ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

NON-TECHNICAL SUMMARY (NTS)

600MW AL GHAT WIND INDEPENDENT POWER PLANT

TABLE OF CONTENTS

1. INTRODUCTION

Marubeni in collaboration with Axia and Ajlan & Bros are planning to develop the 600MW Al Ghat wind independent power plant (hereafter, the Project) which is located approximately 5 km north of the town of Al Ghat and less than 4 km south of Az Zulfi (Figure 1) in Riyadh Province. The total area of the Project is about 110.367 km2. The overall plant capacity is expected to be close to 616 MW.

The project will include installation and operation of 80 wind turbines, which results in an overall nominal installed plant capacity of 616 MW. The total power generation capacity is expected to be equivalent to 2068 GWh per year (Master Plan, Al Ghat wind energy park, Worley, July 2021). Power evacuation and substation components are not part of the Project' scope but are considered associated facilities.

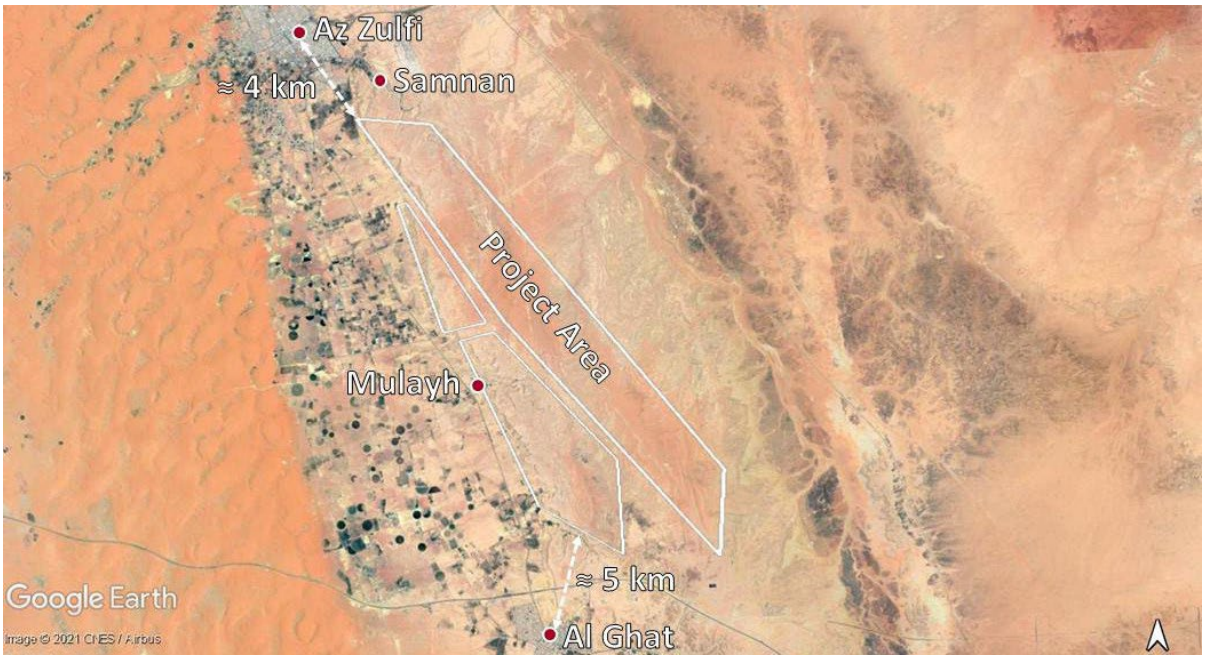

Figure 1-1 Project Location

The proposed Project has been classified as Category 3 as per National Center for Environmental Compliance (NCEC) response to the Project Environmental Classification Form. The original ESIA for the windfarm development was prepared by Worley in 2021 and approval was obtained from the Saudi National Center for Environmental Compliance (NCEC) in accordance with local Saudi regulations. The NCEC issued the permit on June 9th, 2022, and it is valid until April 22nd, 2025. NCEC informed, the permit shall be valid for the Construction period and to be reviewed for the Operation.

WSP was commissioned by the Client to review the original ESIA and amend the ESIA where required to meet the requirements of the following guidelines and standards for ESIAs:

- International Finance Corporation (IFC) Performance Standards (PSs);
- Equator Principles IV (EP IV);
- IFC Environment, Health & Safety (EHS) General Guidelines;
- IFC Environment, Health & Safety (EHS) Guidelines for Wind Energy; and
- The Japan Bank for International Cooperation (JBIC) Environmental Guidelines.

In undertaking this work, WSP recognizes the original work of Worley and has only amended the ESIA where strictly necessary to comply with the above requirements. The EPs refer to the IFC PSs as the benchmark for ESIA development. Therefore, the assessment has been undertaken in line with IFC PS requirement. it is important to note that the EPs introduce additional considerations. These include the requirement for a Climate Change Risk Assessment (CCRA), which has been prepared specifically for this project.

To be consistent with the initial ESIA, this ESIA Addendum has followed the same assessment methodology as of the initial ESIA. Where relevant, assessment has been updated, and mitigation measures have been provided.

The current document is the Non-Technical Summary that provides a summary of the findings contained in the ESIA Report. The updated ESIA Report contains more detailed information on the Project. It includes an Environmental and Social Management Plan (ESMP) which describes the monitoring and mitigation requirements for the duration of the project, including responsibilities and any legal requirements.

1.1. Project Description

The proposed Project originally proposed the installation and operation of 125 wind turbines, which results in an overall plant capacity of 525 MW. The total power generation capacity is expected to be equivalent to 2068 GWh per year2 (Master Plan, Al Ghat wind energy park, Worley, July 2021).

The current design, which has been assumed for the purpose of this amended ESIA summary prepared by WSP, is presented in Table 1-1.

	Current Design	Original Design
Generation capacity (MW)	600MW	525MW
Turbine Manufacturer (supplier)	Windey Energy Technology Group Co., LTD (OEM)	
Turbine model	WD200-7700	
Turbine hub height (M)	131	120
Turbine rated power (MW)	7.7	4.2
Rotor diameter (M)	197.3	150
Number of wind turbines	80	125
Number of substations	1	1

Table 1-1 Windfarm Design

It should be noted that the number of turbines of the windfarm is significantly reduced. Therefore, while the individual turbine size (in MW), turbine height and rotor diameter are increased in the new design, it is expected that the predicted environmental and social impacts of the new design will generally be reduced compared to those associated with the original design.

