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Strategic Environmental and Social Assessment of Wind Energy Projects in the East Nile Region (Arab Republic of Egypt)

Non-Technical Summary (NTS) of the Final Draft SESA Wind Report




May 2018

New and Renewable Energy Authority (NREA)
Ministry of Electricity and Renewable Energy

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Strategic Environmental and Social Assessment of Wind Energy Projects in the East Nile Region (Arab Republic of Egypt)

Non-Technical Summary (NTS) of the Final Draft SESA Wind Report

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Report Status: Approved

Revision History:

Revision	Date	Author	Checked by	Approved by	Description
01	04.10.2017	Dr. Frank Bergen Dr. Ernst Niemann Tony Moens de Hase Dr. Omneya Nour Eddin Matthias Drosch	Matthias Drosch	Matthias Drosch	NTS of the Draft SESA Wind Report
02	22.12.2017	Dr. Frank Bergen Dr. Ernst Niemann Matthias Drosch	Dr. Frank Bergen Matthias Drosch	Dr. Frank Bergen Matthias Drosch	NTS of the Second Draft SESA Wind Report – considering comments from NREA and EBRD
03	25.05.2018	Dr. Frank Bergen Dr. Ernst Niemann Matthias Drosch	Dr. Frank Bergen Matthias Drosch	Dr. Frank Bergen Matthias Drosch	NTS of the Final Draft SESA Wind Report – considering comments from NREA and EBRD

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1 Objective and Scope

1.1 Objectives and Scope of the overall SESA Process

The Government of Egypt (GoE) has identified three large areas suitable for development of Renewable Energy (RE) farms for both wind and solar energy projects in Egypt. Among these, an area of 2,200 km^2 with a usable area of 1,725 km² (425 km^2 were excluded due to military height limitations, see section 2) located to the east of the Nile River across three Governorates – Beni Suef, El Minya and Assiut, which have been identified based on existing data on solar and wind potential and existing land-use (the "Project Area", see section 2). To ensure a strategic level assessment of potential environmental and social issues associated with the development of such projects and to inform the decision-making process for project development, two Strategic Environmental and Social Assessments (SESAs) have been conducted. A SESA is a systematic decision-support process that helps to ensure that environmental, social and other sustainability aspects are considered effectively in policy, planning and programme making. The SESA process for the Project area has the following objectives:

- To provide a reliable source of environmental and social data for the Project Area to inform RE development plans, environmental permitting and project financing.
- To identify eventually existing zones of technical or social constraints for RE development within the Project Area.
- To identify and assess potential environmental and social impacts associated with RE project development and operation in the Project Area and define mitigation and management measures to address these potential impacts, including recommendations on arrangement of plots for individual wind or solar power projects.
- To identify zones in the Project Area, which are suitable for RE development based on the outcome of the environmental and social impact assessment.
- To engage with stakeholders, including members of the public on the planned development of RE projects in the Project Area.
- To develop a Geographic Information System ("GIS") database, which will be used to inform future RE projects.
- To determine the spatial distribution of wind and solar power potential of the area.
- To identify and outline the best possible areas for wind power and solar power development considering technical, environmental and social RE power potential aspects.
- To identify eventually existing further requirements (data procurement/measurements, studies, administrative) for RE development on the identified areas.

In addition, during the SESA course, the SESA consultant provided training to the staff of the New and Renewable Energy Authority (NREA) on SESA, Environmental and Social Impact Assessment (ESIA) and GIS.

Major elements of the assessment were field surveys such as general area reconnaissance, ornithological field monitoring over three migration periods (spring 2016, autumn 2016 and spring 2017) and other surveys (e.g. flora and fauna, land-use and other social aspects).

1.2 Objectives and Approach of the SESA Wind Report

This subject report, the SESA Wind Report, focuses on the social and environmental assessment to define the suitability for wind power development within the greater East Wind-1 and East Wind-2 subareas identified by NREA, considering technical, social or environmental constraints.

Considering the environmental, social and technical attributes and the significance of predicted impacts that the study identifies

- areas that are favourable for wind power development
- areas that are less favourable, but can be developed with restrictions, and
- areas in which wind power development is precluded.

