found in the project area, with ecologist advice, the company staff should immediately stop the construction or transportation (till the bird leaves the area safely or completes the nesting activities) in order to minimize disturbance to the birds.

Regular removal of carcasses from the project areas

Dead animal (cow, buffalo, camel etc.) carcasses attracts large number of vultures and raptors. During and after construction of the wind farm, the project staff should monitor the project area for any presence of such large animal carcasses. If there is any communal dumping ground of such carcasses present in and around the project site, they should be removed away from the project site. The villagers should be convinced and the dumping ground of cattle carcasses could be taken at least 5-10 km away from the project site boundary.

Training of Project Personals

Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 243

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

In order to avoid any accidents, poaching or harassments to any bird species by the project staff involved in construction or operation, such as labourers, drivers or any other employees, a training program should be carried out. During training they should be made aware of the presence of various bird species in the project area and surrounding area. They should be trained in identification of endangered and rare birds and animals.

Post Construction Planning and management

After the completion of the construction work, company should restore the area in terms of any damage caused to the public roads, or drainage etc. in and around the project site. There are several activities suggested which the company should take up as Corporate Social Responsibility.

Restoration of damaged (if any) roads, trails, drainages, etc.

Plantation of native trees in other areas selected in consultation with biologists or with local forest officials.

Significance of Impact

The impact on fauna and flora will have low intensity with a moderate spread for a long duration which will result in an overall moderate impact without mitigation.

Table 6-30: Impact Significance - Fauna and Flora

Aspect	Scenario	Spread	Duration	Intensity	Overall
Ecology	Without Mitigation	Moderate	Long	High	Moderate
	With Mitigation	Local	Long	Low	Minor

6.4.6 Health and Safety Risk

Impacts

Electromagnetic Fields (EMF) emanate from any wire carrying electricity. Possible effects associated with the electric and magnetic fields from transmission lines (or similar electrical sources) fall into two categories:

- short-term effects that can be perceived and may represent a nuisance

Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 244

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

- possible long-term health effects.

The issue of whether there are long-term health effects associated with exposure to fields from transmission lines and other sources has been investigated for several decades. There is little evidence that electric fields cause long-term health effects. Estimates of magnetic-field exposures have been associated with certain health effects in studies of residential and occupational populations. Research in this area is continuing to determine whether such associations might reflect a causal relationship.

Mitigation

The lists of exposure limits for general public/occupational exposure to electric and magnetic fields published by the International Commission on Non-Ionizing Radiation Protection (ICNIRP) is as given in **Table 6-31**.

Table 6-31: ICNIRP exposure limits for general public exposure

Frequency	Electric Field (V/m)	Magnetic Field (μ T)
50 Hz	5000	100
60 Hz	4150	83

Source: ICNIRP (1998): "Guidelines for limiting exposure to time-varying electric, magnetic, and electromagnetic fields (up to 300 GHz).

Table 6-32: ICNIRP exposure limits for occupational exposure

Frequency	Electric Field (V/m)	Magnetic Field (μ T)
50 Hz	10,000	500
60 Hz	8300	415

There are no specific standards or guidance on EMF in India however the Indian Electricity Act and Rules clearly stipulate the minimum clearances required. Hence the ICNIRP standards and guidelines have been considered. For the general public (up to 24 hours a day) an exposure level of 1,000 mG or 100 μ T is suggested. The EMF generated by 33 KV unit will be lesser than the suggested value.

Workers handling electricity and related components will be provided with shock resistant gloves, shoes and other protective gears. Adequate training regarding health and safety will be provided to the workers. The switchyard building will be provided with fire extinguishers

Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 245

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

and sand buckets at all strategic locations to deal with any incident of fire. Safety incidents will be recorded and monitored with an aim that numbers are never significant, and gradually reduce.

Significance of Impact

The impact on health and safety will have high intensity with a local spread for a long duration which will result in an overall major impact without mitigation. However with proper health and safety measures the intensity of impact can be reduced to low resulting in an overall minor impact.

Table 6-33: Impact Significance - Health and Safety

Aspect	Scenario	Spread	Duration	Intensity	Overall
Health and Safety	Without Mitigation	Medium	Long	Moderate	Moderate
	With Mitigation	Local	Long	Low	Insignificant

6.4.7 Socio-economic Impacts

Impacts on Local Economy

During the operational phase of the project, the impact on socio economic environment is likely to be positive as the project will lead to increase in local employment opportunities, increased taxation revenue, increased demand for materials and services through local contracting. The power generated from the Project is being transmitted to the local grid and is likely to increase the power supply situation in the region.

Up-gradation of Local Infrastructure

Although the project is not likely to involve any creation of additional infrastructure, SPRNG is likely to engage in community development activities like improvement of the school, support to the health centre and other such activities in coordination with the local Panchayat. This will lead to a beneficial impact on the upgrading of local infrastructure.

Mitigation

The measures for improved engagement with community suggested are to:

Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 246

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

- Collaborate with local govt. and industry for any community development programs to share the resources and cut cost;
- Avoid duplicating existing infrastructure and emphasize on improving or upgrading the quality and quantity of the same.

Significance of Impact

The impact on socio-economic will have low intensity with a local spread for a long duration which will result in an overall minor impact without mitigation. However implementation of mitigation measures, engagement of community an enhanced positive impact is expected.

Table 6-34: Impact Significance - Socio-economic

Aspect	Scenario	Spread	Duration	Intensity	Overall
Socio economic	Without Mitigation	Local	Long	Low	Minor
	With Mitigation	Local	Long	Low	Insignificant

Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 247

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

7. SCREENING AND SCOPING

At the initial stage of the ESIA process, preliminary information was provided to aid in the determination of what legal and other requirements apply to the Project. This step was conducted utilising a high level description of the Project and their associated facilities. The screening process involved the following:

- Reviewing of applicable regulatory framework for the Project;
- Reviewing of available Project related activities and their impacts on various components of environment;
- Collection and compilation of available secondary baseline data from different sources;
- Categorisation of Project as per IFC guidelines; and
- Categorization of Project as per ADB Safeguard Policy.

7.1 SCREENING METHODOLOGY

For the screening exercise, TUV undertook discussions with the Project team and a review of the documents available. The following sub sections provide an understanding of the methodology followed.

Kick-off Meeting

The TUV team had a brief kick-off meeting with the SPRNG ALT Energy, Envision and Enerfra team prior to site reconnaissance visit. A discussion was also held with regard to the expectations from this assessment in terms of scope of work, deliverables, timeline and the methodology to be followed for the same.

Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 248

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

Document Review

Desk based review of the relevant documents of the wind farm site and its surroundings were undertaken to have a clear understanding of the Project and their impacts. Further, review of the secondary information available on the project areas, the administrative block, the district and the state was undertaken to substantiate the primary data.