The Associated facilities to the Project include the following:

- A switching substation that will be constructed on the site.
- Connection from the switching substation to the transmission lines that already exist in

close proximity to the site.

These assets will be developed, owned and operated by the Saudi Electricity Company (SEC) and are outside the scope of the ESIA. Hence, this ESIA does not cover the assessment of risks and impacts related to the proposed associated facilities i.e. the substation and transmission line (TL).

The project site is easily accessible, located between major highways like King Salman Road (Highway #535) and Highway #65. Highway #571 is also close by, and the paved South Circular Road runs directly through the site, linking these main roads. Most nearby roads are in good condition with light to moderate traffic, providing good access to the site. Although a new road was planned between Mulayh and Highway #571, construction has not yet started.

2. PROJECT BASELINE CONDITION

2.1. PHYSICAL ENVIRONMENT

2.1.1 CLIMATE

The climate in Riyadh Province can be characterized as a hot dry climate in the Köppen Climate Classification system (Köppen, 1884) and is translated in the Volken & Bronnimann classification (2011) as BWh, i.e., tropical, and subtropical desert climate.

2.1.2 TEMPERATURE AND PRECIPITATION

As the region is a desert climate, it is expected that the temperature varies diurnally and seasonally as well. The closest city with available meteorological data is Az Zulfi at a distance of approximately 4 km from the Project area. Historical weather data shows that August is the hottest month, with daytime temperatures averaging over 44°C, while January is the coolest, with average temperatures around 15°C and lows near 9°C. Rainfall is minimal, with most precipitation occurring in the spring, particularly in April, which receives the highest average of 32 mm.

Future climate projections undertaken as part of the Climate Change Risk Assessment in accordance with EP IV, reveal that over the coming decades, the area is expected to experience hotter temperatures, with more frequent extreme heat days. In the worst-case scenario, daily maximum temperatures in summer could increase by around 2.6°C, and the number of extremely hot days above 45°C could rise significantly. These conditions may occasionally reduce turbine efficiency or require short pauses in operation to protect equipment, but overall energy production is not expected to be significantly affected.

2.1.3 WIND

The historical wind data has been obtained from data made available by the Saudi government from meteorological stations (OpenData website, accessed March 2021), meteorological station at Prince Naif bin Abdulaziz International Airport in Buraydah (formerly Qassim Airport. Historical data shows that wind speeds at ground level are moderate, generally ranging from 2 to 6 metres per second, and mostly blowing from the north and northeast. However, at the height of the turbine hubs (131 metres), wind speeds are significantly stronger, averaging between 8.3 and 9.1 metres per second, making the site well-suited for year-round wind energy production.

Future climate projection indicates that Wind speeds are projected to remain largely stable, meaning no major impact is expected on electricity generation. However, dust storms may become more frequent in spring and summer Table 1-2 the wind statistics obtained from Prince Naif bin Adbulaziz International Airport.

Parameter	Year											
	2007											
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Direction	ENE	ENE	N	S	N	E	WNW	N	NNE	S	SSW	NNE
	2008											
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Direction	NNE	NNE	N	N	ENE	N	NE	NE	NNE	NNE	ENE	SSE
	2009											
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Direction	NE	S	ENE	NNE	NNE	ENE	N	E	SSE	SSW	NNE	S
	2010											
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Direction	S	E	NNE	E	NNE	NNW	NNW	N	E	E	NE	NE
Speed (knots)	4	6	6	7	7	5	7	6	4	4	3	4
	2011											
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Direction	E	NE	NE	E	WSW	NE	N	N	NE	E	NNE	NE
Speed (knots)	7	6	7	8	7	7	6	6	5	5	7	4
	2012											
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Direction	N	NNE	ENE	NNE	ENE	N	N	N	E	SE	E	SE
Speed (knots)	6	7	8	7	8	6	6	5	6	5	5	5

Table 2-1 Wind Statistics from prince Nayef bin Abdulaziz International Airport in Burydah

2.1.4 AIR QUALITY

Az Zulfi industrial city, includes production facilities for several industries, is located less than 3 km north from the Project site and is thought to be the most important source of air emissions in the site area. Sources of air pollutants in the vicinity of the Project site are expected to be limited to equipment used in agricultural areas and traffic on roads and highways. Dust particles resuspended by wind from the vast dune areas to the west of the site area and north of Az Zulfi also contribute to reduced air quality especially during sandstorms.

Site visit was conducted in November 2021, during which baseline air monitoring was taken at 5 different points within the boundaries of the proposed project site. The baseline monitoring was undertaken by Support Establishment for Environmental Services. The results of air parameters measured at the site indicate that all parameters and within the permissible values, in accordance with the standards of environmental protection in the general environment system and its implementing regulations.

2.1.5 NOISE

Noise and vibration were monitored in 5 location within the site boundaries The results of the recorded measurements were found to comply with the permissible limits in accordance with

the standards of environmental protection in the general environment system and its implementing regulations.

2.1.6 GEOLOGY AND SOIL

The Arabian Peninsula is a huge crustal plate composed of ancient sedimentary and volcanic rocks, deformed, metamorphosed, and injected by plutonic intrusions. The Arabian Peninsula consists of two major regions: Arabian Shield in the west and the Arabian Platform in the east.

The approximate location of the Project is indicated on the map and corresponds to the northern tip of the Jurassic Tuwaiq limestone formation (shown in blue color) extending for almost 1,000 km all the way from the northern margin of the Rub Al-Khali at Wadi Dawasir and ending at Al Zulfi at the southern margin of An Nafud (Rausch et al., 2013).
The Preliminary Site Assessment reported that the project site largely consists of silt, sand, and gravel. Geotechnical site investigations conducted by ACES in 2021 at the planned Project area included drilling of several 30 m deep boreholes revealed a consistent ground structure: the first few meters are sandy soil, with bedrock extending beneath it throughout the entire depth of the drilling.

2.1.7 HYDROLOGY AND WATER RESOURCES

2.1.7.1 Surface Water

As per the Preliminary Site Assessment Report, The project site and its surroundings don't have any permanent rivers or lakes. However, during the rainy seasons (winter and spring), wadis (dry riverbeds) fill with water. The wadis on the site itself drain towards the east-northeast. Other wadis in the general area, like those near Al Ghat, Az Zulfi, and Wadi Marakh (east of the site), also fill up with rain and flow north.

