

## NON-TECHNICAL SUMMARY

### 1. INTRODUCTION

#### 1.1. Project Background

Sustainable Akkar SAL (the Developer) is proposing to develop a 90.75 megawatt (MW) onshore wind farm in the Akkar region of Lebanon (the Project). The location of the Project site is shown in **Figure NTS-1**.

In accordance with legislation and standards of Lebanon governed by the Ministry of Environment (MOE), the Project has been subject to a full Environmental Impact Assessment (EIA). In addition, The Developer is seeking financing for the Project from International Finance Institutions (IFIs); therefore, an Environmental and Social Impact Assessment (ESIA) Report has been prepared in accordance with good international industry practice and international standards.

#### 1.2. Structure of the ESIA Report

The ESIA document package consists of three documents:

- ESIA Report:
  - Volume I: the main ESIA Report which provides a detailed description of the Project, presents assessment methodologies, findings and conclusions of the ESIA process.
  - Volume II: the Technical Appendices which provides supporting information for the assessment undertaken and reported in Volume I.
- Stakeholder Engagement Plan (SEP).
- Environmental and Social Management Plan (ESMP).

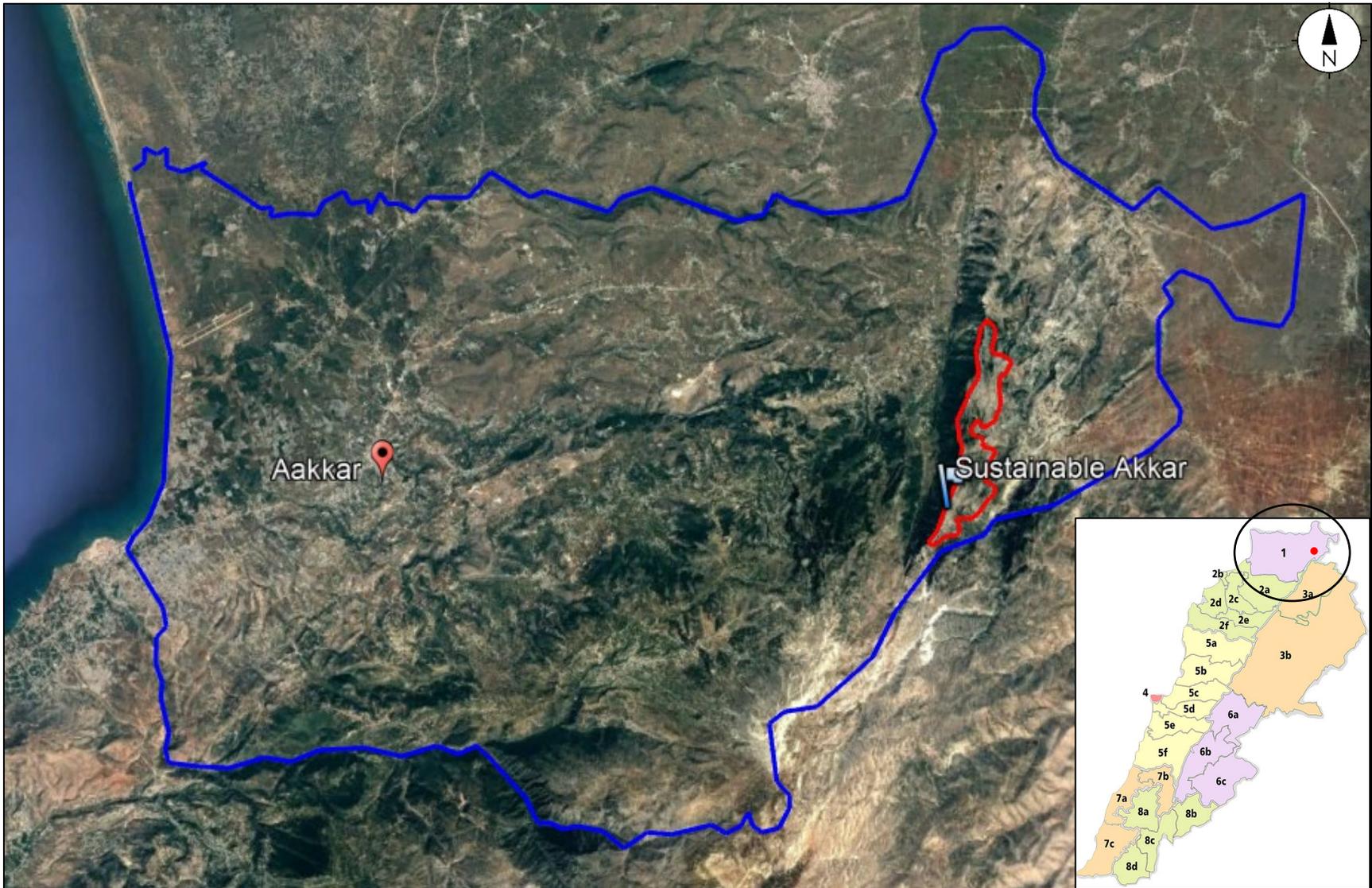
#### 1.3. The ESIA Process

The ESIA has been completed in accordance with Lebanon's legislation, International Finance Corporation (IFC) Performance Standards (2012) and European Investment Bank (EIB) Environmental and Social Standards. The key objectives of the ESIA process are to assess the potential environmental and social impacts associated with the construction and operation of the Project, and to identify measures that can be adopted to avoid, minimize or offset adverse impacts. The process also identifies ways to enhance any beneficial impacts of the Project. The ESIA process included the following activities:

##### *Scoping*

A scoping exercise was undertaken to identify and focus the impact assessment on potentially significant environmental and social issues associated with the development of the Project (through the construction and operation phases). Scoping has an important role to play in achieving proportionate and effective assessment. Key stakeholders, including interested and affected parties, were identified during this exercise and provided with an opportunity to raise any comments, concerns and/or queries that they may have on the proposed Project. A Scoping Report was submitted solely to the MOE in December 2017 and reviewed by an internal committee.

Figure NTS-1 Project Location



The aim of the scoping process is to identify Project effects that have the potential to be significant and to exclude (scope out) from the assessment those effects that are unlikely to be significant. During the scoping phase a summary of available high-level baseline information was collected, key potential environmental and social impacts and sensitive receptors and resources were identified, and the impact assessment methodology was defined.

#### *Collection of Baseline Data*

The “baseline” describes the existing environmental and social conditions of the Project. It is this baseline against which the potential effects of the Project can be assessed. Primary and secondary environmental and social data were collected in order to enhance understanding of the receiving environments. The full baselines for each assessment topic are presented in Volume I, Sections 8 through 19, and supporting specialist annexes in Volume II.

#### *Stakeholder Consultation and Engagement*

Stakeholders have been engaged throughout the ESIA process. Activities included high level consultation with municipalities, detailed engagement with family leadership of affected communities, meetings with key informants, household survey, public disclosure meetings, meetings with landowners, focus group meetings, meetings with the Lebanese Army and meeting with mayors and officials representing towns along the transport route. The key findings of the consultation and engagement are reflected in the ESIA Report and have been incorporated into the project design and planning, where relevant.

#### *Assessment of Alternatives*

The key environmental and social constraints identified during scoping influenced the Project design early in the ESIA process. This allowed the majority of significant impacts to be avoided. Additionally, alternative turbine makes, models, numbers, layouts and construction logistics were considered to further reduce potential impacts.

#### *Impact Assessment*

The impact assessment provides a detailed analysis of the potential environmental and social issues that may result from the Project. The assessment is supported by specialist scientific studies. It also provides details of the measures and management actions that will be implemented to avoid, reduce, remedy or compensate for any significant adverse impacts predicted. Where practicable, details of how the Developer will maximize potential positive benefits and opportunities from the Project are also given. The assessment was completed in May 2019.

**Spatial Scope:** The spatial scope or study area for the ESIA takes into account the physical extent of the Project components/activities and the nature of the affected resource, the source of impact and the manner in which the resultant impact is likely to spread beyond the physical extent of the Project activities. This is also known as the Area of Influence or AOI. For the Project, the Direct Area of Influence (DAOI) is defined by the spatial extent of the footprint created by the core Project components and associated facilities, and their associated effects on the physical, biological and socioeconomic environments, including:

- A 3km radius around the Project footprint of land to be leased or purchased from landowners for the installation of the turbine platforms, internal roads, which encompasses the noise, shadow flicker and visual receptors.

- The footprint of land needed to construct the internal roads for Lebanon Wind Power and Hawa Akkar (as new segments of track to access the Project).
- The office space to be leased for the Community Relations Office in Kfartoun.
- The new segments of road.
- Settlements within the sightline of the wind farm were also assessed, including Rweimeh, Sahle, Qenia, Quobaiyat, Aandqet and Kfartoun.
- Extends up to 15km from the Project footprint (limited to sites and monuments of national importance located within the 15km and potentially affected by the Project’s visual impact).

The Indirect Area of Influence (IAOI) for the ESIA comprises the existing transport corridor between the Tripoli Seaport and the Project and includes informal settlements within 1km of the existing road. It further includes visual impacts to key landscape units.

Temporal Scope: The Project will be developed in a three-phase sequence, as follows: 1) Construction Phase; 2) Operations and Maintenance Phase; and 3) Decommissioning Phase:

Subject	Treaty, Convention or Protocol
<b>Construction Phase</b>	<p>This includes construction activities which will be undertaken by the OEM/EPC Contractor.</p> <p>This mainly includes preparing the detailed design and layout of the Project, transportation of Project components to the Project site, as well as site preparation and construction activities for installation of wind turbines, foundations, internal access roads, buildings, etc.</p>
<b>Operations and Maintenance Phase</b>	<p>This includes activities to be undertaken by the Project Operator. Activities expected to take place mainly include the normal daily operation of the wind turbines and the routine maintenance activities.</p>
<b>Decommissioning Phase</b>	<p>At the conclusion of the PPA term, the Project will be completely decommissioned by the Developer.</p> <p>The anticipated impacts throughout the decommissioning phase are similar in nature to impacts assessed during the construction phase – and specifically in impacts related to soil, air quality, and occupational health and safety.</p> <p>Therefore, the assessment of impacts for those receptors and mitigation identified during the construction phase is assumed to apply to this phase in particular without the need to reiterate or emphasize this throughout this section.</p>

*Assessment of Cumulative Impacts*

Cumulative effects result from incremental changes caused by other past, present or reasonably foreseeable development (i.e. the planned Lebanon Wind Power and Hawa Akkar wind farms) together with the cumulative effect and those from the Project. In most instances past and present development will have been captured in the baseline for the Project (e.g. through noise measurements) and the normal practice of ‘adding’ impacts from the Project to the baseline will assess the cumulative impacts.

*Management Plans*

Following the assessment of impacts, an Environmental and Social Management Plan (ESMP) framework is developed. This sets out how the impact mitigation and management measures will be put into practice through a suite of specific plans. Refer to Section 6.

*Disclosure*

The ESIA report will be disclosed to interested stakeholders.

## **2. PROJECT DESCRIPTION**

### **2.1. Overview**

The Project will involve the construction and operation of up to 21 wind turbines within the site boundary. Depending on the Engineering, Procurement and Construction (EPC) Contractor selected, the wind farm will comprise wind turbine generators (WTGs) with different power ratings:

#### **Potential Contractors, Turbine Power Ratings and Turbine Numbers**

<b>OEM/EPC Contractor</b>	<b>Turbine Power Rating</b>	<b>No. of Turbines</b>	<b>Power Generated by Turbines</b>	<b>Total Power Generated</b>
Vestas Wind Systems	4.2MW	21	88.6MW	88.2MW
General Electric	4.8MW	3	30.0MW	88.6MW
	5.3MW	14	74.2MW	

The entire investment will include the following components:

- A maximum of 21 WTGs.
- Underground cable networks (electric and fiber-optic control and communication cables).
- External and internal access roads.
- Power substation and temporary and permanent maintenance buildings.
- Parking/laydown/assembly areas.
- Concrete batching plant in Rweimeh Village.
- A CRO building to be located in Kfartoun.

Generally, a wind turbine consists of a foundation, tower, nacelle, rotor blades, a rotor hub, and a transformer. The foundation is used to bolt the tower in place. The tower contains the electrical conduits, supports the nacelle, and provides access to the nacelle for maintenance. Typically, three (3) blades are connected to the hub which then connects with the nacelle; the box-like component that sits atop the tower and which most importantly contains the gear box (which steps up the revolutions per minute to a speed suitable for the electrical generator) and the generator (which converts the kinetic energy into electricity). Each turbine and associated platform will occupy a maximum surface area of +3,500m<sup>2</sup>. Foundation platforms will be constructed to bolt the tower of the turbine in place.

Construction is expected to commence in Q4 of 2019, employing up to 125 staff on site for a duration of approximately 18 months. This will mainly include skilled opportunities (to include engineers, technicians, consultants, surveyors.) and unskilled job opportunities (mainly labor force but will also include a number of security personnel). Approximately 3 job opportunities will be available during the

operations phase for a duration of 20 years. This will include skilled job opportunities (such as technicians) and unskilled job opportunities (such as drivers). This number does not consider the security personnel that will be required onsite.

## 2.2. Need for the Project

The country has yearlong power deficit that can reach up to 1,400MW during the summer. As of 2016, the peak power demand reached 3,594MW while the effective power production by EDL only reached 2,108MW, generating to 21 hours of electricity supply in Beirut and 14 hours outside of the capital.<sup>1</sup> In response to the frequent power rationing by the government, local residents rely on private back-up generators.