IFC Categorization

IFC's Environmental and Social Review Procedure Manual (1) has provided a provisional categorization tool for projects. The tool assigns an E&S category based on risk inherent to the particular sector, as well as on the likelihood of a development taking place and on what can be reasonably ascertained about the environmental and social characterization of the Project's likely geographical setting. The categories are defined as follows:

- 1. Category A:** Projects with potential significant adverse environmental or social risks and/or impacts that are diverse, irreversible or unprecedented.
- 2. Category B:** Projects with potential limited adverse environmental or social risks and/or impacts that are few in number, generally site- specific, largely irreversible and readily addressed through mitigation measures.
- 3. Category C:** Projects with minimal or no adverse environmental or social risks and/or impacts.

The proposed Project has been categorized as falling under **Category B** as per the guidelines.

7.2 CATEGORY JUSTIFICATION

Selection of **Category B** is based on following reasoning:

Potentially limited risks/impacts and reversible: Environmental and social impacts of the Project are anticipated during the construction phase and will encompass changes in land-use, increased noise levels, changes in air quality, use and changes in water quality, impacts on terrestrial ecology, occupational health & safety, etc. Most of these impacts are limited to the wind farm components and their immediate vicinity and can be minimized through application of mitigation measures as proposed in the ESMP.

Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 249

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

Unprecedented: Development of wind farms is occurring in large numbers in the last decade and therefore several such projects are located across India. Gujarat Energy Development Agency (GEDA) has developed 1249.5 MW under solar and 4,975 MW under wind power. A wind farm project can therefore not be considered an unprecedented activity.

Limited adverse impacts on the baseline: Wind energy development is a non-polluting source of energy and thus is not likely to lead to any adverse impacts on the baseline environment during the operation phase. In terms of social impacts the land required is composed of private agricultural land. The 79 locations proposed for the Project doesn't involve any anticipated settlements and physical displacement. Impacts will be limited to access to land used for grazing and positive impacts on livelihood opportunities.

7.3 SCOPING METHODOLOGY

For this ESIA study, scoping has been undertaken to identify the potential Area of Influence for the project to identify potential interactions between the project and resources/receptors in the Area of Influence and the impacts that could result from these interactions, and to prioritize these impacts in terms of their likely significance. This stage is intended to ensure that the impact assessment focuses on issues that are most important decision-making and stakeholder interest.

It is to be noted here that during the period of ESIA study, the project is in the planning phase and therefore, the scoping exercise includes all the phases of the projects, i.e., planning and pre-construction, construction, operation and maintenance and decommissioning into consideration.

The scoping exercise was undertaken on the basis of the information available on the project, the discussions with the project team and the prior understanding of TUV of wind power projects. Potential impacts have been identified through a systematic process whereby the features and activities (both planned and unplanned) associated with the operation and maintenance and decommissioning phases of the project have been

Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 250

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

considered with respect to their potential to interact with resources/ receptors. Potential impacts have each been classified in one of three categories:

No interaction: where the project is unlikely to interact with the resource/receptor (e.g., wholly terrestrial projects may have no interaction with the marine environment);

Interaction likely, but not likely to be significant: where there is likely to be an interaction, but the resultant impact is unlikely to change baseline conditions in an appreciable/detectable way; and

Significant interaction: where there is likely to be an interaction, and the resultant impact has a reasonable potential to cause a significant effect on the resource/receptor.

As a tool for conducting scoping, the various project features and activities that could reasonably act as a source of impact were identified, and these have been listed down the vertical axis of a Potential Interactions Matrix. The resources/receptors relevant to the Baseline environment have been listed across the horizontal axis of the matrix.

Each resulting cell on the Potential Interactions Matrix thus represents a potential interaction between a project feature/activity and a resource/ receptor.

The wind power project will involve key activities during its life cycle which will include planning and pre-construction, construction, operation and maintenance and decommissioning phases as detailed in **Section 3.5** of this report.

Scoping Matrix

All environmental and social impacts and risks described in IFC's Performance Standards, E&S Guidelines and ADB Safeguard Policies have been considered for the interaction matrix. The potential Interactions Matrix for Project activities and likely impacted resources/ receptors is presented in **Table 7-1**.

Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 251

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

The interaction matrix has been colour coded to indicate those interactions that are relevant to the Project (coloured in red), possible (coloured in yellow) or scoped-out (coloured in white). Those interactions that are grey are ‘scoped out’, but the ESIA report includes a discussion that presents the evidence base (e.g., past experience, documented data, etc.) used to justify the basis upon which this decision was made.

Interactions that are likely to lead to significant impacts are presented in **Table 7-2** and will be the focus of the impact assessment. Owing to site conditions there are certain possible interactions that will not take place. As a result, these interactions have been “scoped out” and are presented in **Table 7-3**.

Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 252

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

Table 7-1: Activity-Impact Interaction Matrix for Planning, Construction, Operation & Maintenance and Decommissioning Phases

Environmental and Social Resources/ Receptors	Land use	Topography and Drainage	Soil/Land Environment	Ambient Air Quality	Water Environment	Ambient Noise Quality	Terrestrial Ecology	Aquatic Flora/ Fauna	Occupational Health and Safety	Demography (Influx and Displacement	Local Economy and Employment	Natural /Common Property Resources	Land based Livelihoods	Community Health and Safety	Labour and Human Rights	Social Infrastructure and Services	Culture and heritage
Project Activity																	
Land procurement																	
Construction/strengthening of access road																	
Site clearance and preparation for WTG, PSS and EHV line																	
Establishment and operation of batching plant																	

Assignment	Draft Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 253

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

Construction material transport and storage																	
Operation of DG set																	
Foundation excavation and construction for WTG, EHV towers																	
Transient storage of WTG components																	
Transportation of WTG component to site																	
Installation of WTGs, erection of EHV tower																	
Stringing of transmission line																	
Construction of pooling substation (PSS) and office building																	
Operation of all WTGs, PSS, Transmission line																	
Inspection/ maintenance work of WTGs, PSS																	
Operation and maintenance of ancillary facilities such as yards, stores, site office																	
Inspection, maintenance and operation of transmission lines																	
Inspection, maintenance and operation of intra-site pathways/access roads																	
Replace WTG parts with new ones																	
Demolition of building of ancillary facilities																	
Dismantling of WTG																	

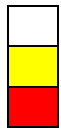
Assignment	Draft Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 254



South Asia

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.