An important regional feature is the 10 km-long Al Kasr lake, located approximately 11 km north-east of the site, which fills during the rainy season as Wadi Marakh and wadis from the site area discharge into it. Adjacent to Al Kasr Lake is the green area of Rawdat Al Sabla. Hydrology studies confirm no significant catchments contribute to the project area.

2.1.7.2 Groundwater

Groundwater is anticipated in the lower areas around the Project site plateau, as evidenced by the abundance of cultivated land in these areas. According to the Preliminary Site Assessment Report, and review of satellite images from Google Earth, reveal identifiable green areas within the project boundaries, often concentrated in wadi channels on the plateau. These green areas likely depend on shallow groundwater within the alluvial formations of these channels, which is recharged by precipitation.

Farmlands surrounding the Project area (Figure 2-1 and 2-2) utilize groundwater from the Zulfa aquifer for irrigation. This aquifer is hosted by the Dhurma shales and limestone formations. This groundwater is of poor quality (Jaju et al., 2016), not suitable for household use. Therefore, potable water for Riyadh and the Project area (including Al-Ghat, Az Zulfi, and Al Majma'ah) is supplied from the Ras El Khair desalination plant on Saudi Arabia's eastern coast, transported via a pipeline extending over 900 km. During geotechnical site investigation, which involved drilling several boreholes to a depth of 30 m, groundwater was not encountered in any of the drilled locations.

Figure 2-1 Farmlands to the west of the project site on top of the Tuwaiq plateau

Figure 2-2 Location of Date Palm Plantations

2.2. BIOLOGICAL ENVIRONMENT

The area can be classified within the World-Wide Fund for Nature (WWF) eco-region called "Arabian Desert and East - Sahero- Arabian xeric shrub lands". This is a desert eco-region characterized by very little biodiversity. The area is characterized by dry shrubs and Acacia trees and gravel plains. According to the habitat classification scheme of the International Union for Conservation of Nature (IUCN), the Project area can be classified as a Subtropical/Tropical Dry Shrubland. Flora and fauna found in this eco-region are well adapted to its extreme weather conditions. This ecoregion is highly sensitive to grazing, soil disturbance and other cover alteration. Restoration potential can be very low, and regeneration is very slow. The introduction of non- native species may pose serious risk.

2.2.1 SITE FLORA

According to the Preliminary Site Assessment Report, the floristic community at the site is comprised of trees, dwarf shrubs, and annual/perennial herbs. The plant species recorded on

site (Table 2-2) are not of conservation value and most were not evaluated by the IUCN.

Common name	Scientific name	Status on IUCN Red List
Umbrella thorn	*Acacia tortilis*[9]	Least Concern (LC)
-	*Rhazya stricta*	Not evaluated
Onionweed	*Asphodelus fistulosus*	LC
Arabian boxthorn	*Lycium shawii*	LC
Bitter apple	*Citrullus colocynthis*	Not evaluated
Apple of Sodom	*Calotropis procera*	Not evaluated

Table 2-2 Floristic Community in the Project Site

2.2.2 SITE FAUNA

As per desktop information collected from the National Centre for Wildlife's website, the National Strategy for Conservation of Biodiversity in the Kingdom of Saudi Arabia (Abuzinada et al., 2005), the IUCN Red List of Threatened Species, Birds of the Middle East by Richard Porter and Simon Aspinall (2013) reveal that KSA lies at the junction of four zoogeographic regions, i.e. Afro-tropical, Saharo-sindian, Palaearctic and Oriental. Historically, the amelioration of the climate as well as the fluctuation of the sea level provided several routes for animal introduction to the region. Thus, KSA's fauna is comprised of species belonging to all zoogeographic regions.

2.2.3 MAMMALS

Small mammals such as Fat Sand Rat (Psammomys obesus), Lesser Egyptian Jerboa (Jaculus jaculus), and Dwarf Gerbil (Gerbillus nanus) are examples of some of the common and widespread mammals on the Arabian Peninsula and can be expected in Riyadh Province. These animals are considered as prey for small carnivores such as the Red Fox (Vulpes vulpes) and Rüppell's Fox (Vulpes rueppellii). These species of foxes are also widespread and can be expected in Riyadh Province. According to the Preliminary Site Assessment Report, camels, sheep, and goat, were seen onsite grazing on the local vegetation, as part of mobile livestock camps. Saudi Arabia has a number of bat species, and according to the First National Report on the Convention on Biological Diversity, the country is home to 30 different species of bats. Widespread species include Egyptian Fruit Bat (Rousettus aegyptiacus), Geoffroy's Trident Leaf-nosed Bat (Asellia tridens), and Kuhl's Pipistrelle (Pipistrellus kuhlii).

2.2.4 BIRDS

The peninsula is home to a plethora of bird species and an important stopover site for many migratory species. In Riyadh, resident birds include common and widespread species such as Rock Pigeon (Columba livia), Laughing Dove (Streptopelia senegalensis), Common Kestrel (Falco tinnunculus), Fan-tailed Raven (Corvus rhipidurus), Crested Lark (Galerida cristata), among others. Rawdat Al Sabla and the lake attract various species of birds such as Eurasian Hoopoe (Upupa epops), White-throated Robin (Irania gutturalis), and Greater Short-toed Lark (Calandrella brachydactyla). According to the Preliminary Site Assessment Report, some bird species were encountered during the site visit. These included the Crested Lark (Galerida cristata) and the Rock Dove (Columba livia) These species are classified as Least Concern (LC) by the IUCN Red List. The farms, parks and green areas in the wider site region are expected to be attractive to many bird species in winter and spring.

2.2.4.1 MIGRATION

Twice a year, birds migrate vast distances across the globe. Typically, these journeys follow a predominantly north-south axis, linking breeding grounds in arctic and temperate regions with non-breeding sites in temperate and tropical areas. Many species migrate along broadly similar, well-established routes known as flyways. Figure 2-3 shows East Asia / East Africa birds flyway. The flyway is known to involve a broad corridor of movement, which is generally to the northeast in spring and to the southwest in autumn. This flyway has been described in literature (BirdLife International, 2010) although is not well known and is particularly ill-defined in KSA. Birds using this broad flyway are considered likely to occur within the Project area (Figure below – Yellow). A few hundred kilometres to the west of the site, another significant flyway extends from Europe to Africa called the Rift Valley / Red Sea Flyway (also known as the Black Sea Flyway) (Figure below – Blue). This corridor of migration is relatively well-defined and studied.