The results, which are also entered into a GIS database, are mapped by overlaying the hard criteria and predicted impacts. Thus, within the SESA Wind Power Report, areas are classified from the point of view of social and environmental criteria as well as of the physical-technical constraints. A further differentiation within the subareas of equal technical, environmental and social suitability (favourable or less favourable) will take place according to the spatial wind power distribution, which, however, is not part of this report and will be dealt with in the separate Final Recommendation Report.

This SESA Wind Power Report is analogous to a regional ESIA study for the East Wind-1 and East Wind-2 subareas. It shall facilitate the later environmental permitting for the intended 50 MW wind power plots of private investors.

2 The Project Area

The East Nile Area originally refers to an area of 2,200 km² with a usable area of 1,725 km² and is mainly located in the Governorates of El Minya. Smaller portions are extending to the Assiut Governorate in the South and to the Beni Suef Governorate in the North (see Map NTS 2–1). With the modification in 2016, three subareas with a total of 425 km² were excluded from further RE developments due to military height limitations ("zero height", see Map NTS 2–1) leading to five subareas for wind (East Wind-1 and East Wind-2) and solar power (photovoltaic) development (East Solar-1, East Solar-2 and East Solar-3) defined by NREA. This report comprises the SESA Wind Report for the East Wind-1 and East Wind-2 subareas.

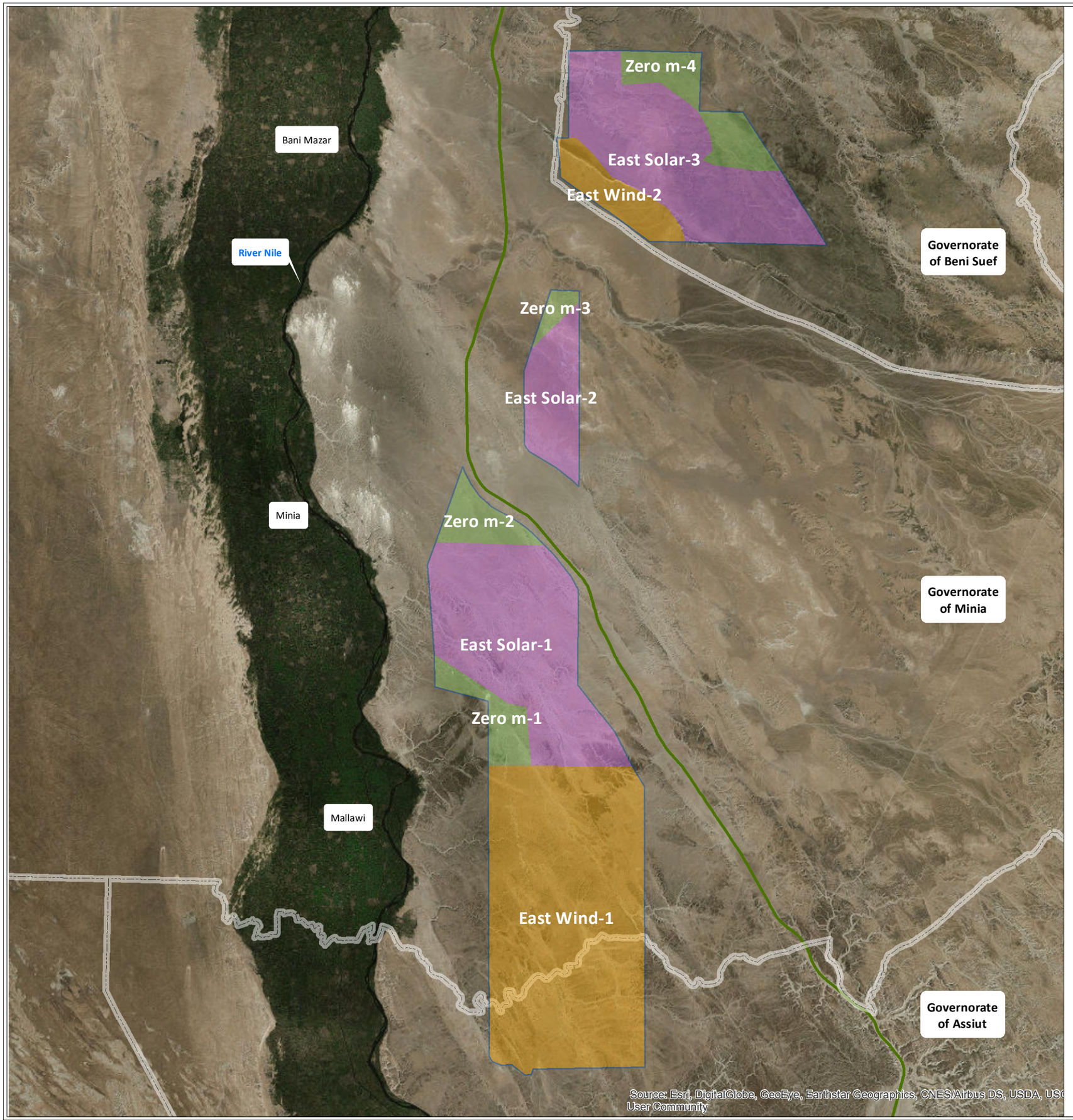
The Project Area is located in the Eastern Desert consisting of a rolling sandy highland that rises abruptly from the Nile Valley and merges some 80 to 170 km east of the Nile into the Red Sea Mountains.