As of 2010, private generators are satisfying 77% of the blackouts. Private generators operate using gas oil at notoriously low efficiencies rates, by comparison, the average generation efficiency of EDL from cradle to consumer gate is about 30% higher; thus, any given private generator is a wasteful and a major contributor to air pollution and costing the consumer 4.74 times more per kilowatt hour (KWH) than government generated electricity.<sup>2</sup>

In a bid to decrease the environmental footprint of its energy sector and align itself with the international efforts to reduce global Green House Gas (GHG) emissions, the Government of Lebanon (GOL) officially pledged to meet 12% of its energy consumption from RE sources by 2020 at the 2009 Copenhagen Climate Change Conference. The Ministry of Energy and Water (MOEW) published the 2010 Policy Paper for the Electricity Sector that was approved by the Council of Ministers (COM) on 21 June 2010. In addition to proposing a strategic solution to the electricity sector in Lebanon, the Policy Paper built on the 12% commitment of RE by 2020 to propose some future milestones.

The MOEW published the Wind Atlas of Lebanon and a 2013 Request for Proposal (RFP) for developing the first utility-scale wind farm in Lebanon sparked private sector interest. At the U.N. Framework Convention on Climate Change (UNFCCC) Conference of the Parties (COP21) in Paris in December 2015, the GOL also pledged to reach a 15% reduction in GHG and 3% reduction in power demand by 2030 relative to a business-as-usual scenario.

The current electrical energy demand is estimated at 16,400 gigawatt hours (GWH), and is projected to reach around 20,000GWH in 2020 assuming a 3% yearly increase. Thus, renewable energy (RE) must provide 2,400GWH of electrical energy in order to meet the RE target set by the GOL. In February 2018, the Minister of Energy and Power Cezar Abi Khalil signed the first Power Purchase Agreement<sup>3</sup> (PPA) with companies of the private sector to build three wind farms of an individual capacity 200MW. The energy ministry's signing of the agreements represents Lebanon's first PPA with the private sector in electricity generation as part of efforts to close an estimated 1GW gap between current electrical supply and demand in the country.

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<sup>1</sup> Ashari, T (2018) Lights Out as Demand Surges for Electricity. The Daily Star Published on 10 July 2018. Retrieved from [www.dailystar.com.lb](http://www.dailystar.com.lb).

<sup>2</sup> Bouri, E., El Assad, J. 2016. The Lebanese Electricity Woes: An Estimation of the Economical Costs of Power Interruptions. *Energies*, 9, 583; doi:10.3390/en9080583.

<sup>3</sup> LBCI. (2018). Lebanon signs wind Power Purchase Agreement. News Bulletin Reports. Retrieved from [www.lbcgroup.tv](http://www.lbcgroup.tv).

**2.3. Project Location and Site**

The area to be developed is located in Jabal Akroum, Akkar on Lebanon’s northeastern border with Syria, approximately 182 kilometers (km) northeast of the capital city of Beirut. The Project location is as shown in **Figure NTS-1** and photographs presented in **Figure NTS-2**.

**Figure NTS-2 Photographs of the Project Site**



Météo Liban (ML) provided wind data from 17 meteorological stations located throughout the country for the MOEW to develop the Wind Atlas for Lebanon, which was supplemented by hourly wind data from 5 meteorological stations situated within Syria near to the Lebanese border. These data were used to derive information about long term annual and seasonal mean wind speeds and to establish a basic understanding of the dominant wind regimes in the country. The site was favored as the wind speeds present in the mountain ridge in Akkar represent the best wind conditions for siting a wind farm.

**2.4. Land Ownership**

Land parcels needed for the Project for wind turbines, platforms, parking areas, permanent buildings, internal tracks, access roads and buried transmission lines, as well as the installation of the substation, are owned by the Municipality of Aandqet to the west and multiple families across the Project site. Following the cadastral survey undertaken in 2018, land lease and purchase were obtained as follows:

- For the construction of Project wind turbines and platforms for WTGs 2, 5, 8, 10, 14, 19, 20, 21, 22, 23, 24, 25 and 27, parking area, access road/transmission line and construction of the substation, land lease and purchase was finalized in accordance with '*Ilm w Khabar*' (Acknowledgement Certificates) as follows:
  - WTGs 2 and 5 - Kanaan Family.
  - WTGs 8 and 10 – Salah Family.
  - WTG 14 – Houda Family.
  - WTGs 19, 20, 21, 22 and 24 – Adraa Family
  - WTG 23 – Aamche, Hassan and Khoder Families.
  - WTGs 25 and 27 – Melhem Family.
  - Substation – Jaafar Family.

*Ilm w Khabar* attests to the ownership of a real estate property which is un-surveyed and un-registered in the official real estate records.

- For the construction of Project wind turbines and platforms 3, 4, 6, 7, 9, 11, 13, 15, 16, 17, 18, 26 and 28, parking area and access road, land lease paperwork was issued by the Ministry of Finance General Directorate of Land Registry and Cadastre and signed by a judge in Tripoli.

The plots subject of the abovementioned lease agreements are free from any occupant, liabilities, rights, liens, or encumbrances. The Project land take will not result in resettlement/economic displacement (loss of livelihoods). The agreed financial compensation for land plots has been agreed between the Developer and private land plot owners and the Municipality of Aandqet. The lease term is for a period of 28 years, with leasing value determined equally across land plots for 3 phases: Phase I Technical Studies and Installation (Design and Construction); Phase II Implementation (Operation & Maintenance); and Phase III Decommissioning (Project Closure and Site Rehabilitation).

The total land to be leased is 1,481,868m<sup>2</sup>. The size of the land plots leased range in size between 5,507m<sup>2</sup> and 45,115m<sup>2</sup>, with a total land lease of 111,624m<sup>2</sup>. Land purchased from the Jaafar Family for the installation of the Project substation is 13,255m<sup>2</sup>. The size of land plots leased from the Municipality of Aandqet range from 45,260m<sup>2</sup> to 367,500m<sup>2</sup>, with a total land lease of 1,370,244m<sup>2</sup>. The Developer is in the process of finalizing the Project land tenure. The transfer of ownership and use the Developer will be a transparent process that will be fully documented, as required by IFC standards.

## 2.5. Project Alternatives

The 'No Project' alternative considered that the 90.75MW Project will not be developed, and that the Project site area would remain unchanged. While the No Project Alternative offers the advantage of absence of disturbance to the natural environment at the Project site, the Project remains more attractive as it gives several advantages over the No Project Alternative including:

- Decreased power outage.
- Contribute to increasing energy security through development of local energy resources and reducing dependency on external energy sources.
- Increased use of renewable green energy and less reliance on conventional polluting energy production.

- Increased security (access road, lighting, cameras) in the region and thus improved protection of the nearby reserve from fires and illegal logging.
- Demonstrating the commitment by Lebanon in realizing clean energy production and reducing greenhouse gas emissions.
- Positive socio-economic impact due to benefit from land rental and creation of job opportunities.

Options were evaluated to identify the preferred approach in consideration of the following:

- Site selection alternatives:
  - Overall Project site.
  - Turbine locations.
  - Substation location.
- Design alternatives:
  - Turbine types/specifications.
  - Alternative substation designs.
  - Alternative transmission designs.
- Transportation alternatives:
  - WTG component vehicle types/modalities.
  - Alternative road transport vehicle types/modalities.
  - Alternative road alignments.
- Technology alternatives.
  - Solar power.
  - Power plants.

## **2.6. Project Sensitivities and Constraints**

Throughout the undertaking of the ESIA, key sensitivities and constraints of the Project site were identified for consideration during the wind farm design process, as follows:

### *Climate and Climate Change*

Climate change is expected to have the following effects in Lebanon:<sup>4</sup>

- Increased mean temperatures of 1-2°C by 2050 and 3.5-5°C by the end of the 21<sup>st</sup> century.
- Decrease in annual average precipitation of 10-20% by 2040 and 45% by 2090.
- Reduced snow cover of 40-70% and decreased snow residence time from 110 days to 45 days by the end of the 21<sup>st</sup> century.
- Increased incidence of drought conditions by 9-18 days relative to present day by 2090.
- Increased wildfire risk.
- Continued sea level rise, rising by a total of 30-60 cm in the next 30 years.

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<sup>4</sup> MOE website <http://climatechange.moe.gov.lb/vulnerability-and-adaptation>.

- Increased frequency of heat waves and decreased number of frost days.
- Less precipitation falling as snow, with snow line shifting from 1,500m to 1,700m by 2050, and to 1,900m by 2090.

#### *Geology and Hydrology*

The Project area is characterized by thinly bedded to widely exposed and highly karstified limestone overlying pale gray fractured fine and thick bedded limestone shaped by major tectonic events in Lebanon. The Project is situated east of the Yammouneh Fault which controls the direction of groundwater flow. The Al Kabir is the main river in the area. There are no major springs in the study area, with the closest being the Ras El Ain Spring in Hermel. Two public wells were identified near the Project.

#### *Geophysical and Ground Seismicity*

A geophysical ground investigation was implemented in April-June 2018 to determine the engineering parameters for the wind turbine and plant foundations, platforms and roads to be constructed. The Project will be located at the highest altitude points of the Akkar region and is not be expected to be exposed to flood or flooding due to its geological structure and elevation, and the Akkar region is not within a landslide area and/or considered to slope stability issues.

#### *Air Quality*

The Project is located in a rural area of Jabal Akroum. No industrial point sources of air pollution have been identified within the Project boundary, and review of baseline information indicates that concentrations of criteria pollutants are low in the Project area. There are no sensitive receptors (i.e., residents, hospitals, schools) near the Project area.

#### *Transport and Traffic*

The Project site can be accessed by a number of existing asphalt roads. Internal tracks currently traverse the site. Two route surveys and a Traffic Impact Study were undertaken between April and October 2018 to assess existing road conditions, identify road obstacles and assess potential impacts to road access to support selection of the preferred route for WTG transport.

#### *Biodiversity*

##### Habitat

The landscape is dominated by dense mixed forest, shrub and sparse herbaceous vegetation, grassland and barren land. The Project site lies entirely within the Qammouaa-Dinnyeh-Jurd Hermel Important Plant Area (IPA) and the Western Akroum Key Biodiversity Area (KBA). An overview of habitat types present in the Project area was provided through literature review. A more detailed habitat mapping and species records will be provided following further flora surveys.

##### Mammals

Mammals observed at the Project site and/or the planned Hawa Akkar wind farm (to the north) include the Golden (common) jackal, Red fox, Beech (stone) marten, Striped (Barbary) hyaena, Wild boar, Caucasian (common, Perisan or red) squirrel, Indian crested porcupine and Eastern broad toothed field mouse. A mammal survey will be completed on the Project site in early Summer 2019 and involve a walkover to search for signs and installation of camera traps.

### Bats

The distribution of bat species in Lebanon is strongly associated with varied altitudinal gradient.

Species most frequently recorded at lower altitudes include: Egyptian fruit bat, Mediterranean horseshoe bat, Blasius's horseshoe bat, Botta's serotine and greater mouse-tailed bats.

At medium altitudes, records of greater mouse-eared, long-fingered and bent-winged bats are most frequent, while records of serotine and Savi's pipistrelle were recorded at higher altitudes. Common pipistrelle, Kuhl's pipistrelle, noctule, free-tailed bat, lesser mouse-eared bat, Natterer's bat, Geoffroy's bat, greater horseshoe bat and lesser horseshoe bat appear across the majority of the gradient, suggesting a wider altitudinal range.

### Birds

The Upper Mountains of Akkar-Donnieh Important Bird Area (IBA) is located approximately 5km to the southwest of the Project site. Up to 50,000 soaring birds pass through the area each year, with the IBA being more important in the autumn when large flocks of levant sparrowhawk, great white pelican, common crane and white stork pass over it. 102 species were observed on the Project site during surveys.

The rare species recorded include:

- Alpine accentor *Prunella collaris*.
- Blue rock thrush *Monticola solitarius*.
- Common reed bunting *Emberiza schoeniclus*.
- Greater spotted eagle *Clanga clanga*.
- Stock dove *Columba oenas*.
- Winter wren *Troglodytes troglodytes*.

The very rare species recorded include:

- Cinereous vulture *Gyps monachus*.
- Egyptian vulture *Neophron percnopterus*.
- Eurasian Griffon Vulture *Gyps fulvus*.
- Imperial eagle *Aquila heliaca*.

### Reptiles

Lebanese viper, Fraas' lizard, and an unnamed lizard are three species of reptile considered likely to be present within the Project site, as their known ranges occur close by to the south.

### Community

There are no communities located within the Project site. Rweimeh Village is on the southern end of the Project, where the Project substation will be installed. The village has no electricity supply, as it is short-stay destination for visitors rather than a residential village. It is mostly inhabited by the Jaafar Family Clan. A total of 200 families, part of Jaafar Clan, are registered in Fnaidek, half of which visit Rweimeh Village in the summer. Numerous residences are located outside the Project area. There are no informal settlements or Syrian or Palestinian refugee camps within or near the Project site.

Shepherds from nearby Kfartoun and Aandqet use the area for grazing animals. Recreational bird hunters use a network of existing tracks inside and outside the Project site, although they advised they do not use hunting as subsistence of a source of income.

### *Noise*

The loudest sources of noise in the area are the movement of vehicles using unsealed and sealed roads. The movement of trucks are largely between existing quarry operations east of the Project area, through Rweimeh Village along Quobaiyat-Qasr Road and customers in the northern Akkar region.

### *Landscape and Visual Setting*

The study area (i.e. project plots and surrounding area) encompasses the following habitats: Calabrian pine forests, evergreen oak woods, juniper woodland, mixed forests, grassland, cliffs and rocky habitats. The Aandqet Forest is dominated by Calabrian pine *Pinus brutia* and is the largest *Pinus brutia* forest in Lebanon. The western edge of parts of the Project site contains similar forest.