The Central Asian Flyway has also been identified as another broad corridor of bird movement. which crosses from Europe into Asia (Figure below – Red). It is possible that birds using this flyway may also occur in the Project area. Importantly, there is significant general migratory bird movement throughout the Arabian Peninsula in spring (northwards) and autumn (southwards) which may also result in increased bird activity within the Project area during migration periods (Jacobs, 2021).

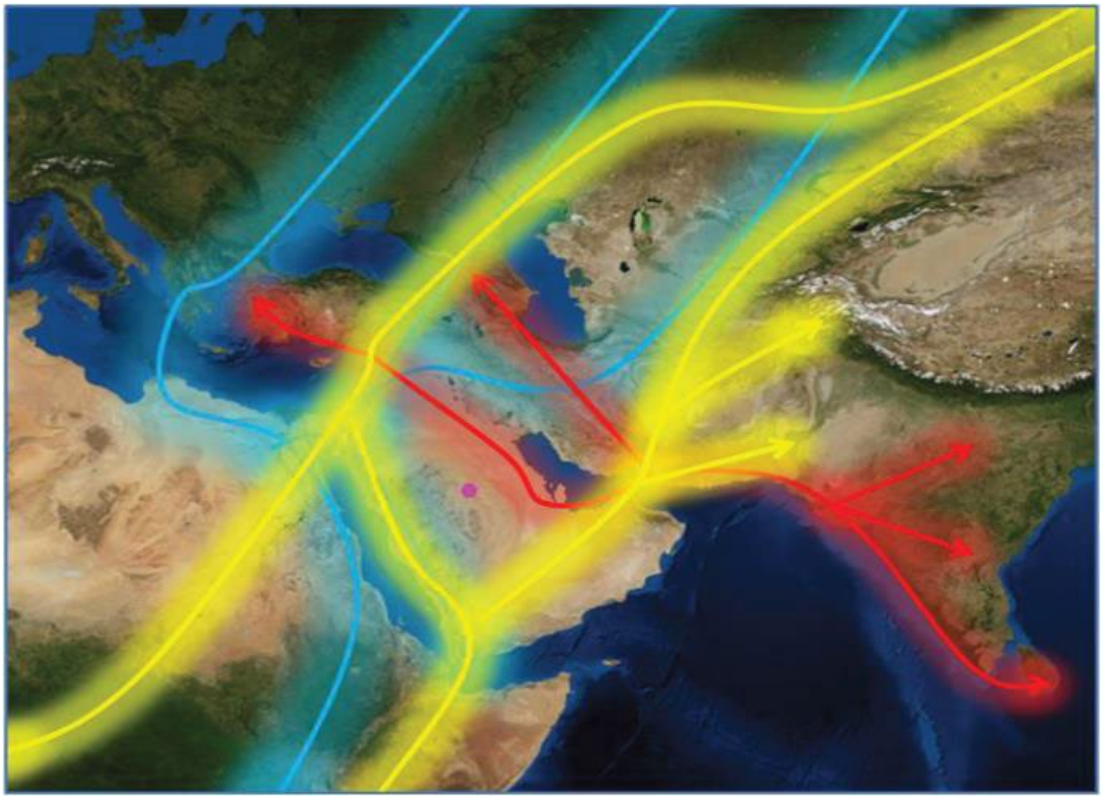

Figure 2-3 East Asia / East Africa birds flyway

2.2.5 REPTILES

All of Saudi Arabia's seven native amphibian species are restricted to freshwater seeps and ephemeral pools. During the spring portion of the bird survey, 6 burrows and individuals of Egyptian spiny-tailed lizards (Uromastyx aegyptia) were noted on the project site (Table 2-3). This reptile is a large species which is threatened with habitat loss, giving it a Vulnerable (VU) status on the IUCN Red List (IUCN Red List, August 2021).

Location	Coordinates
Burrow 1	N26° 08'00.1" E44° 58'44.1"
Burrow 2	N26° 05'26.0" E44° 58'37.8"
Burrow 3	N26° 05'38.3" E45° 00'55.8"
Burrow 4	N26° 12'01.1" E44° 54'42.3"
Burrow 5	N26° 11'14.0" E44° 53'41.2"
Burrow 6	N26° 12'58.7" E44° 54'22.2"

Table 2-3 Locations where Egyptians Spiny Tailed Lizards were spotted in the Project area during spring 2021

Figure 2-4 Locations of burrows of the Egyptian spiny-tailed lizards within the Project site

2.3. ARCHAEOLOGICAL AND CULTURAL ENVIRONMENT

As the capital of the Kingdom of Saudi Arabia, the city of Riyadh has numerous cultural and historical sites. According to a 2018 brochure released by the Saudi Commission for Tourism, on the outskirts of Riyadh city is Historical Diriyah holding the ruins of the old city of Diriyah which lay on Wadi Hanifa. The buildings consist of mud-brick structures and are divided into three districts. At Turaif District is considered the most important political and historical site because it was the original home of the Saudi royal family and is a World Heritage Site (UNESCO, accessed March 2021). These sites are located over 200 km southeast of the Project site (Figure 2-5). Al Ghat and Ushaiger are referenced as “Heritage Villages” in the province, which combine natural scenes and ancient architecture and gives visitors the opportunity to experience Saudi customs and traditions. The municipality has an ongoing project of renovating old mud-brick residences in Al Ghat and turning them into hotels (Arab News, accessed March 2021).