= Represents “no” interactions is reasonably expected

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

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

Assignment	Draft Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 255

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

Table 7-2: Identified interactions that are likely to result in significant impacts

Sr. No.	Interaction (between project activity and Resource/Receptor)	Justification for Expectation of Potentially Significant Impacts
1	Changes in Land Use	Only Revenue land will be utilized for the Project and therefore there will be no change to non- agricultural purposes during the construction phase. The change will not affect the community. On the contrary the addition of better maintained access roads may be considered a positive for local villages.
2	Alteration of Topography and drainage	Study area of the wind farm site exhibits undulating land. Project activities (e.g., site development, construction of access roads) may lead to alteration (mostly to smoothing) of the topography and drainage of this area.
3	Impact on Soil / Land Environment	Vegetation clearance and construction can change the soil properties and negatively affect soil stability in the area. Large vehicle movement can compact or erode soil further. Improper waste disposal can contaminate soil and groundwater layers.
4	Impact on Air Quality	Operation of DG sets, vehicular movement and construction activities can increase air emissions in the area. The loss of tree cover because of site preparation can also contribute to a deterioration of air quality.
5	Impact on Water Environment	Container water will be utilized for the procurement of domestic and construction water for the project. The water requirement of the project therefore will not affect the nearby water sources. Surface and ground water can also be impacted due to improper waste disposal or leaks/spills and runoff.
6	Increased Ambient Noise Levels	Construction, operation of DG sets, vehicular movement, influx of demographics, maintenance activities and establishment of Project components would increase the ambient noise levels. Local communities may be disturbed

Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 256

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

		due to higher than anticipated noise.
7	Impacts on Nearby Structures (Shadow Flicker)	There are no major settlements that could be impacted by shadow flicker as envisaged through Shadow Flicker and Noise Modelling assessment study
8	Occupational Health and Safety	Occupational health and safety hazards can include construction machinery, handling of electrical, noise pollution and dust pollution. In the case of spills/leaks there is a potential for fire hazards and some hazardous substances.
9	Local Economy and Employment	The Project will be providing opportunities to locals during the anticipated construction activities. Migrant labourers, contractors and subcontractors will also be staying in local villages and could provide an influx of money into local businesses. Wind farms tend to hire locals as security guards during the construction and operation phase.
10	Land Based Livelihoods	The land is identified for the Project is primarily revenue land hence there will be no loss of agriculture produce or livelihood due to the project.
11	Community Health and Safety	Community health and safety hazards include noise pollution, increased traffic, dust pollution and any effects due to structural damage. In the case of spills/leaks, there is a potential for fire hazards and soil/water contamination.
12	Labour and Human Rights	Construction activities are expected to require considerable number of skilled and unskilled labour. The unskilled labour would be sourced from local villages and therefore attention needs to be made to minimum wages, child labour, worker compensation, working conditions, equal remuneration and health and safety policies (including provision of appropriate PPEs). For hiring of migrant workers, if any additionally, regulation of employment and condition of services needs to be monitored as per the pertaining act.
13	Ecology	There is a large water body (Satapar check dam) located on the western part of the wind farm. Movement of fauna across the wind farm site may be affected by vehicular traffic, construction activities and anthropogenic movement. In the operation phase, the movement of the wind turbines could

Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 257

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

		cause a collision risk to flying fauna and transmission lines pose an electrocution risk to perching birds.
--	--	---

Table 7-3: Scoped-out Interactions

Sr. No.	Impact Title	Reason for Scoping-Out
1	Cultural Heritage	There are no reported archaeological or heritage sites in and around the Project. Based on the site assessment two places of worship were spotted near the WTGs. Churi Aai Mandir is located at 134m SW near CHR 05 and Vegad Pariva Na Surapura Haji Pir Bapa shrine is located at 310m NE of ML03
2	Indigenous People	According to the Census records and consultations with the local community, the study areas do not report a significant presence of Scheduled Tribe population within the study area. No direct impacts on indigenous people are identified.

Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 258

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

8. ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

8.1 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)

The importance of managing social and environmental performance throughout the life of a project is highlighted by the IFC Performance Standard-1. An efficient environmental and social management system ensures a continuous communication process between the project proponent, workers (including contractors), local community and other key stakeholders.

Environmental & Social Management Plan (ESMP) is an implementation plan for mitigation and offsetting the potential adverse environmental & social impacts of the project and enhance the positive impacts. Based on the environmental baseline conditions, planned project activities and impacts assessed earlier, this section enumerates the set of measures to be adopted to minimize the adverse impacts. Process of implementing mitigation and compensatory measures, execution, agencies responsible for their implementation and indicative costs is discussed in this chapter. The ESMP also shows how mitigation and management measures will be scheduled.

The key objectives of the ESMP are to:

- Formalize and disclose the program for environmental and social management;
- Provide a framework for the implementation of environmental and social management initiative.

This section presents the Environmental and Social Management Plan (ESMP) for the wind farm. The purpose of this ESMP is to specify the standards and controls required to manage and monitor environmental and social impacts during construction and operation phase. To achieve this, the ESMP identifies potential adverse impacts from the planned activities and outlines mitigation measures required to reduce the likely negative effects on the physical, natural and social environment.

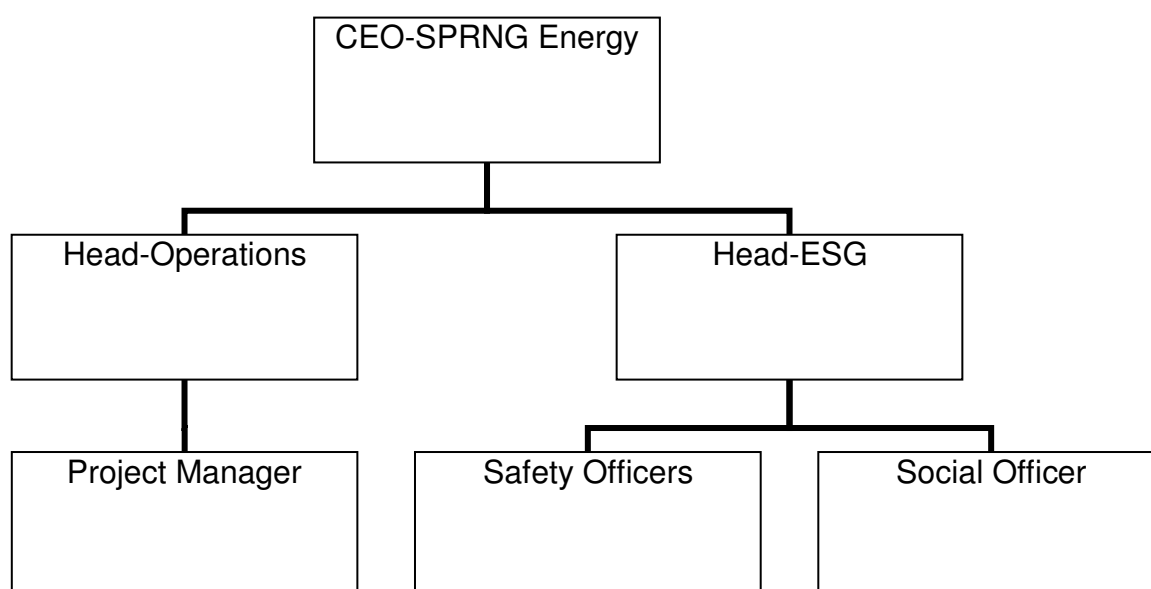
Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 259