Houses near the Project area were assessed for potential noise, shadow flicker and visual impacts. In addition, viewpoints from settlements in the vicinity of the wind farm were also assessed, including Jour el Hachich, Rweimeh Village, Quobaiyat, Akkar El-Atiq'a'a, Es Sayeh and Fnaidek, as shown in **Figure NTS-3**.

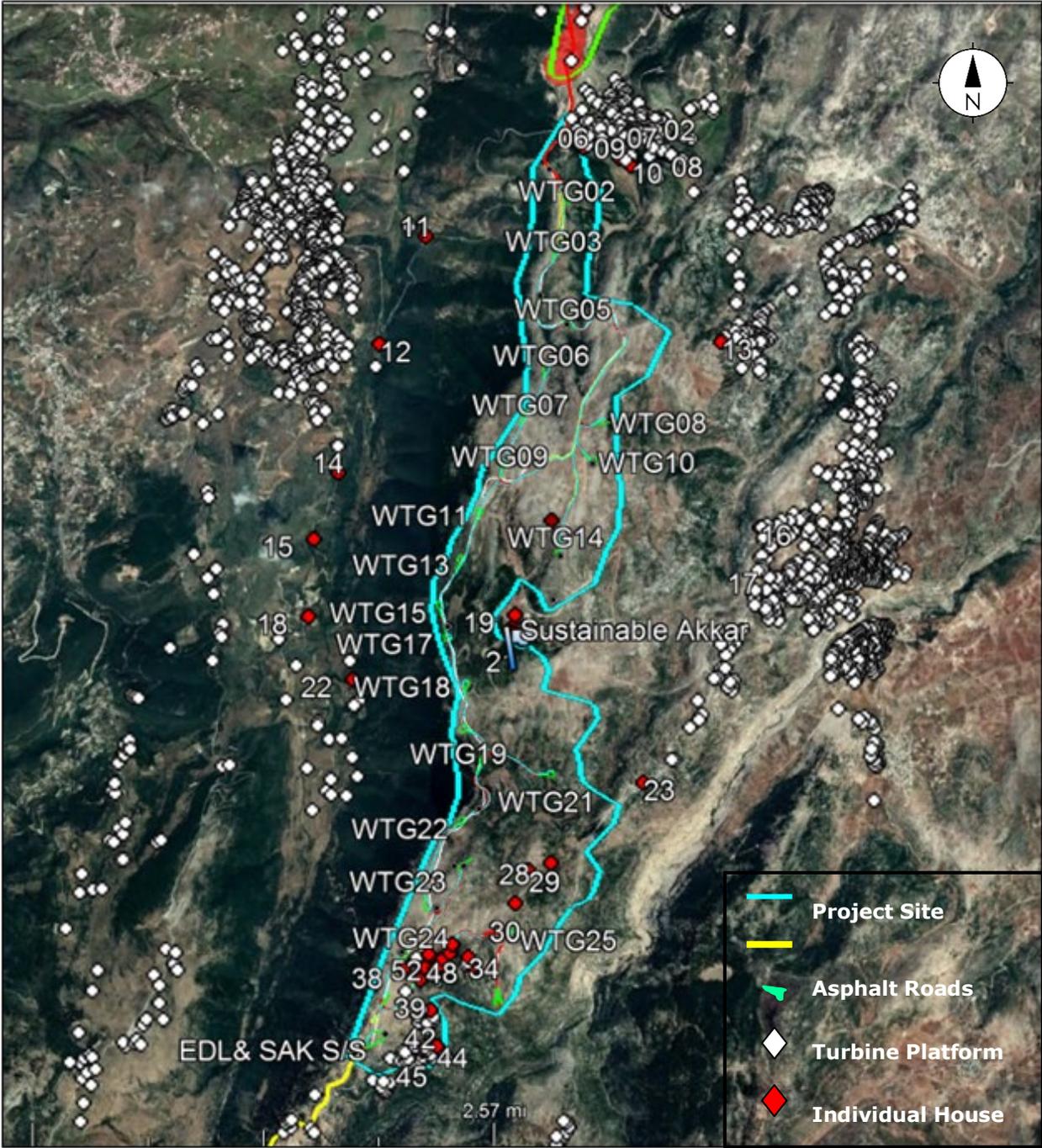
### *Landscape and Visual Setting*

The landscape units near the Project site is characterized by agricultural areas mainly comprised of terraces planted with apple and cherry trees, native dense pinus and quercus forests, dense cedrus forests, abies forests, mixed forests, rocky land, shrublands, sparse coniferous and sparse leafy forests, swamps and urban areas. The primary landscape unit of the Karm Chbat Nature Reserve is sparse coniferous forest. Although the proposed wind turbines will introduce new technical elements in the landscape and affect the perception of the landscape, the typological appearance of the ridge will remain largely recognizable.

### *Archaeology and Cultural Heritage*

No archaeological or cultural heritage sites are located within the Project area. The closest site is the Qalaat Akkar (Citadel of Hosn Akkar), a 13<sup>th</sup> century fortified building/earthwork site located nearly 3km southwest of the Project site.

**Figure NTS-3 Project Landscape and Visual Setting**



## 2.7. Project Design and Layout

In response to the findings of the technical studies, the ESIA process and stakeholder engagement completed to date, the following revisions have been made to the Project design in consideration of environmental, social, health and safety sensitivities:

- Eliminating wind turbines to minimize potential noise, shadow flicker and visual impacts.
- Locating turbines outside vegetated areas and/or would require the removal of trees.
- Siting the Project substation at a location that satisfies the minimum distance away from turbine, while requiring the least amount of vegetative clearance and low leveling requirements.
- Selection of the gas insulation substation design as it provides the most efficient insulation for altitudes >1,100m and requires less land occupancy.
- Designing the transmission line as a buried utility rather than an overhead power line.
- Using existing 2-, 4- and 6-lane asphalt roads for the transport of the WTG components from the Tripoli Seaport to outside Chadra.
- New segments of road to be constructed as follows:
  - A new 0.65km section of asphalt road to avoid impacts to Chadra, Machta Hassan and Machta Hammoud to be constructed through currently vacant land.
  - A new 0.15km section of asphalt road to be constructed between two existing sections of asphalt road in order to avoid hairpin turns near homes.
  - A new 3.0km section of gravel road to be constructed within the existing railroad ROW managed by Machta Hammoud Village.
- Transport of the WTG components will be scheduled to take place between 12am and 4am inclusive in order to minimize impacts to road users.
- Limiting the transport of WTG components to a police-escorted convoy of 11 trucks per convoy, two times per week for a period of 13 weeks.
- Maintaining access to grazing areas and hunting tracks to ensure shepherds and livestock can pass through the Project during operation and hunters can access land.
- Construction of asphalt roads scheduled for time periods when traffic levels are lowest.
- Limiting the movement of construction materials to the existing quarry tracks and Quobaiyat-Qasr Road during the construction phase.

**Figure NTS-4** shows two different turbine design layouts; Design 1 shows one of the initial layouts, while Design 2 shows the currently proposed turbine layout. It is noted that the Project design assessed through the ESIA process is subject to change according to the EPC Contractor selection.

**Figure NTS-4 Project Turbine Layout**

*Scoping Report Design - December 2018*



*Current Design - June 2019*



### **3. ADMINISTRATIVE FRAMEWORK**

A summary of each of the legislative requirements governing the ESIA process is provided in Volume I, Section 4 *Regulatory and Policy Framework*.

The ESIA has been undertaken to meet local requirements to gain permission for the construction and operation of the Project. In addition, to ensure the Project lender's financing policies, standards and requirements are adhered to and met, the ESIA has been completed to meet the following:

- Existing national legislations and policies related to environmental protection, land classification, and environmental control requirements.
- Relevant international treaties, conventions and protocols.
- Relevant International Finance Corporation (IFC) Performance Standards (PSs).
- European Investment Bank (EIB) Environmental and Social Standards (ESSs).
- IFC Environmental, Health and Safety (EHS) General Guidelines.
- IFC EHS Guidelines for Wind Energy.
- Application Decree 2366/2009 related to the National Physical Master Plan for the Lebanese Territory (NPMPLT) covering land use and zoning of lands.
- MOE Decision No. 52/12 of 29 July 1996 setting air quality standards, including thresholds for air pollutants and safe noise exposure limits.
- Law No. 78 dated 19/4/2018, and Decree 3320 dated 29/6/2018 which is related to the adherence to the Convention on the Conservation of Migratory Species of Wild Animals signed in Bonn in 1979.
- Law for the Protection of Forests of 1949 and Law No. 85/1991 for the protection of shrublands and associated floral biodiversity.

Law No. 444 emphasizes the principle of EIA as a tool for planning and management, and stipulates that proponents undertake assessment for all projects likely to affect the environment due to their sizes, nature, impacts or activities for review and approval by the MOE. In addition, this legislation is implemented by Decree No. 8633/2012: Fundamentals of Environmental Impact Assessment and the MOE's Decision 261/1 of 2015: Review Process for EIA Scoping and EIA Reports.

The law and the decree assign full authority to the MOE to arrange the screening, review, control, and follow-up of the EIA process and its implementation. The approval of an EIA is a pre-requisite for any subsequent license or permit by any or all other relevant authorities that may be required prior to construction. The efforts of the MOE aim at improving the Lebanese environmental performance on the international level, alike all developed countries, and the coordination, cooperation and follow up between the MOE and concerned parties, as the private and public sectors or the civil society organizations that may have a real positive impact on achieving a global unified vision related to all what concerns the protection of the environment.

#### **3.1. Relevant International Treaties, Conventions and Protocols**

International conventions, treaties and protocols which are triggered by the Project are as shown in the following table.

**3.2. Lender Requirements**

As previously mentioned, this ESIA has been developed in accordance with international finance institution (IFI) requirements, namely the IFC Performance Standards, the EIB Environmental and Social Standards, the IFC EHS General Guidelines, including IFC EHS Guidelines for Wind Energy.

A listing of the IFC PSs and EIB ESSs, and their relevance to the Project, are provided in **Table 4-6** and **Table 4-9** in **Section 4 Regulatory and Policy Framework**.

Subject	Treaty, Convention or Protocol
<b>Environment</b>	<ul style="list-style-type: none"> <li>• Convention on Migratory Species of Wild Animals (CMS); Bonn Convention.</li> <li>• Convention on Biological Diversity; Rio De Janeiro.</li> <li>• Convention on Wetlands of International Importance especially as Waterfowl Habitat – Ramsar.</li> <li>• Cartagena Protocol on Biosafety to the CBD.</li> <li>• Agreement on the Conservation of African-Eurasian Migratory Water Birds.</li> </ul>
<b>Cultural and Natural Heritage</b>	<ul style="list-style-type: none"> <li>• UNESCO Convention on the protection of Cultural and Natural Heritage.</li> </ul>
<b>Air and Climate Change</b>	<ul style="list-style-type: none"> <li>• Vienna Convention for the Protection of the ozone layer.</li> <li>• Montreal Protocol on Substances that deplete the ozone layer.</li> <li>• Amendment to the Montreal Protocol on Substances that deplete the ozone layer; London.</li> <li>• Amendment to the Montreal Protocol on Substances that deplete the ozone layer; Copenhagen.</li> <li>• UN Framework Convention on Climate Change aiming to fight global warming.</li> <li>• United Nations Convention to Combat Desertification; Paris.</li> <li>• Beijing Amendment of the Montreal Protocol.</li> <li>• Kyoto Protocol.</li> <li>• Euro-Mediterranean Energy Partnership HY-PA.</li> <li>• International Renewable Agency (IRENA).</li> </ul>

## 4. STAKEHOLDER CONSULTATION AND ENGAGEMENT

Stakeholder consultation and engagement is an integral part of ESIA good practice and is a statutory requirement of the national EIA legal framework in Lebanon, within the IFC Performance Standards and EIB Environmental and Social Standards. The principles of the engagement process are illustrated below:

	<p><b>Integrated</b></p>	<p>The process should be able to integrate the contributions of very different groups of stakeholders from government, to international organizations, to local communities. This principle reflects inclusivity (all stakeholders considered equally) and representability (all elements, perspectives and interests are represented).</p>
	<p><b>Adaptive</b></p>	<p>The process should be flexible in engaging a range of stakeholders through different methods.</p>
	<p><b>Transparent</b></p>	<p>The process should have clear requirements. It should ensure public access to information, identify factors taken into account in decision making, and acknowledge limitations and difficulties.</p>
	<p><b>Credible</b></p>	<p>The stakeholder engagement process is the only way in which affected stakeholders may influence the decision-making process. It is important that the process be conducted by professionals to ensure faith in the process.</p>
	<p><b>Rigorous</b></p>	<p>The process should apply "best practice", using methodologies appropriate to the scale and phase of the project for stakeholder engagement, stakeholder consultation and record-keeping.</p>
	<p><b>Practical</b></p>	<p>The process should result in outputs which assist with problem solving and are practical for implementation by proponents.</p>
	<p><b>Purposive</b></p>	<p>The process should help decision-making by considering all stakeholder concerns.</p>
	<p><b>Efficient</b></p>	<p>The process should be efficient, making use of well-developed methodologies.</p>
	<p><b>Systematic</b></p>	<p>The process should result in full consideration of all relevant information.</p>

#### 4.1. Stakeholder Identification

The Project has a wide range of stakeholders ranging from national and regional government institutions, in addition to communities within the area of influence of the Project. As such stakeholders have been identified at all geographic levels, including national, regional and local levels. The three principal categories of stakeholders are as follows:

- National governmental institutions, including the MOE, MOEW, Ministry of Public Works and Transport (MOPWT), Ministry of Interior and Municipalities (MOIM) and other bodies involved in the permitting and ESIA process, and governmental authorities at the regional level, including the Governorate level (Governors) and District level (Kaemmakam).
- Affected Communities, defined as the local community as well as other people directly affected by the Project, land owners and/or those who have been identified as most vulnerable to change and who need to be engaged in identifying impacts and their significance, as well as in decision-making on mitigation and management measure. Affected communities are considered to include:
  - 3 villages where land was or will be leased/acquired for the Project:
    - Aandqet.
    - Jabal Akroum area, including Kfartoun and Sahle Municipality (where the CRO Office is to be leased).
    - Rweimeh Village (where the Project substation will be constructed).
  - 4 villages where land was or will be leased/acquired for new segments of track through Hawa Akkar:
    - Chadra.
    - Machta Hammoud.
    - Machta Hassan.
    - Mqaible.
  - 4 Villages where land was or will be leased/acquired for new segments of track through Lebanon Wind Power:
    - Fnaidek.
    - Karm Chbat.
    - Rweimeh Village (same village as listed for the Project; so not counted twice).
    - Kfartoun (same village as listed for the Project; so not counted twice).
  - Settlements where potential visual impacts were assessed (may be otherwise indicated above):
    - Sahle.
    - Qenia.
    - Quobaiyat.
    - Aandqet.
    - Kfartoun.
    - Rweimeh Village.
- Other Interested Parties, defined as people and organizations that are interested in the Project and/or could affect the Project in some way. Those generally include universities and non-governmental organizations.