East-Wind 1
The East Wind-1 subarea stretches over nearly 43 km from the North to the South at a minimum distance of 12 km east of the River Nile. The maximum width of this subarea is about 22 km (total area of about 750 km²). It is mainly located in the area of the Governorate El Minya, whereas the very south is located in the Governorate Assiut. The El Minya – Assiut National Road runs in a southerly direction through this subarea.

East-Wind 2
The East Wind-2 subarea is located at a minimum distance of about 25 km east of the Nile Valley in the area of the Governorate Beni Suef. In the south, the El Shaikh Fadel - Ras Ghareb Road borders this subarea. At a distance of about 8 km, the Cairo - Aswan Highway runs from south to north. The maximum extent of this subarea is about 20 km from the north-west to the south-east and about 4 km from the south-west to the north-east (total area of about 79 km²).

In the SESA Wind Report, the following terminology is used to distinguish between different areas:

- Project Area: whole area useable for RE developments (1,725 km²)
- Subareas: East-Wind 1 or East-Wind 2 subarea
- Zones: favourable, less favourable and preclusive zones as defined under section 5 and 6 of the SESA Wind Report.



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SESA Wind Report

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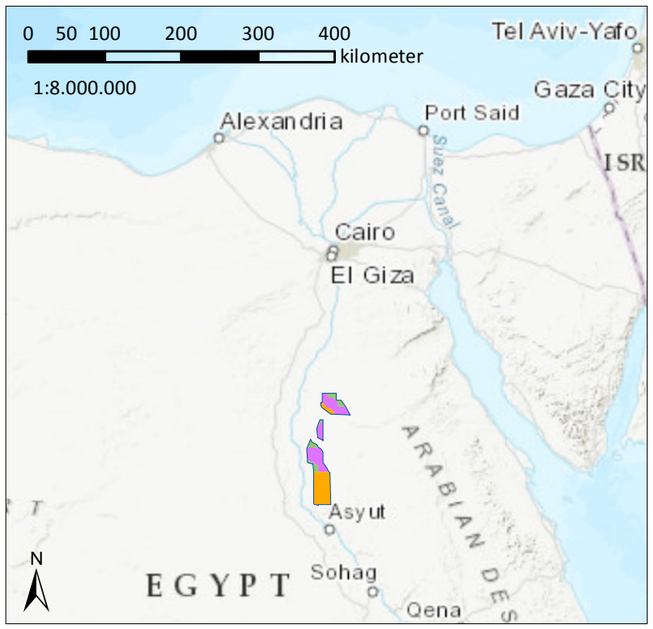
Map NTS 2-1:
Overview of the location and the extent of the Project Area and of different subareas based upon already prescribed height restrictions for RE developments

Bordering of project area and subareas

- project area
- subarea not useable for RE developments (due to height restrictions "Zero")
- subarea usable for PV solar power projects (due to height restrictions "5 m")
- subarea usable for wind power projects (due to height restrictions "150 m")
- borders between governorates
- Assiut - Cairo Desert Road (motorway)



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3 Legislative Framework and International Environmental and Social Standards

The SESA Wind Report will take into account Egyptian legal and regulatory framework, EBRD Performance Requirements and the Equator Principles. Whilst compliance with Egyptian legal and regulatory requirements is obligatory, the SESA will adopt the strictest requirements, Egyptian or international, whichever is strictest. Thus, the conditions for later international project financing shall be fulfilled.