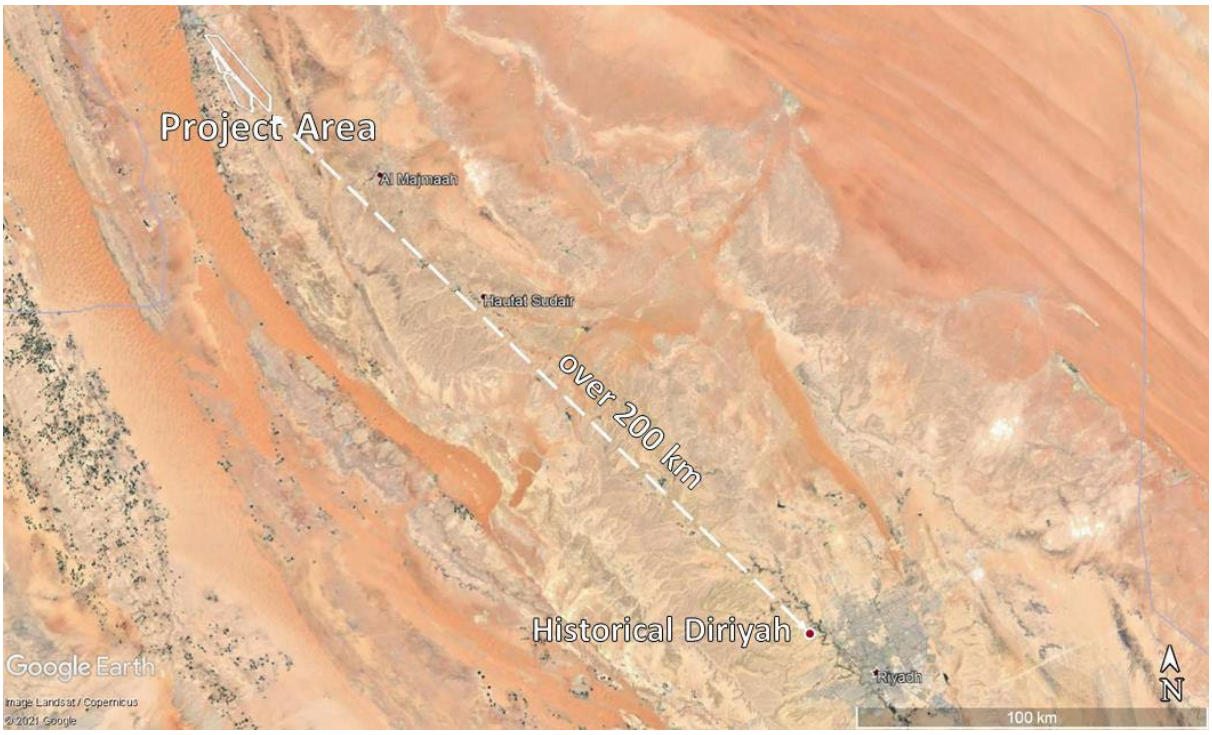

Figure 2-5 Distance between Project area and Historically Diriyah

Archaeological surveys were conducted around Al Ghat in 2013 where Palaeolithic artefacts had been sampled at two localities, Jebel Samar and Jebel Markh. The surveys uncovered textual (written in Thamudic script) and iconographical material. These sites represent new evidence within the context of early human demography (Bretschneider et al., 2017). It should be noted that the closest site (Jebel Markh) is at a distance of about 10 km from the proposed Project boundaries.

2.4. SOCIAL ENVIRONMENT

The Project is located in Riyadh Province in a low polluted agricultural area, with vast farmed areas west of the site. Figure below shows the closest towns and villages around the Project area. The closest cities include Mulayh located within the boundaries of the Project area. Samna is about 2 km north of the Project area, while Az Zulfi is about 4 km north.

According to the Statistical Yearbook of 2019, the total population of Riyadh Province was 8,660,885 individuals accounting for approximately 25% of the total population of the Kingdom of Saudi Arabia. This indicates that the project is situated within a densely populated and economically active region, although the immediate project area might be less populated.

Agriculture is a prominent livelihood in the region, with Riyadh being a largely agricultural province producing various crops like dates, grains, and fruits. Al Ghat, in particular, is renowned for its date farms and production. In terms of educational provisions there are numbers of schools in Az Zulfi and Al Ghat governorates. For higher educational services, Al Riyadh Province has 5 public and 5 private universities. These universities are in Riyadh city, and the public universities have branches in the other governorates such as Al Ghat and Az Zulfi.

According to the statistics released by GAStat, there are a total of 51 public hospitals in Al

Riyadh Province, and 37 private hospitals. These hospitals have a total number of 17,310 beds with a team of 50,674 doctors and nurses distributed among these hospitals. There are an additional 445 public primary care centers in the province, and an additional 917 private clinics. Also, there are 85 red crescent centers and 174 ambulances with 1,157 paramedics.

Riyadh Province relies on a combination of groundwater, water collected from dams, and desalinated water for domestic use. This highlights a diversified water supply strategy. In 2020, approximately 944 million m^3 of drinking water was distributed for domestic use. The province's infrastructure includes 14 groundwater wells, 107 dams with a substantial total capacity, and 87 desalination plants with a notable production capacity. Beyond Riyadh city, the governorates have an extensive network of water pipes (11,092 km connecting over 157,000 houses) and sanitation pipelines (1,901 km connecting over 47,000 houses), indicating a reasonable level of utility service.

The site is located in close proximity (less than 1 km) to a large 380/132/33 kV Substation (BSP9064) in the northeast corner. Several existing Saudi Electricity Company (SEC) overhead transmission lines of various voltages (380 kV, 33 kV, 132 kV) run through and adjacent to the site, indicating existing grid connectivity.

The baseline assessment as part of the labour and human right assessment revealed that local communities primarily rely on traditional livelihoods such as agriculture, including date farming. The baseline assessment also revealed challenges in areas such as educational services, water usage and supply, health services, agriculture, and employment opportunities. Potentially vulnerable groups, including women, people with disabilities, illiterate individuals, youth and children, and migrant workers, were identified.

3. PROJECT IMPACTS

3.1. IMPACTS DURING CONSTRUCTION PHASE

During the construction of the wind power facility, various activities like land clearing, earthmoving, road building, and excavation will occur. These operations, particularly during the initial site preparation phase, will generate air emissions. The main concern for air quality is fugitive dust from disturbed soil, along with exhaust from heavy equipment and vehicles. While air pollutant concentrations at nearby human receptors are expected to be minimal as there are no settlement located in close proximity to the project site.

Construction activities will also significantly impact soil resources within the project's footprint, including areas for wind turbines, buildings, and roads. Ground-disturbing activities like clearing, excavation, and grading can lead to increased soil compaction, mixing of soil layers, and erosion by both wind and water. There's also a potential for soil contamination from equipment use, improper waste handling, or chemical stabilizers.

For the acoustic environment, key noise-generating activities will include site preparation (e.g., levelling, grading), construction and installation (e.g., concrete work, turbine installation), and drainage and road paving. The noise levels will depend on the type, size, and number of machineries, as well as local conditions.