**4.2. Stakeholder Engagement Activities**

Full details of consultation with regulatory authorities, local communities and other key stakeholders are presented in **Section 6 Stakeholder Consultation and Engagement**. Photographs of the consultation and engagement are presented in **Figure NTS-5**.

**Figure NTS-5 Consultation and Engagement**



**a – Initial Disclosure Meeting; 15 May 2018**



**b – Iftar; 7 June 2018**



**c – Meeting with Daher Family; 3 October 2018**



**d – Final Disclosure Meeting; 6 December 2018**



**e – Meeting with the Al Fayhaa Union of Municipalities (Mayors of Tripoli, Al Beddaoui, Al Minie and Qalamoun)**



**f - Meeting with the Kobet Al Choumra Municipality; 19 February 2019**



**g - Meeting with Zoug Bhannine Municipality; 19 February 2019**



**h - Meeting with the Talmaaiyan Union of Municipalities; 20 February 2019**



**i - Meeting with the Governor of the Akkar Region; 20 February 2019**



**j - Meeting with Al Mahmra Municipality; 20 February 2019**



**k - Meeting with North Akkar Union of Municipalities; 26 February 2019**



**l - Meeting with North Lebanon Governor; 26 February 2019**

Engagement with family leadership of the affected communities began in 2017, in advance of the ESIA activities. In early 2018, meetings were organized with key informants to discuss their opinions regarding the Project. The Initial Public Disclosure Meeting took place on 15 May 2018. The seminar was followed by a discussion whereby SES responded to the concerns raised by meeting attendants and committed to addressing them in the ESIA study.

A public participation dinner was prepared on Ramadan (7 June 2018) for several communities, including Akroum, Kfartoun and Rweimeh Village. The dinner was held to provide a better understanding of the Project design execution and the implications on the surrounding environment.

In July 2018, discussions were undertaken with officials regarding land rentals and potential ownership impacts from turbines such as noise, shadow flicker and visual amenity in Fnaidek and Quobaiyat.

Two focus group meetings were organized on 2 and 4 November 2018, with a group of hunters who usually hunt in or in close proximity to the area where the Project turbines will be installed and a locally active non-governmental organization (NGO), the Environment Council in Quobaiyat (مجلس البيئة - القبيبات). After introducing the Project to both groups, feedback was collected regarding their knowledge of the wind energy technology and the proposed Project. Their perceptions regarding the Project and its effects, along with the management mitigation measures that the Developer will be adopting to eliminate or reduce impacts were discussed, especially potential impacts to the Karm Chbat Nature Reserve.

A site visit to a wind farm in Turkey was undertaken on 21 November 2018, so that land owner representatives, the Mayor of Kfartoun, Ahmad el Zein, Kanaan Family representatives, Adraa Family representatives, and Daher Family representatives, could observe the operation of the wind farm and its potential negative and positive environmental effects.

A final public disclosure meeting took place on 1 December 2018 at the Qammouaah Plain in Fnaidek Village. Similar to the Initial Public Disclosure Meeting, a seminar presentation was given and included a description of the Project and a summary of the findings of the ESIA studies, including analysis of impacts and the proposed Environmental and Social Management Plan (ESMP), the general findings of the ESIA study being conducted, and actions that were taken by the developer in order to mitigate any potential negative impact of the wind farm on the environment. The seminar was followed by a discussion where the Developer replied to the concerns of the meeting attendants and committed to addressing them during project implementation and operation.

Consultation activities were undertaken on 19-20 February 2019 with officials representing the villages along the WTG component transportation route, from Tripoli to Sahle, including:

- Tripoli
- Beddaoui
- Al Minie
- Deir Amar
- Borj El-Yahoudiyé
- Nabi Youcheaa
- Zoug Bhannine
- Al Mahmra
- Mqaiteaa
- Kfar Moki Akkar
- Rmoul
- Qaabrine
- Sammouniyé
- Hissa
- Tall Aabas El-Gharbi
- Tall Aabbas El-Charqi
- Tall Hmaire
- Chir Hmairine
- Hokr Jouret Srar
- Qoubber Chamra
- Mahmra
- Janine
- Qachlaq
- Aamaret El-Baykat
- Noura El Tahta
- Kouachra
- Dibbabiyyé
- Amayaret Akkar
- Fraidis
- Qsair Akkar
- Menjez
- Aaoainat Akkar
- Rmah
- Iltigo
- Barcha
- Khamoubet Akkar
- Chikhlar
- Mqaible
- Quobaiyat
- Chadra
- Machta Hassan
- Machta Hammoud

**4.3. Outcomes of Engagement**

The response to the Project has, on the whole, been positive with support expressed in all the meetings held. Key concerns raised by the residents of the local communities regarding the Project and how the Project has addressed these and other concerns are outlined below:

Subject	Issue	Response
Land use, land lease and land acquisition	Status of the ownership of the parcels located at the top of the mountain ridge, i.e. whether they are public/municipal or private properties and lack of official survey.	<p>Access to certain grazing areas and hunter’s tracks will be restricted during the construction phase. Following construction, access to these areas will be reinstated.</p> <p>Following cadastral survey, land leases and land purchase for the construction of the substation were finalized with the Kanaan, Salah, Houda, Adraa, Aamche, Hassan, Khoder, Melhem and Jaafar Families in accordance with ‘Ilm w Khabar’.</p> <p>Paperwork was issued by the Ministry of Finance General Directorate of Land Registry and Cadastre to lease land parcels in Fnaidek Municipality and Karm Chbat and was signed by a judge in Tripoli.</p>
Land value/depreciation.	Impact of the wind farm on the existing facilities without considering the depreciated value of surrounding land.	The potential locations for the turbines will be compared to select locations which will have the least adverse impact, all while considering electricity production potential in the assessment. Once selected, the lands to be leased or purchased increase the compensation potential for land owners. However, most of the lands are publicly owned which decreases the significance of the depreciation impact.
Impacts to migrating birds.	Potential for bird casualties in comparison to international guidelines.	Bird monitoring and collision modeling has been undertaken to identify the potential impacts to birds and requirements for turbine shutdown periods, if required.
De-icing mechanisms.	Accumulation of ice on turbines and ice throw.	Turbines will either be equipped with a de-icing mechanism which will ensure sound operation under snowy conditions, or the turbine operations will be stopped under specific snow conditions. The final security measures to be adopted will be specified in the final ESMP.

Subject	Issue	Response
Biodiversity.	Assessment of impacts to bats and flora with high ecological value.	Bat monitoring and collision modeling are being undertaken to identify the potential impacts to bats and requirements for turbine shutdown periods, if required. Habitat survey is being undertaken to map habitats and develop avoidance, mitigation or offset measures.
Cumulative impacts.	Assessment of potential cumulative impacts of the three proposed wind farms in the Akkar region, Lebanon Wind Power, Sustainable Akkar and Hawa Akkar.	The potential cumulative impacts of construction, operation and decommissioning of the three wind farms were assessed as part of the ESIA Report.
Job creation and employment.	Job opportunities that will be created by the Project.	Employment of up to 125 people will be required for the construction phase. Potential employees will be sourced with a preference for the local area, then regional, throughout Lebanon, then internationally, if suitable for the available position. There will be online and onsite training courses made available such that the chances of recruitment of locals can be increased.
Project schedule.	Since 2014, the GOL has discussed wind farms, promised RE in 2018, and now the deadline is 2020.	Work could not begin before November 2017, when the PPA was signed. They have a 36-month term for the final delivery of the project.
Electricity supply.	Infringements made on the public power grid and solution provided to be provided.	The PPA includes producing electrical power and supplying it to the public grid. The solution for the infringements is not within the scope of the Developer.
12% RE commitment by the GOL.	Can the Project provide enough electrical power to satisfy the commitment by the GOL to supply 12% energy demand through renewable energy sources and will the implementation of the wind farms would cover the electrical power shortage.	Operation of the 3 planned wind farms are able to satisfy a significant portion of the commitment, and they are anticipated to supply 25% of the shortage.
Noise.	Noise impacts to residences.	Noise generated by the turbines is below the IFC noise limit of 45 dB(A).
Habitat loss.	Number of trees to be cut.	The number of trees present in the immediate construction zone were quantified and will be avoided, mitigated or offset. Mature trees are

Subject	Issue	Response
		not present on the exposed ridges due to high winds.
Monitoring.	Who will monitoring Project implementation.	The Developer is responsible for recruiting an HSE specialist who would need to properly implement all ESMP requirements. The MOE will conduct inspections in the future to ascertain that the ESMP is implemented and that the latter inspections may involve actual measurements. The international lenders will also have third party auditing processes who will check for ESMP implementation and compliance with environmental standards before giving clearances to release payments to the Developer. The GOL will also participate in supervising Project implementation.
Project benefits.	Who will benefit from the Project.	There will be recruitment of up to 125 persons during construction. Local municipalities and communities will benefit from road widening activities and the development of new roads. Secondary benefits for local businesses, i.e. restaurants and hotels are anticipated.
Groundwater.	Impacts to groundwater quality.	Wind farms are typically not associated with negative impacts to groundwater. Groundwater is very deep in the Project area; measures will be put in place to prevent potential spills and the appropriate disposal of wastewater generated.
Transport of the WTG components, timing, schedule and traffic impacts.	Road routes to be taken during the construction phase.	Coordination has been undertaken with officials from all villages along the transport route. Obstacles have been identified and will be removed in advance of the transport, i.e., pedestrian bridges, concrete blocks, etc., and improvement of road conditions will be coordinated with the municipalities. Modification to the Al Abdeh Roundabout may be necessary, but any modification will be discussed with the municipality as it is under their authority. New road segment construction will be scheduled for low traffic periods.

Subject	Issue	Response
		<p>A maximum of 2 roundtrip convoys of 12 trucks will be escorted by police twice per week between 11pm and 4am during weekdays to avoid potential impacts to travelers, for a total of 8 weeks. replacing the asphalted speed bumps with rubber ones, which we can easily be removed during the transportation of the WTG components and reinstalled immediately after the trucks pass.</p> <p>Multiple methods of communication will be used to provide advance notification of the scheduled transport, and in particular, informal settlements present along the transport route. A communications protocol is being developed between the Project companies and the MOIM for the transport of the turbines from Tripoli to the Project site. Once this protocol is ready, it will be distributed to the Mayors two to three months prior to the start of the transport.</p> <p>All community Mayors have emphasized their willingness to provide further coordination across the municipalities and Project companies and assisting in accomplishing the Project as quickly as possible.</p>
Potential turbine malfunction.	What parts of the turbine are susceptible to malfunction.	<p>Bad weather conditions, e.g. ice, very high wind speed may harm the turbine parts. Turbines will either be equipped with a de-icing mechanism which will ensure sound operation under snowy conditions, or the turbine operations will be stopped under specific snow conditions. The final security measures to be adopted will be specified in the final ESMP. The monitoring and control of the turbines will be implemented by the turbine manufacturer in collaboration with a local control and support office.</p>

**4.4. Stakeholder Engagement Plan**

The Stakeholder Engagement Plan (SEP) outlines the approach and plans to be adopted and implemented for engagement across all Project stages. The overall objectives of the SEP are shown below:



**Informs**

Promotes the informed participation of all stakeholders (i.e., national and local government institutions, local communities and other interested parties).



**Decision-Making**

Incorporates dialogue and agreements on decision-making on issues related to Project implementation.



**Development**

Contribute to the social development of local communities, through actions and programs in the Project's area of influence.



**Builds Relationships**

Builds strong, constructive, and responsive relationships with all stakeholders.



**Manages Impacts**

Successfully manages the Project's environmental and social impacts.



**Promotes Benefits**

Promotes socioeconomic benefits, i.e. job creation and social development.



**Builds Trust**

Builds consensus, credibility, trust and support for Project activities and future endeavors.



**Promotes Understanding**

Discloses relevant, clear and accessible Project information to enable stakeholders to express their views on the Project and understand risks and opportunities.