4 Description of a Typical Wind Power Development in the Area

Typical features of a wind farm are:

- Three-bladed wind turbines (wind turbine generator or WTG) of the 3 MW class with rotor diameters of about 100 to 120 m and a maximum tip height of 150 m above ground, installed in rows from east to west (considering the predominant wind direction from north) at about 250 to 350 m distance along the rows. The distance between rows will be about 800 m to 1,200 m.

- A medium voltage wind farm internal grid made by an underground cable. Kiosks for ring main stations might be installed next to each WTG or inside the WTG tower.

- High voltage substation for power evacuation at high voltage level and high voltage overhead transmission lines (OHTL). Collector substations and OHTL shall serve for the power evacuation of several 50 MW wind farms combined. As existing power lines are already loaded, new OHTL will have to be built up to the Load Centres.

- Internal wind farm gravel roads of about 8 m in width as well as construction platforms of compacted gravel (hard stands) with dimensions in the order of 150 x 100 m mainly depending on the dimensions of the WTG blades.

- External access roads from existing road network.

- Service facilities such as possibly a control room, spare part stores, workshop and facilities for service personnel inside or outside the Project Area.

Wind farm construction works typically extend across 6% to 8% of the overall wind farm plot, while this is reduced to about 5% of the land once the wind farm is operational. More than 90% of a wind farm area will remain untouched. To a major extent, the natural environment can be preserved and/or other economic activities in the area can continue or be initiated in parallel to wind power utilisation.

4.1 Construction Works

Construction works for a typical wind farm project consist of civil, electrical, transport and installation works. Major elements of civil works are the construction of concrete foundations, cable trenches, roads and platforms as well as auxiliary buildings (e.g. service buildings, control room, substation).

Foundation bodies for a 3 MW class WTG usually involve a ring foundation with diameters of about 20 m and a depth of about 3 m. This requires excavation of foundation pits, construction of formwork and reinforcement, concreting of about 500 m³ and backfilling of excavated materials. Aggregates for concrete (Cement, river gravel, water) need to be procured from external sources.

Roads will be gravel roads of a width of 5 to 8 m mainly depending on transport requirements and with a two-layer road body of about 0.4 to 0.5 m in depth. The road alignment need to consider

maximum gradients of about 6 to 8 %, what in complex terrain requires thorough planning balancing cut and fill. Gravel can be collected from nearby gravel deposits. Gravel needs to be compacted in layers by rollers and spraying water. For the erection platforms with dimensions of about 150 x 100 m next to each WTG, the same principles apply as for road construction.

Further civil works are the excavation and backfilling of cable trenches (with a depth of about 1 m and a width of 1 to 2 m). Service buildings for storage and control may be erected at the wind farm site or its surroundings.

Wind farm construction of 3 MW class WTG requires special transport for parts of the WTG and the substation. Critical parts are the WTG blades with a length of 50 to 60 m, the nacelle with a weight of 60 to 80 t and the power transformers with a weight of more than 100 t.

Major elements of electrical works are construction of the wind farm internal Medium Voltage (MV) grid and collector substation. For wind turbines of the 3 MW class MV, step-up transformers are part of the WTG. Moreover, the WTG internal switchgears serve as well as the ring main station. Therefore, no external kiosks will be required.

4.2 Operation and Maintenance Works

Operation and maintenance (O&M) activities comprise the regular control/operation of the wind farm as well as troubleshooting, repair and scheduled maintenance. Considering that wind farm operation can be done by remote control, concerned activities for a 50 MW wind farm are usually limited and do not require the permanent presence of personnel at the site. Nevertheless, O&M personnel should be available within 24 hours for troubleshooting (e.g. change of fuses, replacement of sensors, checking and restarting WTGs) to avoid loss of generation. For the O&M, a standard set of weir and spare parts would need to be stored near to the site to have that available to not cause delay and loss of generation. Accordingly, a storage building needs to be maintained not too far away from the site.