During construction of the wind farms, partial destruction of the topsoil surface and of some deeper soil layers will occur. Additionally, few scarce vegetation will be removed, but unnecessary removal will be avoided. It is highly likely that most bird species will vacate the area for the duration of these activities. Construction activities can disturb roosting sites and foraging areas for bats. Increased

noise and human activity may drive bats away from important habitats. However, direct impacts are less severe compared to operational risks. Similarly for reptiles the primary impact is habitat disruption, particularly affecting the Spiny-tailed Lizard (Uromastyx aegyptia). Destruction of burrows and alteration of the habitat can lead to increased predation risk and habitat loss. Recorded Spiny-tailed Lizard burrows indicate a need for careful management to prevent displacement and habitat degradation.

Potential visual impacts caused by construction activities will include visual changes caused by clearance of vegetation, ancillary buildings, laydown areas and high structures that will be progressively erected. Visual disturbance caused by construction of roads, buildings, wind turbines, power lines, increased traffic (and number of large vehicles), worker presence, and dust emissions. Other visual disturbances may include soil stockpiles (from excavation for building foundations and other structures).

The project site, owned by the Ministry of Energy. The area is largely undeveloped, with the exceptions of the village of Mulayh (partially within the site but not directly affected by the project) Few temporary livestock camp we re observed within the project site however, no land acquisition or involuntary resettlement issues are anticipated. During construction, the operation of heavy machinery and the transport of materials and workers will increase noise levels and reduce air quality (due to dust and gaseous emissions) in the project area. These impacts will affect both onsite workers.

The primary economic impact during construction is likely to result from local employment creation and the use of local businesses/services during this phase. Any creation of jobs is likely to be welcome and is a net Positive social impact.

The climate change risk assessment has been undertaken in accordance with the Equator Principles IV (EQ IV) requirements to evaluate physical climate risks to key project receptors during the construction phase. Given that the project's Scope 1 and Scope 2 emissions are expected to be less than 100,000 tones, this assessment focuses exclusively on physical risks and excludes transitional risk assessments. During construction, the project may be exposed to several climate-related risks, including extreme heat, high winds and dust storms, and extreme precipitation. High winds and dust storms pose a potential threat to visibility and safety on-site.

The labor and human rights risks associated with the construction phase have been assessed in accordance with EP IV requirements. Our findings indicate that the primary risks are related to nondiscrimination, workplace safety, and labor rights. Additionally, construction activities are anticipated to pose safety risk to local communities, however these are limited to construction period only.

3.2 IMPACTS DURING OPERATIONAL PHASE

During operational phase, only a limited number of workers and limited vehicle movement will be required. Furthermore, vehicles movement is expected only during the maintenance activities. A significant advantage of this project is that it does not release air pollutants (such as NOx and SO2) that typical power plants would. As a result, the project has a positive impact on air quality.
The rotating wind turbines are the main noise generating source during operation. WindFarmer5 software, a standard industry tool, was used for the preliminary noise impact assessment from the wind turbines during operation. The assessment was based on a simple noise model which is based on ISO 9613-2.

The Project site is in a region that is notable for the presence of significant migratory bird flyways.

Importantly, there is significant general migratory bird movement throughout the Arabian Peninsula in spring (northwards) and autumn (southwards) which may also result in increased bird activity within the development site during migration periods.

Collision Risk Modelling predicted 0.508 collisions per year based on a worst-case scenario assessment, this is the equivalent of one individual every 1.97 years. This species was most active in the autumn migration period. Collision Risk Modelling predicted three (3) further target species to potentially collide with wind turbine infrastructure within the operational lifetime of the project; common kestrel (0.436 collision per year, 2.29 years per collision), long-legged buzzard (0.12 collision per year 8.97 years per collision) and black kite (0.059 collisions per year, 16.91 years per collision). For the remaining target species, no collisions were predicted within the operational lifetime of the project.

Collision with operating wind turbines is recognized as one of the key risks of wind power developments on bats. Bats which travel and hunt below tree height are typically less affected than bats which travel, or hunt higher up and therefore spend more time within the rotor swept area.

Wind turbines often have deadly effects on migratory bats including collision with blades and barotrauma caused by rapid pressure changes. Bats such as the Egyptian Free-tailed Bat (Tadarida aegyptiaca) and Kuhl's Pipistrelle (Pipistrellus kuhlii) are particularly at risk due to their flight patterns and foraging habits that overlap with turbine operation areas.

Wind turbines are visible from far distance and contrast with the viewed landscape. It can be anticipated that during certain times in the day, depending on the angle of the sun, reflection of the turbines may amplify their view, while the landscape change would be less visible in the presence of heat haze and dust.

During the operational phase, no air emissions are expected; furthermore, the potential impacts resulting from noise emissions are expected to be minor. Furthermore, the local community can be positively impacted by power generation. The only potential adverse impact on the local community that is typically associated with wind farms is shadow flickering.
During the operational phase, the project may face similar climate risks, particularly extreme heat, dust storm and extreme precipitation and flooding which could reduce turbine performance or cause shutdown, impact electrical systems, increase wear and tear etc.
Risks related to workers' rights and fair employment practices will be addressed through measures ensuring contractor compliance with labor laws and IFC requirements, regular monitoring of management plans (security, OHS, supply chain), and ongoing worker training.

4. MITIGATION MEASURES

4.1. MITIGATION MEASURES DURING CONSTRUCTION

- During construction, to avoid impact to nearby land, the contractor will follow the clearly defined transportation routes for transportation related activities. Transport routes will be identified, and training will be provided to the drivers and other employees on the designated routes in order to protect the environment and reduce encroachment on adjacent land, reduce dust fall across the site due to the movement of trucks on undesignated sand tracks and also protect the visual aesthetics of the landscape.
- Construction activities will be limited to demarcated areas. A dust control plan accompanied with dust monitoring would be developed and implemented at site.
- Dust control preventive measures will be implemented at site. This includes installing barriers at

least as high as any open stockpiles—to minimize dust movement away from the construction area during dry and windy conditions.