**Analyzes Information**

Serves as a way to analyze information gathered throughout the Project phases.

#### 4.5. Grievance Mechanism and Feedback

The following feedback channels have been available to stakeholders throughout the ESIA process:

- In writing (Project contact details provided in Scoping Report).
- Focus group discussions and key informant interviews during baseline data collection and ESIA engagement.
- Public meetings during ESIA engagement.

A grievance mechanism will be established to respond to and resolve stakeholder concerns during future Project activities. Grievances may take the form of specific complaints or concerns or perceived incidents and impacts. Grievances can be raised confidentially and without repercussion. The grievance mechanism seeks to resolve concerns promptly, using an understandable and transparent consultative process that is culturally appropriate and readily accessible, as shown in **Figure NTS-7**.

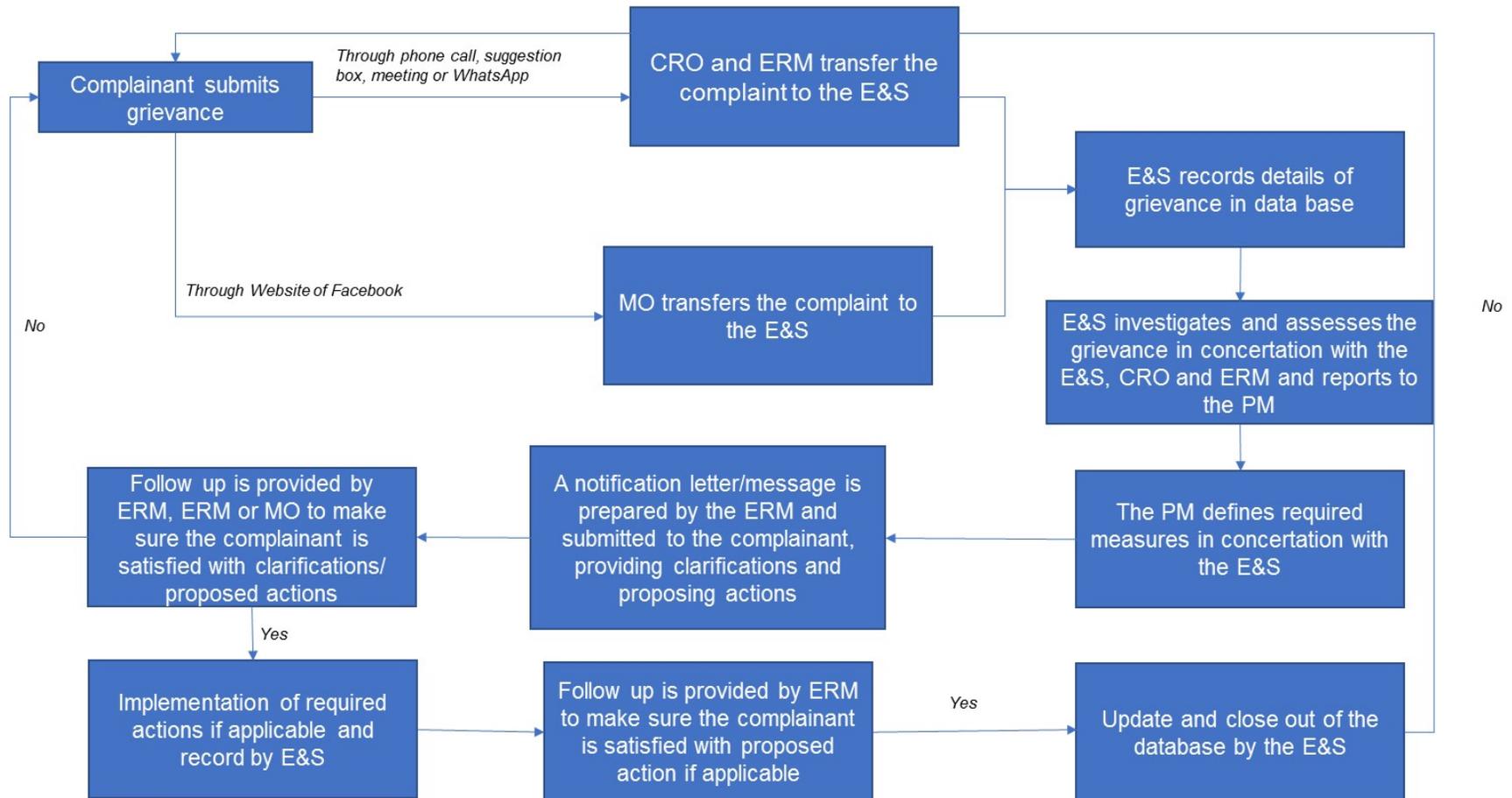
The key steps of the Community Grievance Mechanism Process are as follows:

1. Identification of grievances. This could be by:
  - a. Meeting, Phone call, WhatsApp, or depositing a grievance in a suggestion box addressed to the CRO or the External Relations Manager (ERM). Women who feel uncomfortable talking to a man can also contact directly the Environmental and Social Manager (E&S), who is a woman.
  - b. The company website or Facebook page managed by the Media Officer (MO).
2. Grievance is then transferred to the E&S and recorded in an electronic 'grievance log' within 2 days of receipt. The grievance log will be held at Sustainable Akkar sal & Lebanon Wind Power, 1st floor, An-Nahar, Martyr's Square, Beirut Central District – Lebanon.
3. The significance of the grievance will then be assessed by the E&S within five working days using the criteria outlined below:
  - Level 1 Complaint: An inquiry, suggestion or request.
  - Level 2 Complaint: A complaint of a minor nature.
  - Level 3 Complaint: A complaint of a significant nature, i.e. a risk to community health and safety.

If the grievance is not well understood or if additional information is required, clarification should be sought from the complainant during this step.
4. E&S investigates and assesses the grievance in concertation with the E&S, CRO and ERM and will report the case to the Project Manager (PM).
5. The PM will decide how to deal with the grievance and determine adequate measures in concertation with the E&S.
6. A notification letter/message is prepared by the ERM and submitted to the complainant (directly, through the CRO or the MO), providing clarifications and proposing actions.
7. A follow up is provided by ERM, ERM or MO to make sure the complainant is satisfied with clarifications/ proposed actions.
8. If the complainant is satisfied and if applicable, actions are undertaken by the team as required; actions are then documented by the E&S.
9. Then, follow up is provided by ERM to make sure the complainant is satisfied with proposed action if applicable.
10. If the complainant is satisfied, the E&S updates and closes out the database.
11. If the complainant is not satisfied, the E&S should return to Step 2 to re-assess the grievance.

**Figure NTS-7 Grievance Mechanism Process**

- CRO = Community Relations Officer
- ERM= External Relations Manager
- E&S = Environmental and Social Manager
- PM= Project Manager
- MO = Media officer



## 5. IMPACT ASSESSMENT

### 5.1. Summary of Impacts, Benefits and Key Mitigation

Impact	Mitigation
GHG Emissions	<ul style="list-style-type: none"> <li>The GHG emissions are considered offset by the beneficial impact of generating clean energy through the operation of the wind farm.</li> </ul>
Flood Risk	<ul style="list-style-type: none"> <li>Avoid locating any of the Project components within the buffer distances developed under the flood risk assessment to eliminate any risks for flood.</li> <li>Hydrological study to be undertaken to identify and determine the required engineering structures to be considered as part of the detailed design for new asphalt and gravel road segment and internal tracks (e.g. drainage structures, culverts).</li> </ul>
Wildfire	<ul style="list-style-type: none"> <li>Avoid locating any of the Project components within the buffer distances (if any) developed for the Aandqet Forest.</li> <li>Identify and determine the required fire detection and protection equipment to be considered as part of the detailed design.</li> </ul>
Impacts from Improper Management of Waste Streams	<ul style="list-style-type: none"> <li>Coordinate with the appropriate Municipality or hire a competent private contractor for the collection of water, wastewater, solid waste and hazardous waste from the site to the municipal approved disposal area.</li> <li>Prohibit disposal of waste to the land.</li> <li>Implement proper housekeeping practices at all times.</li> <li>Maintain records and manifests that indicate volume of waste generated onsite, collected by contractor, and disposed of at the landfill.</li> <li>Ensure appropriate management of septic tanks.</li> <li>Regular maintenance of all equipment and machinery used onsite.</li> <li>Implement spill management procedures.</li> <li>Additional protection shall be afforded by scheduling major activities with high potential for the generation of water pollution away from the snow melt season when the large majority of recharge is believed to occur.</li> </ul>
Impacts on Soil and Groundwater	<ul style="list-style-type: none"> <li>Implementation of general best practice housekeeping measures</li> <li>Following the Construction Health and Safety Plan.</li> <li>Staging of work areas.</li> <li>Provision of washout/washdown facilities with filter/neutralization prior to discharge.</li> <li>Installation of silt fencing.</li> <li>Erosion and sediment control.</li> <li>Excavation and grading containment.</li> <li>Provision of spill response equipment.</li> </ul>
Impacts on Disposal Utilities	<ul style="list-style-type: none"> <li>There are no mitigation measures to be applied. Coordinate with the appropriate Directorates to: <ul style="list-style-type: none"> <li>Obtain list of authorized contractors for disposal of wastewater.</li> <li>Undertake discussions with the appropriate municipal landfills to determine where there is sufficient capacity to easily handle construction debris generated from the Project.</li> <li>Coordinate with the appropriate municipality or hire a competent private contractor for the collection of construction waste from the site to the approved landfill.</li> <li>Coordinate with the appropriate municipality or hire a competent private contractor for the collection of solid waste from the site to the approved landfill.</li> </ul> </li> </ul>
Landslide, Slope Stability, Earthquake	<ul style="list-style-type: none"> <li>Incorporate recommendations of the seismic study for excavation at the platform foundation locations to a depth where stable soils are encountered.</li> </ul>
Air Quality	<ul style="list-style-type: none"> <li>Use of wind screens or enclosures around dusty activities or the site boundary.</li> </ul>

Impact	Mitigation
	<ul style="list-style-type: none"> <li>• Water spray to reduce fugitive dust.</li> <li>• For unpaved roads, water flushing is the essential with 0.48 gallons per square yard twice per day.</li> <li>• For paved roads, water flushing with 0.48 gallons per square yard followed by sweeping is very effective and can reach 96%. If conducted directly before the passage of the turbines convoy or the morning and evening passages of the project vehicles to and from the site, a consequent decrease will occur.</li> <li>• A combination of the different above-mentioned measures will give a higher control efficiency that when applied individually.</li> </ul>
Traffic and Transport	<ul style="list-style-type: none"> <li>• An additional transport route survey will be undertaken.</li> <li>• The temporary removal of concrete bund, curb, electric pole and overhead cable, and demolition will be coordinated with the Port Authority.</li> <li>• Raising of pedestrian bridges, prohibition of car parking, removal of curbs, electric poles, trees, lamp posts, and fencing at ramps and roundabouts and ground leveling and compaction of significant curves will be coordinated with the Ministry of Transport.</li> <li>• Asphalt speed bumps will be replaced with rubber ones, which we can easily be removed during the transportation of the WTG components and reinstalled immediately after the trucks pass.</li> <li>• Any modification required for the Al Abdeh Roundabout will be discussed with the municipality as it is under their authority.</li> <li>• Works will be coordinated and permitted by the Ministry of Transport and scheduled for time periods when traffic levels and/or pedestrian use are lowest.</li> <li>• The construction of asphalt roads will occur for a period of 6 months and will be coordinated and permitted by Ministry of Transport and scheduled for time periods when traffic levels are lowest.</li> <li>• Construction of internal track will occur for a period of 3 months and will be coordinated with the Ministry of Transport and the Lebanese Army.</li> <li>• A communications protocol being developed for the transport of WTG components will be distributed to all Mayors two to three months prior to the start of transport. A final transport route map will be provided to all municipalities.</li> <li>• Announcements will be made to all villages along the WTG transport route from the Tripoli Port to the entrance of the Project site.</li> <li>• WTG components will be transported 2 days per week, a total of 24 trucks roundtrip per week for a period of 13 weeks.</li> <li>• Municipal police will provide an escort for the WTG transport convoy.</li> <li>• Transport will be timed before and after farmers take their crops to the Akkar Vegetable Market.</li> <li>• The road that passes through El Rweimeh Village is the main access of the trucks transporting rocks and gravel, and maintenance activities will be undertaken by the Project Proponent.</li> <li>• For Road Segments A, B, C and D, which are 4 lanes with a median, a conservative approach to traffic management will dedicate the northbound direction for transport and divert all other background traffic to the other direction making a two-lane road.</li> <li>• For Road Segment E, which is a two-lane road, the transport vehicles will have to utilize the road along with the background traffic.</li> <li>• Once the EPC Contractor has been selected, and the number and location of construction numbers are known, measures will be put in place to maximize mitigation of traffic impacts through carpooling and group transport by van.</li> </ul>
<p>Total Habitat Loss:</p> <ul style="list-style-type: none"> <li>• Approximately 75.47 ha out of 948.72 ha (8%).</li> </ul> <p>Sensitive Features Loss:</p> <ul style="list-style-type: none"> <li>• <i>Juniperus excelsa</i> dominance: 2,69ha (19.55%) lost or modified (moderate adverse impact)</li> <li>• Mixed oak woodland: 49.89ha (6.59%) lost or modified (moderate adverse impact)</li> </ul>	<p>During Pre-Construction:</p> <ul style="list-style-type: none"> <li>• Completion of a pre-construction flora survey to identify habitats and key flora species as identified in the baseline section.</li> <li>• Micrositing of infrastructure to avoid or reduce oak woodland and mixed woodland removal.</li> <li>• Preparation of a final BAMP outlining the measures required to deliver no net loss for areas of natural habitat, such as oak woodland and mixed woodland. A framework BAMP has been provided with the ESIA, as an appendix of the stand-alone ESMP.</li> </ul>