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

8.2 ORGANOGRAM (Environment, Social, Health and Safety)

The overall management and coordination of the project will be managed through CEO, SPRNG Energy who will be supported by Head of Operation and the ESG head looking after Health, Safety and Environment. The Head – ESG will overview, monitor and control the activities of Project Manger and the safety officers at the site. The contractors will be controlled by the Project Manger during construction phase. The overall project management entities are s shown in the following diagram



The proposed project will not lead to any significant adverse social impacts or risks as indicated in the previous sections. Given the project footprint area being limited to the immediate vicinity and the range of stakeholders as well as their levels of influence on the project, SPRNG should appoint one person to manage social (including labour and community) issues. The “Social Officer” will report to the ESG Head.

Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 260

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

8.2.1 Roles and Responsibilities

HSE Head and Safety officers

The HSE head and his/her team will have the following responsibilities:

- Ensuring availability resources and appropriate institutional arrangements for implementation of ESMP;
- Compliance of legislative and IFC's requirements;
- Carryout audits, and inspection of all the project activities;
- Preparation of necessary documents and record keeping system; and
- Review and updating of ESMP for effective its implementation.

Social Officer

The social officer will have the following responsibilities

- Liaison with the government authorities and all project stakeholders;
- Managing all grievances of the project and their outcomes;
- Implementing, monitoring and updating the ESMP;
- Undertaking community development initiatives in the affected villages;
- manage all the human resource issues, contractor and training issue;
- Address training needs of contractors and other employees for social and community issues

8.2.2 Contractors Management

As discussed in the implementation arrangements, the construction activities shall be carried out by Envision. However, the overall responsibility of the project will be of SPRNG which shall further ensure that the ESMP is implemented by its contracts through contractual arrangements. General environmental awareness will be increased among the project's team to encourage the implementation of environmentally sound practices and compliance requirements of the project activities. The same level of awareness and commitment will be imparted to the contractors and sub contractors prior to the commencement of the project.

SPRNG shall ensure that the job specific training and EHS Induction Training needs are identified based on the specific requirements of ESMP and existing capacity of site and

Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 261

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

project personnel (including the Contractors and Sub-contractors) to undertake the required actions and monitoring activities. Special emphasis will be placed on traffic management and operation of Cranes.

An environmental and social management training programme will be conducted to ensure effective implementation of the management and control measures during construction and operation of the project. The training programme will ensure that all concerned members of the team understand the following aspects:

- Purpose of action plan for the project activities;
- Requirements of the specific Action Plans;
- Understanding of the sensitive environmental and social features within and surrounding the project areas; and
- Aware of the potential risks from the project activities;

A basic occupational training program and specialty courses should be provided, as needed, to ensure that workers are oriented to the specific hazards of individual work assignments. Training shall be provided to management, supervisors, workers, and occasional visitors to areas of risks and hazards. Workers with rescue and first-aid duties shall receive dedicated training so as not to inadvertently aggravate exposures and health hazards to themselves or their co-workers.

Through appropriate contract specifications and monitoring, the employer should ensure that service providers, as well as contracted and subcontracted labour, are trained adequately before assignments begin.

8.3 COMMUNITY/STAKEHOLDER ENGAGEMENT AND GRIEVANCE REDRESSAL

The community engagement process is informally managed by the HSE Head and is limited to liaison with local authorities and the Panchayat. In order to ensure the implementation of the ESMP and engage all the stakeholders identified, this process will need to be formalized through the Social officer defined as above.

The two important elements of community engagement will be disclosure and consultation. This implies that as a first step, the findings of the ESIA, especially the ESMP will have to be

Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 262

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

disclosed to the community. The ESMP should be finalized through consultation with the community and an action plan shall be developed. Further, the community should be regularly updated about the implementation of the ESMP and all other relevant information pertaining to the construction phase, activities, health and safety risks etc. The community shall also be made aware of the available job opportunities from time to time.

The project will engage with the affected community (if any) to understand the stakeholders on the common property resources (roads, grazing areas etc.) which would be impacted. It shall work closely with the Panchayat and local administration to identify and develop alternate areas for common resources (fodder,) if required.

In order to understand community expectations and manage any local concerns, SPRNG will constitute a Grievance Redressal Mechanism to be managed by the Social Officer. This grievance mechanism will respond to the concerns and grievances of local communities, NGOs, Panchayats and any other aggrieved party or stakeholder. The project will share information about these mechanisms to the stakeholders through locally appropriate communication tools.

The Grievance Redressal procedure will also outline the process and steps to be taken and the time limit within which the issue would need to be resolved to the satisfaction of the complainant. The project will endeavour to get all complaints recorded and addressed in a uniform and consistent manner. For disputes that cannot be internally resolved, the project will set up an independent mechanism with representation from community, Panchayats and locally respected citizens of the area to sort these conflicts. If it has a legal implication the district administration will be approached.

8.4 ESMP REVIEW AND AMENDMENTS

The project ESMP is a social and environment management tool which shall be reviewed periodically (at least once in 2 years or earlier) to address changes in the project design, life cycle processes and activities, organisation and regulatory requirements.

Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 263

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

8.5 Inspection, Monitoring & Audit

In order to implement the ESMP, the on-site team will develop a time-bound and action-oriented Environmental and Social Action Plan to implement the mitigation measures provided for each of the identified environmental and social impacts. This ESMP will have to be monitored on a regular basis, quarterly or half-yearly and all outcomes would need to be audited in accordance with existing EHS commitments.

The monitoring process will cover all stakeholders including contractors, labourers, suppliers and the local community impacted by the project activities and associated facilities. Inspection and monitoring of the environmental and social impacts of construction and operation phase activities will increase the effectiveness of suggested mitigations. Through the process of inspection, audit, and monitoring SPRNG will ensure that all the contractors comply with the requirements of conditions for all applicable permits including suggested action plans. The inspections and audits will be done by SPRNG's trained team and external agencies/experts. The entire process of inspections and audits will be documented. The inspection and audit findings will be implemented by the contractors in their respective areas.