- Emissions from the diesel generators that will probably be used for power generation on site during construction will be minimized by using low-sulfur diesel (<1.5%) as required by IFC General EHS guidelines (2007).
- In line with IFC Performance Standard 8, If any sites of suspected archaeological value are found, a "chance find" procedure will be implemented during the construction phase of the Project, to identify any previously unrecorded archaeological sites or unidentified archaeological finds. The national regulations and requirements (e.g., Article 46 of the national Antiquities, Cultural Heritage and Museum Regime, the Saudi Commission for Tourism and Antiquities (SCTA)) will be strictly followed, as needed.
- Construction and decommissioning traffic will be managed as per the requirements of IFC EHS Standard 3.0: Community Health and Safety and IFC EHS Standard 4.0: Construction and Decommissioning. This will minimize the potential for impacts to occur because of the Park. Occupational health and safety hazards during the construction, operation, and decommissioning of wind energy facilities are generally similar to those of most large industrial facilities and infrastructure projects. The project will follow the IFC EHS Guidelines for Wind Energy (2015) to ensure health.
- A field survey will be conducted before starting construction, to ensure that there are no reptiles, mammals, or ground nesting birds at the site. Egyptian spiny tailed lizards and burrows surveys would be undertaken for the Egyptian spiny tailed lizard prior to the construction of internal roads, crane lifting pads and the construction of wind turbine generator foundations. A translocation plan will be compiled and permits from the National Center for Wildlife (NCW) will be obtained prior to any translocation and the translocation will follow best practices for humane relocation. Core habitats for mammal species of conservation concern will be mapped and no-go zones will be designated around key mammal habitats to avoid impacting on them. If avoidance is not possible artificial dens will be installed if any dens are disturbed.
- A pre-construction survey would be undertaken if required, for bats to understand bat species diversity, activity patterns, and roosting behaviors before wind farm construction begins.
- Construction activities will be scheduled outside of key bat activity periods, such as dawn and dusk, to minimize disturbances. This measure is particularly important for species like Kuhl's Pipistrelle and the Egyptian Free-tailed Bat, which are most active during these times. Transportation on and to/from the site will be minimized through efficient transport management to minimize noise and vehicle pollution. Machinery will be maintained on a regular basis to ensure smooth efficient running to control emissions and leakages
- Signage and diligent supervision of contractors will be implemented across the site.
- Hazardous materials used during the construction stage would be adequately managed, to minimize the potential risk of spillage. The project would follow recommendations included in IFC EHS guidelines and Performance Standards related to the storage of materials in double bunded areas and on hard surfacing, and the use of containment measures such as oil interceptors and spill kits.
- All labour facilities would promote fair labour practices. Labour camp would be provided with dedicated areas for food preparation, personal hygiene, and healthcare and suitable waste management facilities, sewage collection and removal facilities and health, safety, and security programs. Inspection schedules and independent audits would be carried out to ensure that standards are achieved and maintained.
- Climate Change Measures would be implemented for the following:
  - Extreme Heat:
    - Guidance to be provided to ensure machinery is shut down when not in use and stored in a

cool, dry place away from direct sunlight to prevent overheating.

- Provide training and instructions for construction workers on handling equipment prone to overheating.

— High Wind Speed and Dust Storm

- Adjust working hours based on forecasted dust storms.
- Dust management plan, emergency preparedness plan, occupational health and safety plan would be developed and implemented at site.
- During high-speed winds, Supervisors would issue stop work activities.
- Dust control measures and air quality monitoring would be implemented at site.
- Regular air quality monitoring and reporting on-site.
- Covering of materials, where feasible, to minimize windblown dust.

— Extreme Precipitation and Flood:

- Maintain an emergency stockpile of essential materials and equipment to sustain operations during temporary disruptions.
- Evacuation of the construction site in the event of rainfall flood warnings. o Relocation or protection of elements to minimize the effects of scour from high flow velocities.
- Install drainage elements such as concrete pipe culvert at the intersections with wadis to avoid waterlogged and flooding.
- Schedule deliveries and critical operations around weather forecasts to minimize disruptions.
- In case of extreme events floods like scenario, temporary flood barriers (e.g., sandbags, inflatable flood walls) in high-risk areas are to be provided.

4.2. MITIGATION OF IMPACTS DURING OPERATION

- Standard mitigation measures to reduce landscape and visual impacts would be adopted in order to minimize impacts on landscape and visual receptors. These would include all of the turbines having the same rotor diameter and hub height and turning in the same direction at broadly the same speed. Tubular steel towers reduce visual clutter and are preferred to lattice or pylon-like generator towers. Turbine transformers, in line with larger turbine designs, would normally be mounted within the machines to reduce visual clutter. If the transformers are external to the turbines, then an appropriate colour which diminishes their visual impact should be adopted in relation to the characteristics of the site and surrounding landscape. The turbines would all be a similar colour and finish so as to promote visual integration.
- A detailed noise assessment for operation will be conducted by the operator during the next phase of the development and based on detailed engineering to assess the potential impacts and proposed the suitable mitigation measures as needed.
- The shadow flickering modelling will be revisited once the layout of the proposed Project is finalised to ascertain the extent of the effects (if any) on the population.
- Wind turbines will be subject to continuous monitoring and regular maintenance such that the likelihood of blade throw is unlikely and rare.
- Low wind speed curtailment (by raising the cut-in speed of wind turbines and/or feathering turbine blades) has proven effective at reducing birds and bat mortality at wind farms. Operational mitigation measures (i.e., a shutdown on demand) will be considered as the most appropriate to mitigate the risk. This will be further assessed based on the detailed design on the proposed Project.
- Active turbine management such as curtailment and shut-down on-demand procedures will be considered as part of the mitigation strategy at an early stage. This method of mitigation should be adaptive and guided by a well-developed post-construction monitoring program.
- Curtailment and shut-down on-demand measures would initially be carried out as an experiment, with turbines that are not curtailed and with both sets carefully monitored, to determine whether the curtailment is producing the desired fatality reduction. Technology-led turbine shutdown would be considered in certain cases, although any such system should be subject to a period of observer-led ground truthing and evaluation through a process of adaptive management.
- The project would avoid creating artificial features in the environment that could attract birds and bats to the wind energy facility, such as water bodies, perching or nesting areas, novel feeding areas, and/or roosting habitats. Capping or fixing any cavities in walls or buildings helps to remove potential bat roosting sites.
- It is recommended to avoid attracting birds to predictable food sources, such as on-site or off- site waste disposal areas. These measures may also need to be carried out in the surroundings of the wind park in order to be effective.
- Landscaping on the site would include indigenous/native plants that have minimum water and fertilizer requirements. An integrated pest management plan would be developed which uses organic pest management products in preference to large-scale pesticides.
- Transport routes on site and training will emphasize that vehicles and employees should keep to the designated routes to prevent unnecessary land encroachment, thus protecting the natural resources and reducing dust emissions, limit speeds in areas eventually known to be occupied by special status species and minimize foot traffic in undisturbed areas.
- An efficient waste management plan will be developed and implemented at site to prevent waste from polluting the Project site and promote sustainable management of waste.
- Install ultrasonic deterrents on turbines would be installed to discourage bats from approaching. These

devices emit high-frequency sounds that are unpleasant to bats, helping to keep them away from turbine blades.