Impact	Mitigation
<ul style="list-style-type: none"> <li>• Oak woodland: 165ha (12.39%) lost or modified (moderate adverse impact)</li> <li>• Oak/pine woodland: 13.97ha (12.05%) lost or modified (moderate adverse impact)</li> </ul> <p>Habitats Including Vulnerable Plant Species:</p> <ul style="list-style-type: none"> <li>• Pine forest dominance 2: 7.16ha (16.93%) lost or modified (moderate adverse impact)</li> <li>• Oak/pine habitat: 13.97ha (12.05%) lost or modified (moderate adverse impact)</li> <li>• Mixed oak woodland: 49.98ha (6.59%) lost or modified (moderate adverse impact)</li> <li>• Oak woodland: 1.65ha (12.39%) lost or modified (moderate adverse impact)</li> </ul>	<p>During Construction:</p> <ul style="list-style-type: none"> <li>• Offsetting for the loss of natural habitats will be required to deliver no net loss of biodiversity in these areas. Full details of the measures to achieve no net loss will be provided in the final BAMP. Measures would include additional tree planting to produce new areas or improve degraded areas of oak-dominated woodland and mixed woodland. The translocation of tree species would also be considered.</li> <li>• Preparation and provision of workforce toolbox talks and monitoring to ensure all staff understand the importance of the biodiversity controls in place, what they entail and how these controls should be followed. Particular key early tasks in workforce education will include implementation of a hunting ban on the Project site and prohibition of burning of vegetation for warmth or cooking.</li> <li>• Minimization of the project footprint within Karm Chbat Nature Reserve. Footprint minimization will include measures such as adherence to strict working boundaries for all infrastructure construction.</li> <li>• If any key flora species are identified during the pre-construction survey, areas of habitat inhabited by the plants would be avoided. If it is not possible to avoid examples or areas of the species detailed in the baseline, every effort would be made to reduce the impact and further offsetting would be required.</li> <li>• Implementation of rehabilitation measures to mitigate the loss of habitat, such as vegetation remediation, translocation or creation of new habitat areas. Full details of these measures will be provided in the final BAMP to be developed by others.</li> <li>• Proper management of excavation materials. Rubble from site excavations should not be allowed to spread down slopes. Clear working procedures should be defined, implemented and supervised.</li> <li>• Separation and storage of top soil for use in restoration of all temporary project infrastructure and areas of temporary disturbance, e.g. track margins. Segregation of the topsoil of different habitat types will be required.</li> <li>• Soil management would also include observance of appropriate biosecurity controls to prevent the spread of invasive plants or floral diseases. This would involve washing vehicles and equipment to remove particles of vegetation and loose soil, with this done in specific "wash down" areas. Any invasive plants that are removed during vegetation clearance would need to be disposed of appropriately, in a safe way that does not allow it to spread.</li> <li>• Good construction environmental management on site based on good practice guidance to avoid spillage of fuels, other pollutants or excavated materials and provision of sufficient spill kits and similar to deal with any incidents.</li> </ul> <p>During Operation and Maintenance:</p> <ul style="list-style-type: none"> <li>• Monitoring of all habitat reinstatement, translocation, recreation, offsetting or enhancement as identified and implemented as required following pre-construction surveys.</li> <li>• Remove invasive plant species during routine vegetation maintenance.</li> <li>• Monitor power-line right-of-way vegetation to avoid fire risk. Remove blowdown and other high-hazard fuel accumulations.</li> </ul> <p>During Decommissioning:</p> <p>Typically, the same controls set out for construction will apply.</p> <ul style="list-style-type: none"> <li>• Minimization of activities within Karm Chbat Nature Reserve. Footprint minimization will include measures such as adherence to strict working boundaries for all infrastructure decommissioning.</li> <li>• Good construction environmental management on site based on good practice guidance to avoid spillage of fuels, other pollutants or excavated materials and provision of sufficient spill kits and similar to deal with any incidents.</li> <li>• Preparation and provision of workforce toolbox talks to ensure all staff understand the importance of the biodiversity controls in place and exactly what they entail.</li> </ul>
<p>Terrestrial Fauna</p>	<p>During Pre-Construction:</p> <ul style="list-style-type: none"> <li>• Completion of pre-construction fauna walkover survey to identify potential habitat for key mammal and reptile species, followed by camera trapping to confirm species considered to be present/status of any dens found.</li> <li>• Preparation of a final BAMP setting out the measures required based upon the findings of the further surveys. A framework BAMP will be included with the ESIA.</li> </ul>

Impact	Mitigation
	<p>During Construction:</p> <ul style="list-style-type: none"> <li>• If any mammal or reptile species are encountered during works, they would be allowed to disperse or would be translocated outwith the construction area.</li> </ul> <p>During Operation and Maintenance</p> <ul style="list-style-type: none"> <li>• If found to be present during pre-construction surveys, monitoring of populations of endangered reptiles as appropriate, including monitoring of any offsets or enhancements for those species.</li> </ul>
<p>Bats:</p> <p>Loss or Disturbance of Roosts and Foraging Habitat</p> <p>Collision Risk</p>	<p>During Pre-Construction:</p> <ul style="list-style-type: none"> <li>• A full year of activity surveys will be completed pre-construction, adding to the information gathered from the spring activity surveys used to inform this assessment. As per best guidance, a full year of survey data will allow for a more accurate understanding of bat activity across the site, temporally and spatially, which will enable a more accurate and informed impact assessment which in turn will determine the most effective mitigation required.</li> </ul> <p>During Construction:</p> <ul style="list-style-type: none"> <li>• A presumption for avoidance of all artificial light as far as possible. All lights should be cowed and downward facing and avoid light spill onto surrounding non-construction areas.</li> </ul> <p>During Operation and Maintenance:</p> <ul style="list-style-type: none"> <li>• Once the pre-construction survey results have been analyzed, it will be possible to develop an appropriately focused scope of operational period bat surveys. Surveys would cover up to three years' activity periods.</li> <li>• Given the high levels of activity recorded at SA2, SA6, SA9 and SA20 and predominately from species identified as high or medium risk in terms of collision (common pipistrelle, Kuhl's pipistrelle and serotine) it is recommended that turbines situated at these locations are subject to operational adjustments. Raising the cut-in speed at which the turbine begins to generate electricity, thus preventing movement in low winds, notably decreases bat mortality rates<sup>5</sup> along with feathering of blades i.e. adjusting the angle of the blade parallel to the wind or turning the unit away from the wind<sup>6</sup>. In addition, operational times could be altered – stopping turbines at these locations between the most active periods i.e. 20:00-05:00.</li> <li>• Monitoring of bat collision fatalities under and around each turbine following a standardized methodology potentially using trained dogs. Monitoring to be completed monthly and concurrently with bird collision monitoring.</li> <li>• Preparation and subsequent implementation of plan to identify and protect key bat roost caves in the area on and around the Project site from human persecution, such as identified elsewhere in the area.</li> <li>• Additional Good Practice: To prevent further persecution and destruction of bat roost caves protective metal grates should be installed across the entrances of all bat roost caves identified during the December 2017-March 2018 surveys. These would prevent members of the public from accessing the caves and disturbing or damaging the roosts, as observed previously.</li> </ul>
<p>Ornithology:</p> <p>Designated Sites</p> <p>Habitat Loss</p> <p>Barrier Effects</p> <p>Collision Risk</p>	<p>Due to the large number of ecological and ornithological mitigation proposed for the Project, it is recommended that a suitable qualified Ecological Clerk of Works (ECOW) be employed for the Project to ensure the appropriate implementation of the Biodiversity Action and Management Plan (BAMP) to be developed by others. All of the mitigation listed below is detailed in the framework BAMP.</p> <p>During Construction and Decommissioning:</p> <p><i>Nest Destruction</i></p> <ul style="list-style-type: none"> <li>• Where required, vegetation would be removed outside of the bird breeding season (March-August). The following vegetation removal deterrence methods would also be used to ensure ground nesting birds do not nest on the site following vegetation clearance:             <ul style="list-style-type: none"> <li>- Iridescent tape across the construction areas prior to construction activities.</li> <li>- Bird deterring machines which produce intermittent loud noises.</li> </ul> </li> </ul>

<sup>5</sup> Horn J.W., Arnett E.B. & Kunz T.H. (2008) Behavioral responses of bats to operating wind turbines. *The Journal of Wildlife Management*, 72, 123-132.

<sup>6</sup> Hein, C, D and Schirnacher, M, R. (2016). Impact of Wind Energy on bats: A Summary of our Current Knowledge. *Human-Wildlife Interactions* 10 (1), Pp 19-27.

Impact	Mitigation
	<ul style="list-style-type: none"> <li>- Walking of the cleared area by individuals on a regular basis to prevent birds settling and to monitor if any birds are settling to nests on areas close to the planned construction activity.</li> <li>• Where vegetation has not been removed outside of the breeding bird season and must be removed during the breeding bird season, then pre-clearance surveys must be undertaken by a suitably experienced ornithologist. These surveys would identify any potential nests in the vegetation to be removed and then establish suitable "no go" buffers around these nests, to prevent the nest being destroyed or disturbed. Buffers would be species specific and determined by the ECOW.</li> <li>• In addition to the above, prior to commencement of decommissioning activities, walkover surveys would be completed in habitats suitable for and known to be used by breeding bird species as to identify any previously unknown nest sites.</li> </ul> <p><i>Monitoring/Additional Good Practice Measures</i></p> <ul style="list-style-type: none"> <li>• It is recommended that the program of VP surveys is continued, but with a greater survey effort. Surveys should be undertaken between August 2019 and November 2020, with six hours of survey undertaken at each VP location during the months of January, February, June, July and December. During the other months, when birds are migrating, this survey effort should be doubled to 12 hours of survey effort per VP location. It is recommended that more VP locations are used, with at least five locations recommended to cover the site. These should be chosen with the help of a viewshed analysis to ensure that all turbine locations can be observed from a survey location. All surveys must be undertaken by surveyors who are experienced in the identification and recording of Lebanese birds. Where required, these surveyors should also be trained in how to survey as per the SNH guidance. Data should be recorded as per SNH Guidance (2017) , with flight paths mapped into GIS and these reproduced on figures. This data can then be analyzed in GIS. Instead of undertaking a full CRA on the results, the analysis should consider the total number of birds per hour that are passing within the footprint of the wind farm at collision risk height. This should be calculated for each species and, if it is significantly greater than the numbers previously recorded (see <b>Table 14-9: Collision Risk Assessment by Species</b>), further assessment of collision risk impacts may be required.</li> <li>• Hunting Ban: A significant impact on birds migrating through Lebanon is the culture of hunting that exists. In spite of laws that make the killing of migrating birds illegal, thousands are still killed each year<sup>7</sup> impacting populations in their breeding grounds in Europe and Asia. It is proposed that all hunting within the wind farm area is banned, this area is shown in <b>Figure 14-4</b>. This would not only protect the birds using the wind farm area but would also prevent damage to the turbines themselves. The site would be secured during construction, preventing public access to the area. It is proposed to maintain this during the operation phase, with security staff responsible for preventing members of the public accessing the wind farm site. Efforts should be made to invest in public awareness and support for the hunting ban among local residents. This would take the form of increased nature education and training of local bird recorders. Surveyors from the project surveys would be a good resource to educate locals of the species of birds and why Lebanon is an Internationally important bird flyway.</li> <li>• Artificial Light: The use of artificial light should be avoided where possible as steady white lights on the nacelle can attract prey, such as moths, and the prey can attract predators, such as moth eating birds like hobbies and red-footed falcons. Instead, it is proposed that red lights or pulsing/blinking lights are used on the nacelle instead.</li> <li>• Waste Disposal: To prevent attracting scavenging bird species to the site, any waste produce by the workers on the site would need to be disposed of following a detailed plan. Waste should not be stored or deposited where it is open to the air, as this would attract birds to the site. This could, inadvertently, lead to the creation of a de-facto feeding station for scavenging birds such as corvids, kites and vultures.</li> <li>• Disturbance and Displacement: Identified nests of birds of prey, such as common kestrel and short-toed snake eagle, are considered far enough away from any construction area and disturbance impacts are unlikely. However, the ECoW would be responsible for monitoring both nest sites and ensuring that they remain productive through the construction/decommissioning works.</li> </ul> <p>During Operations and Maintenance:</p> <p><i>Migration VP Surveys</i></p> <ul style="list-style-type: none"> <li>• It is recommended to continue the migratory season VPs during the start of the operational phase of the proposed development. These would commence as soon as the Project is operational and would be undertaken following the methods described in this section, although with an increased survey effort to meet the 36 hours per migration season as suggested by SNH Guidance. During each VP watch, flight activity by target species<sup>8</sup> will be recorded using the same details collected before:</li> </ul>

<sup>7</sup> Committee Against Bird Slaughter (CABS) (2013) Report on the hunting of migrant birds in the Lebanon - affected species and their conservation status in the EU.

<sup>8</sup> Target species include all species of raptor, cranes, storks and pelicans.