8.5.1 Reporting and Review

SPRNG will develop and implement a programme of reporting through all stages of the project - construction and commissioning, operation and decommissioning. Contractors will be required to fully comply with the reporting requirements in terms of timely report submission with acceptable level of details. Reporting will be done in form of environmental, health, safety and social check list, incident record register, environmental, health, safety and social performance reports (weekly, monthly, quarterly, half yearly, yearly etc).

8.5.2 External Reporting and Communication

All complaints and enquiries are to be appropriately dealt with and records be maintained in a Complaint/Enquiry Register by HSE Head or other delegated staff.

8.5.3 Internal Reporting and Communication

Inspection and audit observations along with their improvement program are to be regularly reported to the senior management for their consideration. The same are also to be

Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 264

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

communicated within the staff working on the project. To maintain open communication between the staff and management on EHS&S issues the following shall be used:

- Team Briefings,
- On-site work group meetings;
- Key Incidents/accidents and lessons learnt
- Work Specific Instructions; and
- Meeting with stakeholders.

8.6 DOCUMENTATION AND RECORD KEEPING

Documentation and record keeping system has to be established to ensure updating and recording of requirements specified in ESMP. Responsibilities have to be assigned to relevant personnel for ensuring that the ESMP documentation system is maintained and that document control is ensured through access by and distribution to identified personnel in form of the following:

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

8.7 PROPOSED ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

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

Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 265

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

The ESMP includes the following:

- Mitigations suggested for adverse environmental and social impacts and associated risks;
- Institutional arrangement - management tools and techniques for the implementation of environmental impacts and risk mitigations;
- Monitoring and reporting of requirements and mechanisms for the effective implementation of the suggested mitigations;
- Monitoring arrangements for effective implementation of suggested mitigations for the proposed project; and
- Reporting requirement to the regulatory agencies and funding institutes

Table 8-1: Environment and Social Management Plan

Impact Identified	Suggested Mitigation	Monitoring / Training	Management Responsibility
CONSTRUCTION PHASE			
Soil Resources and Quality			
Erosion and compaction Contamination of soil Construction/strengthening of access roads; Vehicular movement; and	<ul style="list-style-type: none"> • Use of existing roads for transport of man and material to the extent possible • Loose soil to be protected from wind and runoff • All construction material to be kept within the footprint of the area acquired. • Loose construction material to be covered to avoid being carried into adjoining areas by wind. • Switchyard structures to be undertaken after covering the land beneath with a sheet of impervious material. • Fuel storage for DG sets to be done on paved surfaces 	<ul style="list-style-type: none"> • Envision representative to make daily observations on storage and handling of soil and construction material. • Workers handling painting activity to be briefed about the need to prevent contamination. • Drivers to be instructed about use of dedicated tracks within the site 	Site supervisor To be mentioned in the contract with SPRNG

Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 266

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

Impact Identified	Suggested Mitigation	Monitoring / Training	Management Responsibility
Land Use			
Construction and strengthening of access road; Site clearance and preparation for WTGs, PSS and HEV line Establishment and operation of batching plant; and Transient storage of WTG components	SPRNG has considered all aspects of siting and design prior to selection of the sites	On completion of construction activities, land used for temporary facilities such as stockyard, batching plant and labour camps should be restored to the extent possible. The land use in and around permanent project facilities should not be disturbed.	SPRNG
Waste Generation, Storage and Disposal			
Accumulation of construction waste Runoff into rain water channels Unhygienic condition for labours	<ul style="list-style-type: none"> Construction waste to be properly stored and disposed off to local municipal waste disposal site Domestic waste generated by workers to be collected and composted at site Other wastes like wood packaging material, metal jute etc. will be sold to scrap dealers. Provision of segregated toilets for male and female workers in the ratio of 1:15 and 1:10 (toilet to workers) respectively; Waste oil shall be stored on paved surfaces 	<ul style="list-style-type: none"> Workers to be instructed to use dustbins and toilets at the site Contractors will be briefed about the need for proper storage and disposal construction waste 	Site manager To be mentioned in the contract with the construction contractor Site supervisor to make observations and convey it to the contractors

Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 267

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

Impact Identified	Suggested Mitigation	Monitoring / Training	Management Responsibility
	<ul style="list-style-type: none"> Empty paint containers shall be stored in earmarked area and sold to authorised vendors. 		
Water Resource and Quality			
Ground water extraction Runoff into rain water channels Wastage of water	<ul style="list-style-type: none"> Water for construction to be arranged by the construction contractors through authorised tanker water suppliers. Domestic water requirement of the workers at site to be met through bore well at the site, if present Adequate arrangement for storm water management during construction period to be made to avoid sediment runoff from the site. Optimal utilization of water to be ensured throughout the construction phase Storm water flow during monsoons to be directed to the existing channels with silt traps to avoid sedimentation of the channels or the receiving water body. Water conservation to be practiced to reduce water requirement.. 	<ul style="list-style-type: none"> Daily consumption of water to be recorded and assessed on weekly basis for wastage Workers to be instructed about optimal use of water Storm water arrangements to be monitored for clogging on weekly basis 	Site manager To be mentioned in the contract with the construction contractor Site supervisor to make observations and convey it to the contractors
Ecology			
Clearing of vegetation	<ul style="list-style-type: none"> Tree cutting will be limited to those directly affecting the 	<ul style="list-style-type: none"> Construction contractor to 	Site supervisor To be mentioned

Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 268

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

Impact Identified	Suggested Mitigation	Monitoring / Training	Management Responsibility
Cutting of trees Disturbance to avifauna	WTGs placement. <ul style="list-style-type: none"> • Workforce to be instructed to avoid any other activity likely to affect the local flora & fauna. • High noise generating activities to restricted to daytime with proper mitigation measures • Transportation to be undertaken along identified paths 	instruct and inform workers about need to refrain from activities that may adversely affect the ecology	in the contract with the construction contractor
Damage to forest area	<ul style="list-style-type: none"> • No vehicle or the persons, working for the project site development shall enter inside the forest area. • Project authorities shall ensure that no materials, components, garbage, solid waste, oil, grease etc. are kept or thrown in to the forest areas located to the project site. 	<ul style="list-style-type: none"> • Construction contractor to instruct and inform workers about need to refrain from activities that may adversely affect the ecology 	Site supervisor To be mentioned in the contract with Envision
Impact on Terrestrial Flora	Where necessary, avoid destruction of trees and bushes and allow regeneration of plants. In few points (CHR5, BLV 1, MHK 1 and MHK4, PRD1,2 and 3) more vegetation need to clear for making internal pathway to establish WTG. Hence more precautionary measures should be taken care of while laying the internal roads to the point. No	<ul style="list-style-type: none"> • Monitoring of vegetation clearance activities 	Site Supervisor of Envision

Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 269

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

Impact Identified	Suggested Mitigation	Monitoring / Training	Management Responsibility
	large trees should cut during this stage.		
Impacts on avifauna associated with general construction activities	<ul style="list-style-type: none"> Maximize use of existing tracks for access roads Minimize removal of vegetation Avoid disturbance to grassland areas onsite. Habitats subjected to temporary loss will be re-vegetated as soon as possible after construction, to replicate the habitat A random survey should be undertaken to identify the presence/ absence of nesting birds or breeding habitat. (During the study period no nesting and breeding sites are observed in all WTG points. 	<ul style="list-style-type: none"> Random Ecological Monitoring Survey (One season- Preferably Winter season) 	<p>Envision</p> <p>The detailed avifauna monitoring study needs to be carried out by an expert Ecologist</p>
Temporary increase in dust, odor, from construction vehicle emissions indirectly affect avifauna	<ul style="list-style-type: none"> Dust will be controlled by watering where necessary All combustion engine equipment should be appropriately maintained to meet emission standards 	<ul style="list-style-type: none"> Water sprinkling and monitoring records of PUC and Fitness Certificate of vehicles 	HSE Officer-Envision
Hazards associated with turbine blade. Movement Bird collisions, increased energy expenditure and barrier effects	<ul style="list-style-type: none"> Inter-turbine distance should be large enough that birds can avoid turbine blades and utilize minimal energy while doing so Avoid siting of WTGs near important habitat features 	Annual Bird and Bat Monitoring Study	Envision and SPRNG

Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 270

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

Impact Identified	Suggested Mitigation	Monitoring / Training	Management Responsibility
	<p>such as water bodies, rocky terrain and thick vegetation</p> <ul style="list-style-type: none"> WTGs should be sited in areas that are visible from a manoeuvrable distance for flying species and shouldn't be located near sudden changes of elevation, large trees or be blocked by any manmade/natural structures. Flash lamps on the WTGs will prevent bird collisions at night Waste materials should not be left uncovered as it will attract birds and other fauna to the wind farm boundary Overhead cables should be marked using diffractors Restoring herb layers in the vicinity of the wind turbines will provide shelter for prey animals (E.g. lizards, snakes and rodents) and prevent raptors such as Black-shouldered Kite from flying into the wind farm. 		
Traffic and Transport			
Arbitrary movement of vehicles leading to congestion and accidents Improper parking of	<ul style="list-style-type: none"> Training of drivers about road safety to be organised ; Vehicle movement and parking within the Project premises shall be manned 	<ul style="list-style-type: none"> Necessary training to the driver of construction vehicles for speed restrictions and to 	<p>Site supervisor</p> <p>To be mentioned in the contract with the construction</p>

Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 271

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

Impact Identified	Suggested Mitigation	Monitoring / Training	Management Responsibility
vehicles used by workers and for movement of material can lead to discomfort to other users.	<ul style="list-style-type: none"> properly to avoid accidents Routes for use by construction traffic to be planned to minimize impact on adjoining activities. Dedicated path within the site for exclusive entry and exit of the construction vehicles to be provided. Regular maintenance of vehicles to be taken up. 	<ul style="list-style-type: none"> crewmembers on do's and don'ts during construction vehicles movements. Drivers to be assessed for their knowledge on traffic rules before engagement. 	contractor
Atmospheric Emissions			
Fugitive dust Emissions from diesel engines and DG sets	<ul style="list-style-type: none"> Dust generating activities to be avoided in conditions of very high wind and covers to be provided for loose construction material at construction site. It is to be ensured that construction equipments are properly maintained to minimise smoke in the exhaust emissions. Machinery to be turned off when not in use. Housekeeping of the area to be maintained The impact of emissions from vehicles bringing construction material to be minimised by proper upkeep of maintenance of vehicles, sprinkling of water on unpaved roads at the 	<ul style="list-style-type: none"> Dust deposition in adjoining areas to be physically monitored by SPRNG personals on weekly basis. 	Site supervisor To be incorporated in the contract with contractor

Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 272

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

Impact Identified	Suggested Mitigation	Monitoring / Training	Management Responsibility
	<p>construction site and planned movement of such vehicles.</p> <ul style="list-style-type: none"> Vehicle speed to be restricted to 15km/hour at site to minimize potential for dust generation in the surroundings Trucks /dumpers to be covered by tarpaulin sheets during off site transportation of friable construction materials and spoil All the vehicles entering the site to be asked to have updated PUC (Pollution under control) certificate. Generator to be optimally used with proper orientation and adequate stack height 		
Noise and Vibration			
<p>Disturbance to habitations</p> <p>Disturbance to fauna</p> <p>Occupational Hazard</p>	<ul style="list-style-type: none"> Use of inherently quiet plant and equipment as far as reasonably practicable and regular maintenance to ensure noise emissions are maintained at design levels. Integral noise shielding to be used where practicable and fixed noise sources to be acoustically treated, for example with silencers, acoustic louvres and enclosures. Provision of rubber 	<ul style="list-style-type: none"> Arrangements for noise reduction to be monitored on weekly basis Schedule of activities to be discussed and finalised between site manager and the contractor 	<p>Site manager</p> <p>Construction Contractor</p>

Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 273

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

Impact Identified	Suggested Mitigation	Monitoring / Training	Management Responsibility
	<p>paddings/noise isolators at equipment/machinery used for construction</p> <ul style="list-style-type: none"> Construction vehicles to be well maintained and not idling equipment or vehicles when not in use. Provision of make shift noise barriers near high noise generating equipment to minimise horizontal propagation of noise Loud, sudden noises to be avoided wherever possible. Fixed noise sources to be located away - more than 50m inside from site boundary. Noise prone activities will be restricted to the extent possible during night time 2200 to 0600 hours to reduce the noise impact (Table 2.5.3). Site workers working near high noise equipment use personal protective devices to minimise their exposure to high noise levels 		
Health and Safety Hazards			
Accidents leading to injuries fatalities Occupational health hazards	<ul style="list-style-type: none"> All the required safety measures based on individual job profile to be provided (as per working 	<ul style="list-style-type: none"> Proper training of the workers regarding health and safety 	Site Manager Safety Officer To form part of the contractor's

Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 274

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

Impact Identified	Suggested Mitigation	Monitoring / Training	Management Responsibility
	<p>guidelines, use of personal protective equipments like gloves, helmets, ear muffs, safety belts etc.) for construction worker through the contractors.</p> <ul style="list-style-type: none"> • Ensure effective work permit system for hot work, electrical work, working at height, working in confined space etc. • Ensure personal protective equipment for all personnel present at site are made available. • Arrangement for fire control measures • Display of phone numbers of the city/local fire services, etc. at site. • Ensure good housekeeping at the construction site to avoid slips and falls. • Dropping/lowering of construction material or tool to be restricted and undertaken only under strict supervision, if required. • Provision of proper sanitation at the labour camp. 	<p>procedures</p> <ul style="list-style-type: none"> • Workers to be trained through sub contractors regarding use of Personal protection equipment and its importance. 	contract.
Socio Economic Impacts			
Land Acquisition Loss of land Loss of livelihood	<ul style="list-style-type: none"> • Adequate compensation provided • Employment opportunities 	<ul style="list-style-type: none"> • Grievance redressal mechanism shall 	Site Manager

Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 275

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

Impact Identified	Suggested Mitigation	Monitoring / Training	Management Responsibility
Loss of grazing land	given to locals and family members of land losers	be formulated for project affected families to express their concerns.	
Access to Common Property Resources Access to grazing lands; Common village approach road to the site; Access to fuelwood sourcing areas.	<ul style="list-style-type: none"> The project shall avoid using community /village roads for project activities. Alternative access roads will be constructed and used; 	<ul style="list-style-type: none"> The site personnel is to ensure that during the construction phase there are no additional encumbrances to block access to alternative areas due to material storage etc. 	SPRNG On-site personnel and contractors
Increased Community Expectations Heightened community expectations for employment and other local benefits	<ul style="list-style-type: none"> The project will initiate an early dialogue with the local community to understand their concerns as well as expectations from the project; The project will communicate and discuss with the community in a transparent manner about employment/contract and other opportunities on a regular basis and demonstrate the efforts being made to accommodate as many people as possible. The projects will ensure that there is a transparent process of giving jobs/contracts and other 	<ul style="list-style-type: none"> Increased Community Expectations Heightened community expectations for employment and other local benefits 	Social Officer

Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 276

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

Impact Identified	Suggested Mitigation	Monitoring / Training	Management Responsibility
	benefits.		
Influx of Migrant Workers Social Impacts; Health Impact; Economic Impacts.	<p>The Contractor needs to ensure construction of labour camp as per IFC Guidelines in case of hiring migrant labour for the pproject. The following measures shall be ensured:</p> <ul style="list-style-type: none"> • Accommodation: It shall be ensured that a minimum space of 4-4.5 m2 is allocated per person. • Common latrines and bathing facilities duly segregated for male and female labour - Number of toilets and sanitary fittings shall be considered as 1 toilet, 1 urinal and 1 bathroom per 15 male workers. Arrangement for female workers shall be 1 toilet and 1 bathroom per 10 female workers. • Water supply through borewells and authorized water tankers- Adequate provisions of water with about 150 litres per capita per day shall be made. • Disposal of sewage through a septic tank – soak pit arrangement. • Arrangements for collection of garbage in dustbins and disposal through daily 	<ul style="list-style-type: none"> • SPRNG shall ensure that the onsite administration team to look after contractors will monitor all compliances to the terms and conditions. In addition, personnel will need to be aware of the applicable regulatory requirements for ensuring compliance to good working and labour law compliance. 	SPRNG, the local procurement team and the labour contractors.

Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 277

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

Impact Identified	Suggested Mitigation	Monitoring / Training	Management Responsibility
	<p>collection.</p> <ul style="list-style-type: none"> Provisions of food – it shall be ensured that the food provided to workers contains an appropriate level of nutritional value and shall take into account the different religious/cultural backgrounds; Supply of fuel wood and LPG cylinders in order to avoid encroachment in adjoining areas IFC Labor guidelines need to be followed 		
<p>Community Health Safety and Security Common approach road to the site; Nuisance from air emissions and noise due to transportation; Traffic impacts like accidents.</p>	<ul style="list-style-type: none"> Ensure proper training of drivers and planning for transport of construction machinery, material and manpower. All workers whether local or migrants will be instructed to follow strict code of conduct Local security personnel shall preferably be engaged at site. To the extent possible, labour to be housed in camps, with good living conditions and access to amenities. Health and safety training of the labour, raising awareness about STDs, and HIV, and maintaining behaviour 	<ul style="list-style-type: none"> SPRNG to provide training to drivers, workers and security personnel 	SPRNG /Envision

Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 278

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

Impact Identified	Suggested Mitigation	Monitoring / Training	Management Responsibility
	<p>standards while moving in the community should be a priority;</p> <ul style="list-style-type: none"> Any complaints or concerns with respect to labour should be addressed without delay. 		
Impact on adjacent lands Crop loss during construction; Encroachment.	<ul style="list-style-type: none"> Ensure that all the project activities are restricted to the existing site boundary. The use of land outside the boundary for purposes like parking of vehicles, storage of material during construction etc warrants prior consent of the owner of that land as well as adequate compensation for such a use; The project should proactively discourage any encroachment around the project area and involve the local panchayat authorities in the same; Any structures which are constructed outside the boundary should be dismantled after use. 	<ul style="list-style-type: none"> SPRNG will need to monitor the compliance of the contractor to these measures and ensure that any non-compliance is adequately addressed. 	SPRNG /Envision

Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 279

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

OPERATION PHASE				
Waste Disposal				
Domestic waste from staff quarters Waste transformer oil	<ul style="list-style-type: none">Transformer oil to be replaced and retained by the supplier of transformers	<ul style="list-style-type: none">SPRNG staff to be briefed about the need for proper storage and disposal waste oil	Plant Manager Safety Officer Transformer / PV module Suppliers	
Water Resource and Quality				
Water requirement for cleaning Waterlogging	<ul style="list-style-type: none">Alternate arrangement of water through authorised tanker water suppliers to be madeAdequate storm water drainage	<ul style="list-style-type: none">Daily consumption of water to be recorded and assessed on weekly basis for wastageWorkers to be instructed about optimal use of water	Safety Officer Plant manager	
Ecology				
Distraction to avifauna Routine clearance	<ul style="list-style-type: none">Clearing of vegetation to be limited to removal of undergrowth or shrubs at the plant site	-	Safety Officer Plant manager	
Bird & bat collisions with Operational turbines	<ul style="list-style-type: none">Annual monitoring study for birds and bats in the Core Zone should be developed and implemented to understand the effects of potential bird collisions with the rotors during the operational phase.Make the wind turbine blade visible to birds by painting	<ul style="list-style-type: none">Annual Bird and Bat Monitoring Study (once in Winter season) for monitoring impact of the project on avifauna in Core Zone by a third party agency for study of mortality of	Safety Officer/Plant Manager/Corporate ESG Head	

Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 280

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

	<p>blade tips with orange or red colour as per international standard measure to isolate from the sky and mitigates risk of bird collisions.</p> <ul style="list-style-type: none"> Monitor wind turbines particularly located in Satapur village for bird and bat mortality during Annual Bird and Bat Monitoring Study in operational phase for two continuous years for determining the scale of impacts on birds and bats. Upon finding significant bird & bat mortality mitigation measures could be suggested including that of curtailment or cut off the generation during certain identified period identified when maximum impact occurs. For minimizing impacts on bats, a random survey should be conducted for carcass bat searches at a representative sample of turbines to determine the level of bat mortality around wind turbines. This is especially important during the periods March to May and September to December when bats are migrating between summer and winter 	<p>birds/bats in the area for a minimum period of two years</p> <ul style="list-style-type: none"> Carcass Survey 	
--	--	--	--

Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 281

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

	roosts. <ul style="list-style-type: none"> Carcass searches should be made early in the morning to minimize the effect of scavengers (which remove carcasses). Avoid raising Eucalyptus trees and fruit bearing trees such as Ficus sp. nearer to WTG points where these species are habitat for roosting places for Bats and Birds. 		
Bird Collision with Powerlines	<ul style="list-style-type: none"> Align power lines as far as possible in three clusters Chur, Mahiki and Palvada village clusters as shown in the map. Monitor power lines passing near by the water bodies for collisions. If found frequent mortality more efforts to increase visibility of power line could be suggested 	<ul style="list-style-type: none"> Monitoring powerlines 	Safety Officer/Plant Manager
Electrocution of birds on Poles and Powerlines	<ul style="list-style-type: none"> Cables & electric wires originating from wind turbine should be either made underground or under concealed pipes when sent to DP Yard adjoining to turbine. This DP Yard must be protected by animal proof walls/fence on all four sides. Use coiled barbed fencing 	<ul style="list-style-type: none"> Monitoring electrical installations and ensuring safety/security 	Safety Officer/Plant Manager

Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 282

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

	<p>(concertina coil) to avoid any animal jumping above the wall as an extra protection measure</p> <ul style="list-style-type: none"> The poles in DP yard shall be kept at the height of 10m above ground. All out door electrical equipments shall be kept in compact sub-station (which is a cubical, metal box, consisting of CT, PT, VCB and meter) which can reduce chances of electric shock to wildlife which can accidentally enter fenced yard. 		
Health and Safety			
Electromagnetic field Accidents leading to injury/fatality	<ul style="list-style-type: none"> EMF generated to be of weak in intensity Personal protective equipment to be provided for all personnel at road construction and transmission line. 	<ul style="list-style-type: none"> Proper training of the workers regarding health and safety procedures Workers to be trained for use of Personal protection equipment and its importance. 	Site Manager
Social			
Impacts on Local Economy	<ul style="list-style-type: none"> In case of development of local enterprise in the vicinity of the project, these should be encouraged through sourcing opportunities. 	-	Procurement team
Upgrades to Local	<ul style="list-style-type: none"> Collaborate with local govt. and industry for any 	--	SPRNG

Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 283

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

Infrastructure	<p>community development programs to share the resources and cut cost;</p> <ul style="list-style-type: none"> • Avoid duplicating existing infrastructure and emphasize on improving or upgrading the quality and quantity of the same. 		
----------------	--	--	--

Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 284

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

9. CONCLUSIONS AND RECOMMENDATIONS

The Environmental and Social Assessment study for the proposed 197.5 MW Wind power project in Jamjodhpur Taluka, Jamnagar District of Gujarat State has been undertaken in accordance with IFC's Performance Standards, World Bank's Environment Health and Safety (EHS) Guidelines; IFC's Environmental, Health and Safety Guidelines for Wind Energy; and IFC's EHS Guidelines for Electric Power Transmission and Distribution.

The project is assessed to generate some environmental and social issues owing to construction related activity, water resource requirement, movement of traffic and requirement of land for transmission line. The mitigation measures for potential impacts on various environmental and socio-economics have been specified through proper

- follow up of best practice of compensation, public disclosure, and grievance management;
- planning & designing of power plant, site preparation and access route, construction, drainage, traffic movement etc.
- application of standards for Health and Safety
- clearances and permits required for each sub activity

Environmental Management Plan and Social Management Plan describe implementation mechanism for recommended mitigation measures together with monitoring to verify overall project performance.

This ESIA study together with mitigation measures and follow up of recommendations on management actions will help SPRNG in complying with the environmental standards and meet the IFC performance standards.

The Project is a renewable energy projects which uses wind power generation. Renewable energy projects are considered to be cleaner compared to fossil fuel based energy projects.

The potential environmental and social impacts of the Project are limited as the project is a clean project and does not involve any emission or rehabilitation issues. The duration and

Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 285

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

extent of construction activities is also limited; thereby resulting in minimal environmental and social impacts. Any adverse environmental and social impacts may be readily addressed through mitigation measures as outlined in the Environmental and Social Management Plan (ESMP).

However, in accordance to the screening criteria of the IFC on the basis of the following observation in ecology study the Project has been classified as **Category B**:

- The project is a greenfield project. The revenue land has been acquired for the project and there are no resettlement and rehabilitation or involuntary resettlement issues related to the project;
- The migratory bird pathway does not coincide with the WTG Locations in the Core Zone of the Study Area;
- The project is located at a distance of 37 km from Chaya Rann Wetland and at a distance of 41 km from coastal city Porbandar which attracts migratory birds;
- The Shadow Flicker and Noise Modelling assessments conducted reveal that there shall not be impacts on increase in noise levels and aesthetics during operation phase of the project
- There are 3-4 other upcoming windfarm projects at a distance of approximately 6-7 km from the proposed project site henceforth cumulative impact assessment on avifauna is a significant concern.

The Bird and Bat Monitoring needs to be carried out annually to understand the impact of potential bird collisions with the rotors, especially near Satapar village, to be developed by SPRNG for the operation phase. This study should be carried out for minimum two years' period with a frequency of atleast monitoring once in a year in Winter season to get a clear idea of WTG impacts on birds and bats in the area.

To minimize impacts on bats, a random survey for search of Bat carcass should be conducted by SPRNG at a representative sample of turbines to determine the level of bat mortality. This is especially important during the periods March to May and September to December when bats are migrating between summer and winter roosts.

Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 286

Project: Final ESIA Report for 197.5 MW Kageshree Wind Power Project, Jamjodhpur Taluka, Jamnagar District, Gujarat

Client: SPRNG ALT Energy Pvt. Ltd.

SPRNG needs to further monitor power lines passing near by the water bodies for bird collisions. If frequent mortality is observed, more efforts need to be made to increase visibility of power line could be suggested.

Assignment	Final Environmental and Social Impact Assessment Report for 197.5 MW Kageshree Wind Power Project, Gujarat	Tool : IFC Performance Standards
Version-01		Page 287