- Implement blade feathering (changing the angle of turbine blades to reduce rotation speed) during low wind conditions. This reduces the operational risk to bats by minimizing the speed and therefore the potential for collision and barotrauma during low wind periods when bats are most active.
- Non-blinking, low-intensity lighting on turbines would be considered, which is less attractive to nocturnal birds and bats compared to traditional, continuously blinking lights.
- To the extent possible, minimize the number of areas where wildlife could hide or be trapped
- Regularly monitoring of the Project site, access roads, and ancillary facilities would be carried out for invasive non-native plant species establishment. Initiate control measures immediately upon evidence of invasive species introduction or spread.
- Develop and implement spill management plan. Address spills immediately per the appropriate spill management plan, and initiate soil clean-up and soil removal if needed. The project will follow recommendations included in IFC EHS guidelines and Performance Standards related to the storage of materials in double bunded areas and on hard surfacing, and the use of containment measures such as oil interceptors and spill kits.
- A minimum of five (5) years post construction bat monitoring by experienced ecologist during peak activity period to undertake the following:
    - Acoustic Monitoring:
    - Deploy ultrasonic bat detectors for a minimum of 5 years post-construction.
    - Monitor bat presence and activity patterns.
- Bat Carcass Monitoring
- Climate Change Measures:
    - Extreme heat:
        - Though mitigation measures are in place, they are not currently activated and will only be triggered when required. Current forecasts indicate temperatures may exceed 45°C, potentially impacting energy yield. Therefore, further studies at hub height are recommended to analyse the combined effects of temperature and wind on energy yield, enabling proactive planning and ensuring optimal turbine performance as conditions change avoiding downtime.
    - High wind speeds and dust storm:
        - Where feasible, pave critical access routes or compact soil to prevent excessive dust. Limit vehicle speeds and restrict movement during extreme dust storms to reduce airborne particles. Provide workers with protective gear, implement real-time weather monitoring, establish emergency response protocols including designated safe zones and emergency communication channels during severe dust storms and conduct training to educate workers on dust storm hazards, symptoms of respiratory distress, and safe evacuation procedures.
    - Extreme Precipitation and Flood:
        - Maintain an emergency stockpile of essential materials and equipment to sustain operations during temporary disruptions.
        - Schedule deliveries and critical operations around weather forecasts to minimize disruptions.
        - Use temporary flood barriers (e.g., sandbags, inflatable flood walls) in high-risk areas.

5. STAKEHOLDER ENGAGEMENT

The Stakeholder Engagement Plan was prepared for the project. This plan involves identification of all stakeholder groups and interested factions with a channel of communications between the stakeholder groups and the Project developer. The S E P included various engagement methods for the different proposed activities. The SEP also outline the grievance mechanisms for the Project in order to monitor grievances and identify any recurrent issues or escalating conflicts. Including but not limited to the following:

- Implementing a grievance mechanism and ensure the responsiveness of this mechanisms to concerns and complaints
- Receiving and logging all comments and complaints associated with the project
- Responding to such complaints and comments wither verbally or in writing

Lastly, the SEP emphasizes the importance of monitoring stakeholder engagement activities in order to ensure that the consultation and disclosure efforts are sufficient and effective throughout the process.

4.3. PUBLIC CONSULTATION/ENGAGEMENT TO DATE

Engagement/Public consultation were conducted as part of the ESIA process. This engagement took place on 4 August 2021. Due to COVID-19 pandemic restrictions, the meeting was held through means of video conference. The meeting was attended by representatives from different stakeholders including but not limited to:

- National Centre for Environmental Compliance (NCEC)
- National Centre for Wildlife (NCW)
- Ministry of Environment, Water and Agriculture (MEWA)
- Ministry of Tourism
- The Public Authority for Transport
- Ministry of Transport and Logistic Services
- Ministry of Municipal, Rural Affairs and Housing
- Saudi Railway Company
- Ministry of Defence
- Communications and Information Technology Commission (CITC)
- The Saudi Authority for Industrial Cities and Technology Zones (MODON)
- General Authority of Civil Aviation (GACA)
- Heritage Commission
- Saudi Ports Authority

During the session, the different Project aspects were discussed including but not limited to components as well as the potential positive and negative impacts of the Project. Attendees were supportive of the concept of the renewable energy program and the development of the proposed Project.

6. PROJECT JUSTIFICATION

The proposed Project has a number of significant positive impacts. A summary of the potential gains and losses associated with the Project is presented below in Table below.

Aspect	Gains	Losses
Environmental	• GHGS reduction (approximately 686,710 metric Tonnes of CO_2 per year) • Energy production from renewable resources •	Limited negative impacts on the environment (e.g., increased noise levels) during construction and operation phases as detailed in section 6.3. However, applying the proposed mitigation measures outlined in section 7.1 will further minimize these impacts. Damage to electrical systems and other critical components, due to extreme precipitation and floods, which may result in short-circuits and increased wear and tear on the wind turbine blades due to heavy rainfall. Considering the exiting mitigation measures, the impacts is anticipated to be minimum.
Social	• Energy production (600 MW) • Job opportunities creation during the different phases of the project • Purchasing of materials, especially during the construction phase will have indirect positive impacts on the local community due to the improved economic conditions	Limited nuisance to the local community and onsite workers especially during construction phase is expected. However, these impacts are limited in duration and magnitude as well. More details are presented in section 6.2. However, applying the proposed mitigation measures outlined in section 7.1 will further minimize these impacts Unsafe working conditions on-site may lead to restricted work and possible operational interruptions. However, with the application of the mitigation measures. The impact due to high winds and heat waves will be minimum
Economic	• Purchasing of materials, especially during the construction phase will have direct positive impacts on the local economy. • Power generation (approximately 600 MW)	Overheating of wind turbine components, reduced efficiency, increased maintenance needs, and accelerated wear and tear. When temperatures exceed 45°C, turbines may automatically shut down to prevent damage.However, applying the proposed mitigation measures outlined in the Climate change Report the impact is anticipated to be low.