Impact	Mitigation
	<ul style="list-style-type: none"> <li>- Flight Number.</li> <li>- Time.</li> <li>- Date.</li> <li>- Species.</li> <li>- Number of Birds.</li> <li>- Flight height.</li> <li>- Total time of flight including time spent at each height.</li> </ul> <ul style="list-style-type: none"> <li>• In addition to this information, surveyors will record if any birds display any flight behavior apparently associated with the presence of the turbines (avoidance) or if any were seen to collide with a turbine (collision). Observations would use the following terminology after Meredith (2002)<sup>9</sup>:             <ul style="list-style-type: none"> <li>- Weave - Weaving flight line up to maximum height of turbine.</li> <li>- Direct - A direct flight line, within the turbine envelope but clearly in a line up to maximum turbine blade height, avoiding turbines.</li> <li>- Horizontal - A bird flying towards a wind farm site, which takes avoiding action by a horizontal movement (i.e. no change in height) so as to take it around the edge of the turbines.</li> <li>- Vertical - As for horizontal, but this time, the bird gains altitude to take it over the top of the wind farm site.</li> <li>- Bullet - Flight behavior with no avoiding action with regards to turbines (or other infrastructure).</li> <li>- Hit - A recorded collision between a bird and a turbine (or other infrastructure).</li> <li>- Avoid - Avoidance behavior near a turbine, generally taken at short notice and likely to appear as a sudden change in direction and/or height.</li> <li>- Other – Any other behavior not easily classifiable into any of the above categories.</li> </ul> </li> </ul> <p><i>Carcass Searches</i></p> <ul style="list-style-type: none"> <li>• As well as the VP surveys, searches for collision victims will be completed under the turbines. Visual searches within an area at least five meters greater than the length of each turbine blade will be undertaken. The surveys would be stratified, with a third of the turbines survey during each visit. It would also be randomized, with a different set of turbines chosen to be surveyed on each visit. These surveys would be undertaken ten times per month during the migration period (mid-February to mid-May and mid-August to mid-November) and three times per month during the rest of the year. The amount of time spent searching will be standardized to allow comparability between turbines and visits.</li> <li>• Prior to starting the surveys, both scavenger and surveyor bias will be calibrated. This will be completed by leaving proxy carcasses<sup>10</sup> under turbines in locations where they can be seen by static trail cameras to record how much time passes before a carcass is removed by scavenging animals.</li> <li>• A similar process will be used to calibrate how successful surveyors are at locating carcasses. One surveyor will place a number of carcasses, ideally of differing sizes randomly under turbines and a different surveyor would search as described above. This process will be repeated across a number of turbine locations and for all surveyors involved in the searching. How many of the placed carcasses which are found can then be used to identify how effective the surveyors are at finding carcasses.</li> <li>• A project specific monitoring protocol would be developed. This will need to be adapted following the publication of the Bird Monitoring Protocol by the MOE.</li> </ul> <p><i>Radar Bird Monitoring Equipment</i></p> <ul style="list-style-type: none"> <li>• Radar equipment to monitor volumes of migrating birds approaching the proposed development would be considered. The requirement for this would be based on the expectations of the Bird Monitoring Protocol currently being prepared by the MOE. It is anticipated that this would involve guidance on the specifications of system appropriate and how it should be utilized.</li> </ul>

<sup>9</sup> Meredith, C., Venosta, M., & Ransom, R. (2002) *Cordington Wind Farm Avian Avoidance Behaviour Report*, 2002. Biosis Research Report.

<sup>10</sup> Proxies required as its unlikely that access to any hooded vulture carcasses will be possible. A bird of similar size and colouration should be used. It will be acceptable to use man-made dummies in the surveyor bias trials as that is a test of the surveyors' visual abilities. However, for the scavenger bias trials, real carcasses should ideally be used.

Impact	Mitigation
	<ul style="list-style-type: none"> <li>The radar system would have a more direct feedback into the shutdown mitigation of the proposed development, as it would detect large volumes of birds approaching so large collision risk events can be avoided. The other monitoring methods would have an indirect feedback into the shutdown mitigation.</li> </ul>
<p>Positive Impacts:</p> <ul style="list-style-type: none"> <li>The potential for the consistent provision of electricity to meet demand.</li> <li>Economic benefits from the expected sourcing of construction materials from the Akkar region.</li> <li>Economic benefits from the sourcing of Project personnel from the northeastern part of Akkar.</li> <li>Economic benefit from income that may be generated by nearby businesses including hotels and restaurants.</li> <li>Land lease / acquisition for 23 years with a possible extension to 28 years.</li> </ul> <p>Negative Impacts:</p> <ul style="list-style-type: none"> <li>Land lease / acquisition for 23 years with a possible extension to 28 years.</li> <li>Temporary loss of access by shepherds to 0.43km<sup>2</sup> of grazing areas.</li> <li>Temporary loss of access to tracks by recreational bird hunters.</li> <li>Potential impacts to vulnerable groups, including women, the elderly and informal settlements.</li> <li>The potential to overwhelm businesses in the Project area by the influx of workers.</li> <li>Reduced cost of provision of power to residents.</li> <li>Boosting of the local economy.</li> <li>Enhancing infrastructure such as roads and transportation.</li> <li>Cleaner environment.</li> <li>Improved quality of life.</li> <li>Economic growth.</li> </ul>	<p>Construction, Operations and Maintenance and Decommissioning:</p> <ul style="list-style-type: none"> <li>Landowners have agreed that the compensation provided is appropriate and fair, though the Project represents a loss of access to 747,589m<sup>2</sup> will be leased for the Project for 28 years, and +3,500m<sup>2</sup> will be acquired permanently.</li> <li>A temporary loss of access of land for grazing of 45% of the total available in the Project area. Given the loss of access to nearly half of the total, the impact severity is anticipated to be high. Additional consultation will be undertaken with livestock owners and shepherds to explain the areas they cannot access for the duration of the construction. Shepherds will be consulted to find out whether goat grazing is a subsistence activity and whether there are adequate alternative grounds that can be used during the construction period. If there's impact or loss of livelihoods, a Livelihood Restoration and Compensation Plan will be developed. Shepherds grazing near the Project will be advised of exclusion zones in advance, noting that other grazing areas are available. Alternative areas for grazing will be researched and secured by the Developer for alternative use during construction. If the Developer cannot arrange an alternative area because of landowners' objection, financial compensation will take place. All grazing areas will again be accessible at the end of construction.</li> <li>Access to tracks within the Project area would be temporarily prohibited during the construction phase for a period of 18 months. Recreational hunters near the Project will be advised of exclusion zones in advance, noting that other tracks are available, and hunting is for recreational purposes, i.e. not subsistence. There are other tracks available for hunters, who only hunt recreationally. A significant impact on birds migrating through Lebanon is the culture of hunting that exists. In spite of laws that make the killing of migrating birds illegal, thousands are still killed each year impacting populations in their breeding grounds in Europe and Asia. It is proposed that all hunting within the wind farm area is banned, this area is shown in <b>Figure 14-4</b> in <b>Section 14 Ornithology</b>. This would not only protect the birds using the wind farm area but would also prevent damage to the turbines themselves. The site would be secured during construction, preventing public access to the area. It is proposed to maintain this during the operation phase, with security staff responsible for preventing members of the public accessing the wind farm site. Efforts should be made to invest in public awareness and support for the hunting ban among local residents. This would take the form of increased nature education and training of local bird recorders. Surveyors from the project surveys would be a good resource to educate locals of the species of birds and why Lebanon is an Internationally important bird flyway.</li> <li>Impacts to vulnerable groups, including women, the elderly and Palestinian and Syrian refugees, are not expected to be disproportionately different than other community members. The impact severity is anticipated to be Low (to be confirmed). The Developer will collect additional data, identify all Project stakeholders and engage with them, as necessary, including directly-affected people and vulnerable groups. These exercises will help clarify and confirm the DAOI and focus the assessment of project impacts and inform mitigation, as well as inform management plans. The Developer will identify and map all of the Project stakeholders and engage with them as necessary. This will help ensure that all Project stakeholders are consulted and there are no hidden pockets of opposition. Other potential use of natural resources on the Project site will be investigated. Additional measures to communicate the Project information, including provision of schedules, health, safety and security measures are necessary (refer to Section 16 Community Health, Safety and Security and the stand-alone SEP).</li> <li>Up to 125 workers will be employed by the Project. Workers will be sourced from the Project area first, regionally second, nationally third and internationally last. Employment will supply income for a period of up to 18 months. Pre-recruitment skills training will be provided. A job skills assessment will be undertaken to provide transparency in hiring practices. The impact to workers is expected to be positive.</li> <li>General impacts to communities are expected to be Positive based on establishment of the CRO Office in Jabal-Akroum Kfartoun and community development projects as agreed between Municipalities and the Developer.</li> </ul>
<p>Noise</p>	<p>Construction:</p> <ul style="list-style-type: none"> <li>Limit the working hours from Monday to Friday 7 a.m. to 7 p.m., if possible. Some flexibility in working hours may be required during the delivery and erection of turbines and depending on weather conditions.</li> <li>The final time schedule of the transport movements should be clarified with the authorities and communities. Only well-maintained equipment should be operated on-site.</li> </ul> <p>Operations and Maintenance:</p> <ul style="list-style-type: none"> <li>The distance of the WTGs to nearby receptors was increased by eliminating the originally planned WTGs 26, 27 and 28. In addition, WTG 25 was shifted to increase the distance to nearby receptors.</li> </ul>

Impact	Mitigation
	<ul style="list-style-type: none"> <li>In order to comply with the IFC noise limit of 45 dB(A) some turbines need to be operated in noise reduced modes. Using the noise reduced modes which are available for all considered turbine types, the IFC noise limit of 45 dB(A) can be complied with. Due to the fact, that the calculation was based on a worst-case assumption of 23 turbine locations, the noise assessment should be redone when the final and reduced turbine layout is available. At the time the final number of turbines is available, the noise reduction modes for the corresponding turbine type can be stipulated.</li> <li>The WTGs will be maintained regularly to ensure that the turbines do not become louder over time.</li> </ul>
Shadow Flicker	<ul style="list-style-type: none"> <li>Shutdown modules will eliminate the possibility for exceedances of annual and day limits. An automatic shadow-flicker shutdown system shuts down the WTG when the sun is shining (direct sunshine on a horizontal area &gt; 120 W/m<sup>2</sup>). These systems shut down a turbine when one of two conditions are reached:               <ul style="list-style-type: none"> <li>More than 30 minutes of shadow-flicker occur on one day at a receptor.</li> <li>The maximum annual quota of shadow-flicker at a receptor is exceeded.</li> <li>When shutdown systems feature a radiation sensor, the turbines only shut down when the sun is shining. If the shadow-flicker shutdown system does not include a radiation detector, the WTG will shut down at all times when the shadow-flicker assessment indicates shadow-flicker at a receptor (i.e. also in cases of overcast sky or fog when there is actually no shadow flicker).</li> </ul> </li> <li>The use of shadow flicker shutdown modules will have a (small) negative effect on the energy yield of the wind farm.</li> </ul>
Visual Amenity in Settlements or Key Viewpoints	<ul style="list-style-type: none"> <li>The distance to the planned Lebanon Wind Power wind farm was also increased so that cumulative impacts were reduced.</li> <li>The wind farm design layout follows the existing morphology of the mountain.</li> <li>Tracks will be designed to follow the existing tracks and fit with contours as far as possible.</li> <li>The turbines and all the other aboveground structures will be removed at the end of the operational lifetime.</li> <li>The internal cabling will be underground cabling.</li> </ul>
Transport and Traffic	<ul style="list-style-type: none"> <li>The temporary removal of concrete bund, curb, electric pole and overhead cable, and demolition of the 45m of concrete wall be coordinated with the Port Authority.</li> <li>Raising of pedestrian bridges, prohibition of car parking, removal of curbs, electric poles, trees, lamp posts, and fencing at ramps and roundabouts and ground leveling and compaction of significant curves will be coordinated with the Ministry of Transport.</li> <li>Asphalt speed bumps will be replaced with rubber ones, which we can easily be removed during the transportation of the WTG components and reinstalled immediately after the trucks pass.</li> <li>Any modification required for the Al Abdeh roundabout will be discussed with the municipality as it is under their authority.</li> <li>Such works will be coordinated and permitted by the Developer and the Ministry of Transport and scheduled for time periods when traffic levels and/or pedestrian use are lowest.</li> <li>The construction of asphalt and gravel roads will occur for a period of 6 months and will be coordinated and permitted by Ministry of Transport and scheduled for time periods when traffic levels are lowest. The construction would be performed under the supervision and conditions of the relevant municipality.</li> <li>The improved road network will have a positive impact on the health and safety in the area by providing safer roads, minimizing impacts to city centers, providing greater buffer distances between houses and the road and eliminating dangerous curves/turns.</li> <li>Construction of internal track will occur for a period of 3 months and will be coordinated with the Ministry of Transport and the Lebanese Army.</li> <li>Occupational health and safety rules, codes and regulations will be followed during works.</li> <li>The OEM/EPC Contractor will be supervised by and accountable to the Developer.</li> <li>The transport of WTG components will occur between 11pm and 4am to avoid impacts to communities traveling to work and school.</li> <li>Municipal police will provide end-to-end escort for the transport convoy.</li> <li>Advance notification of the scheduled transport will be provided to all communities along the route.</li> </ul>

Impact	Mitigation
	<ul style="list-style-type: none"> <li>• The trucks will travel at a low speed to lessen the generation of noise, vibration and dust.</li> <li>• A communications protocol being developed for the transport of WTG components will be distributed to all Mayors two to three months prior to the start of transport. A final transport route map will be provided to all municipalities.</li> <li>• Transport will be timed before and after farmers take their crops to the Akkar Vegetable Market.</li> <li>• For Road Segments A, B, C and D, which are 4 lanes with a median, a conservative approach to traffic management will dedicate the northbound direction for transport and divert all other background traffic to the other direction making a two-lane road.</li> <li>• For Road Segment E, which is a two-lane road, the transport vehicles will have to utilize the road along with the background traffic.</li> <li>• The Developer will meet with Rweimeh Village residents of the houses located along the quarry tracks and existing asphalt roads to discuss the Project and nature and timing of the transport of construction materials.</li> <li>• Advance notification of the start of construction will be provided.</li> <li>• The trucks will travel at a low speed to lessen the generation of noise, vibration and dust.</li> <li>• Occupational health and safety rules, codes and regulations will be followed during works.</li> <li>• Negotiation of entry to quarry roads by resident vehicles will follow standard traffic safety/traffic control protocols, i.e. Stop/Go signage, flagman, etc.</li> <li>• The OEM/EPC Contractor will be supervised by and accountable to the Developer.</li> </ul>
Landscape Impacts	<ul style="list-style-type: none"> <li>• Large, multi-MW turbines with large rotor diameters are considered. By using large, multi-MW turbines with large rotor diameters the number of turbines per generation capacity and the footprint of the Project will be reduced. In addition, large rotors have a reduced rotor speed compared to smaller turbines which will also reduce the visual impact of the Project.</li> <li>• The distance of the WTGs to nearby receptors was increased by eliminating the originally planned WTGs 26, 27 and 28. In addition, WTG 25 was shifted to increase the distance to nearby receptors. The wind farm layout was designed so that the array follows the existing landform of the mountain ridges. By considering the landform of the mountain ridges at the wind farm design, the wind farm layout follows the existing morphology of the mountain. Consequently, the typological appearance of the ridge remains largely recognizable. In addition, the overlapping of rotors of views from the east and the west are unlikely which can be perceived as visually restless.</li> <li>• Tracks will be designed to follow the existing tracks and fit with contours as far as possible. By following the existing tracks and fitting the location of the tracks with the contours lines the landscape impact of the tracks can be reduced.</li> <li>• The turbines and all the other aboveground structures will be removed at the end of the operational lifetime. By removing the turbines and all the other aboveground structures at the end of the operational lifetime, the landscape impact of the project will be entirely revisable and limited to the operation phase of the project.</li> <li>• The internal cabling should be underground cabling. By designing the internal cabling as underground cabling the landscape impact in the immediate surrounding was reduced.</li> </ul>
Buried Artifacts	<ul style="list-style-type: none"> <li>• Though the potential for impact is considered low, a Chance Finds Procedure has been developed (in accordance with guidance provided by the Ministry of Culture and the General Directorate of Antiquities) to appropriately respond to cultural resources encountered during construction.</li> </ul>
Eco-Tourism at Karm Chbat Nature Reserve	<ul style="list-style-type: none"> <li>• During the construction phase, access to certain portions of the 5.13M m<sup>2</sup> Karm Chbat Nature Reserve will be limited to ensure the health and safety of visitors.</li> </ul>
Impacts to Workers	<ul style="list-style-type: none"> <li>• Provide appropriate worker training.</li> <li>• Implement H&amp;S measures (masks, work gloves, proper clothing, H&amp;S rules) and safe work practices.</li> <li>• Control and supervise personnel.</li> <li>• Development and implementation of an Emergency Response Plan and training personnel on the actions to be taken in risk situations.</li> <li>• Appropriately maintain and operate equipment.</li> <li>• Collect and address worker complaints and suggestions through grievance mechanism.</li> </ul>

### 5.2. Residual Impact Summary

The assessment of residual impacts following implementation of the planned mitigation was in accordance with the following:

		Sensitivity of Receptor				
		Low	Low-Medium	Medium	Medium-High	High
Impact Severity	No Change	Negligible	Negligible	Negligible	Negligible	Negligible
	Slight	Negligible	Negligible	Negligible	Minor	Minor
	Low	Negligible	Negligible	Minor	Minor	Moderate
	Medium	Negligible	Minor	Moderate	Moderate	Major
	High	Minor	Moderate	Moderate	Major	Major
	Very High	Moderate	Moderate	Moderate	Major	Critical

Most residual impacts are minor for the construction and operations and maintenance phases, with only seven impacts being assessed as moderate or moderate to substantial.

The following summarizes residual impacts for the construction phase:

#### Residual Impacts - Construction Phase

		Sensitivity of Receptor				
		Low	Low-	Medium	Medium-	High
Impact Severity	No Change					
	Slight			3, 5, 7	15, 20	20
	Low			1, 4, 6, 8, 9, 10, 12,	16, 18	2, 22
	Medium			11, 17		
	High					
	Very High					

**Key: Construction Phase**

- |   |  |
|---|--|
| 1 GHG Emissions   | 12 Designated Sites  |
| 2 Management of Waste Streams                                     | 13 Birds: Habitat Loss, Nest Destruction, Disturbance and Displacement |
| 3 Landslide, Slope Stability, Earthquake                          | 14 Socioeconomic Impacts   |
| 4 Air Quality   | 15 Noise   |
| 5 Obstacle Removal  | 16 Visual Amenity in Settlements                                       |
| 6 New Road Development  | 17 Visual Amenity from Key Viewpoints                                  |
| 7 Internal Track Development                                      | 18 Impacts to Communities Along the Transport Corridor                 |
| 8 Transport of WTG Components, Construction Materials and Workers | 19 Impacts to Informal Settlements Along the Transport Corridor        |
| 9 Habitat Loss  | 20 Buried Artifacts  |
| 10 Terrestrial Fauna: Loss or Disturbance of Resting Places       | 21 Eco-Tourism at Karm Chbat Nature Reserve                            |
| 11 Bats: Loss or Disturbance of Roosts and Foraging Habitat       | 22 Impacts to Workers  |

**Residual Impacts – Operations and Management Phase**

		Sensitivity of Receptor				
		Low	Low-	Medium	Medium-High	High
Impact Severity	No Change					
	Slight			1, 4,		10
	Low			5, 6, 7	9, 11, 13	2, 3
	Medium			12		
	High					
	Very High					

Key: Operations and Maintenance Phase

- 1 Flood Risk
- 2 Wildfire
- 3 Management of Waste Streams
- 4 Landslide, Slope Stability, Earthquake
- 5 Habitat Loss
- 6 Bats: Collision Risk
- 7 Birds: Collision Risk, Disturbance and Displacement and Barrier Effects.
- 8 Socioeconomic Impacts - Positive
- 9 Noise
- 10 Shadow Flicker
- 11 Visual Amenity in Settlements
- 12 Visual Amenity from Key Viewpoints
- 13 Impacts to Workers

## 6. ENVIRONMENTAL AND SOCIAL MANAGEMENT AND MONITORING

### 6.1. Introduction

To effectively manage social and environmental impact identified through the ESIA process, an Environmental and Social Management Plan (ESMP) framework has been developed. The framework identifies and outlines appropriate measures and mitigation that will be needed to achieve acceptable levels of environmental and social performance, through all phases of the Project. The Developer will use the ESMP framework as the basis for developing an Environmental and Social Management System (ESMS) and series of detailed management plans, initially for construction and then for the operations phase.

The management plans developed for the Project will be practical and fully integrated into the Developer’s ESMS. This will ensure alignment with corporate policies and procedures. The system will need to be fully integrated to enable the plans to be effective (i.e. covering environment, health, safety and security in an integrated manner). These are expected to include the following, as a minimum (noting that some elements may be combined into a plan):

*Detailed Management Plans:*

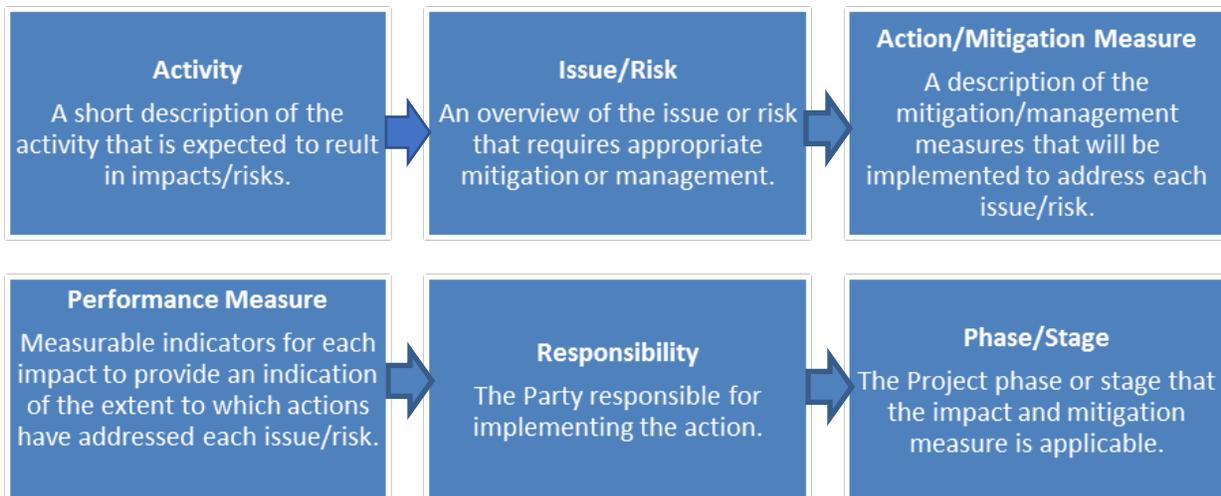
-  **Stakeholder Engagement Plan**
-  **Biodiversity Management Plan**
-  **Resource Efficiency and Pollution Prevention Plan**
-  **Water, Solid Waste, Wastewater and Hazardous Waste Management Plan(s)**
-  **Air Quality Management Plan**
-  **Noise Management Plan**
-  **Shadow Flicker Management Plan**
-  **Landscape and Visual Impact Management Plan**
-  **Traffic Management Plan**
-  **Chance Finds Procedure**
-  **Safety Management Plan (natural disasters, accidents and emergencies)**
-  **Security Management Plan**
-  **Employee Training Plan**
-  **Occupational Health and Safety Plan**
-  **Community Health and Safety Plan**
-  **Contractor Management Plan**
-  **Community Benefit-Sharing Plan (Corporate Social Responsibility (CSR) Plan)**
-  **Labor Accommodation Plan**
-  **Local Hiring and Labor Conditions Plan**
-  **Human Resources Policy**

The main objectives of the ESMS and ESMPs are to:

- Ensure conformance with IFC PSs, IFC Industry Sector EHS Guidelines, international lender’s environmental and social (E&S) policies, local regulations and good international practice.
- Help the Developer to select and manage local consultants and engage with Project stakeholders.
- Have a concrete action plan to avoid and mitigate the negative impact of the project on the environment and local population and to compensate/remedy the negative impacts that cannot be avoided or reduced.
- Provide references for actions, plans and procedures.
- Have an efficient monitoring tool for the contractors of the project company.
- Improve the communication on the environmental and social topics within the project stakeholders.
- Improve the positive impacts of the Project.
- Advise the Developer and assist them in undertaking Informed Consultation and Participation with Affected Communities and other interested parties as per IFC PS1.
- Advise the Developer on E&S capacity requirements for each Project phase and to enhance existing capacity with training and on-the-job learnings.
- Provide advisory support to the Developer to mobilize, execute and staff/resource the ESMPs effectively.
- Engage with potential civil society partners and/or international agencies who could potentially assist in Project preparation and delivery.

**6.2. Approach to Management and Monitoring Plans**

The detailed management plans for the Project will be developed to align with national regulatory requirements and Good International Industry Practice (GIIP) including that set out by IFC, EIB and FMO. The plans will incorporate the following components:



### **6.3. Roles and Responsibilities**

The Developer will have ultimate responsibility for implementing the provisions of the ESMP.

This role will include the on-going management of environmental and social impacts, control of health, safety and security (HSS) risks, monitoring of contractor performance as well as development of mechanisms for dealing with environmental and social problems, and HSS concerns.

The Developer will also ensure that the activities of its EPC Contractor and other contractors (and subcontractors) are conducted in accordance with good practice measures, implementation of which will be required through contractual documentation. The Developer will oversee the Project performance pertaining to environment, health, safety and social issues.

The selected EPC Contractor will provide a dedicated Health, Safety and Environment (HSE) Department to support the Project. The EPC Contractor's HSE Department will have overall responsibility for the coordination of the actions required for environment and social management and mitigation, control of HSS risks, and for monitoring the progress of the proposed ESMP for the Project. However, ultimate responsibility for implementing the provisions of the ESMP will lie with the Developer.

In general, the EPC Contractor's HSE Department shall perform the following activities:

- Ensuring availability of resources and appropriate institutional arrangements for implementation of the ESMP.
- Preparation of required documents on environmental, social and health and safety management.
- Effective implementation of the health, safety and security management system.
- Confirming the competence of contractors/sub-contractors engaged on the Project and monitoring their performance in complying with the HSS management system.
- Collection of the statistics of health of workers.
- Collection and monitoring of data on personnel. Contractor, health and safety.
- Providing support during routine medical check-ups of workers.
- Awareness-raising and implementing safety programs.
- Providing job specific induction training.
- Compliance with regulatory requirements.
- Carrying out environmental, health and safety and security audits.
- Identify unsafe acts & conditions and suggest remedies.
- Develop safety culture and comply with the company's HSE policy and standards requirements.
- Encourage and enforce the use of PPE.
- Educate all employees in the use of PPE and safe practices.
- Direct, coordinate and orient the HSS activities.
- Promulgate the spread of policy, objectives, rules and/or regulations.
- Perform a thorough investigation of all accidents and review the recommendations to avoid any repetition.
- Monitoring the progress of implementation of the ESMP.
- Reviewing and updating the ESMP as and when required for its effective implementation.