4.3 Decommissioning Works

The design lifetime of WTGs is about 20 years. Modern WTGs may even be operated over longer periods. The design lifetime of the other infrastructure (substation, buildings) is even longer. Decommissioning means the removal of the WTGs with their foundation and of the electrical infrastructure. Existing gravel roads are fitting for the desert environment and do not need to be removed. Decommissioning means a large potential for recycling and recovery of valuable components and metals and thus corresponds to commercial interest.

5 Methodology and Approach

5.1 Stakeholder Engagement and Public Consultation

The SESA approach to stakeholder engagement and disclosure is captured in the Stakeholder Engagement Plan (SEP), which is attached to the Scoping Report (see Annex A1 of the SESA Wind Report). The SEP is seen as a living document which was implemented and updated during SESA development, SESA disclosure and during RE project development in the Project Area, if necessary. In the SEP, the SESA stakeholders are identified, considering the various stages when stakeholders, including the public, are engaged and how, the different type of information is disclosed during and after the SESA process.

As the first step in stakeholder engagement and information disclosure, the draft Scoping Report was issued, following submission to the NREA on 27 June 2016, and was circulated to various key stakeholders, including those in the three Governorates, together with an invitation for the scoping meeting, held on 12 July 2016 at the NREA offices in Cairo. The draft and final Scoping Report, which considered the comments from the stakeholders received during the scoping meeting, have been disclosed on the homepages of the NREA and EBRD accordingly.

During the various site reconnaissance missions of the Consultant's experts, people who have been encountered accidentally in the Project Area have been addressed and project information flyers in Arabic have been distributed (see Annex C of the SESA Wind Report). The results of all interviews were documented on interview forms (see Annex D of the SESA Wind Report). A summary of the received feedback can be found in the SESA Wind Report under section 5.3.1.8 of the SESA Wind Report.

Further, key stakeholders such as the regional Governorates of El Minya and Assiut were visited on 4 October 2016 and 31 October 2016 (El Minya and Assiut) and on 7 November 2016 (Assiut), respectively. In addition, Governorates were informed and asked to raise comments via fax, email or mail by NREA.

The scope of the SESA Wind has been defined at an early stage in the SESA process through a scoping study (results were documented in a separate report and submitted in October 2016 as mentioned above). The scoping determined which impacts are likely to be significant and will become the main focus of the SESA. Scoping also identified data availability and data gaps. The scoping process determined the appropriate spatial and temporal scopes for the assessment and suggests suitable survey methodologies.

The Final Draft SESA Wind Report as well as the Final Draft SESA Solar Report will be disclosed to stakeholders and to the public and will be discussed during a public hearing, following the local procedures and the EBRD`s Environmental and Social Policy. Consequently, the Final Draft SESA Reports will be disclosed on the homepages of the EBRD and NREA, plus direct notification to registered stakeholders including public notification of report availability. For private sector projects, EBRD's Environmental and Social Policy requires a minimum disclosure period of 60 days, and 120 days for public sector projects. Given the fact that the SESA is the first assessment for subsequent privately financed projects, it has been accepted by the EBRD to apply the minimum disclosure period of 60 days.

The public consultation process aims to minimise potential negative environmental and social impacts, strengthen social acceptance of the project, informing the concerned parties that the environmental and social impacts will be minimised to levels that are low as reasonably practical and achieve the balance between legitimate requirements for development and environmental protection.

The public hearing should take place after the Final Draft SESA Reports have been available for an appropriate period of time. After the public hearing, the stakeholders are afforded at least a month to provide comments. The final version of the SESA Reports will be prepared based on these relevant comments and remarks received during this process and will be disclosed again. In addition, the Final Recommendations Report will be disclosed as well, following the same guideline.

5.2 Baseline Studies on the Existing Physical, Biological and Social Environment

Baseline data on the physical, biological and social environment of the Project Area was investigated by:

- Desktop studies, i.e. by a review of existing literature, an investigation on data officially available by the Egyptian Environmental Affairs Agency (EEAA) and on existing data available on the World Wide Web and via available satellite images,
- Approach of the administration of the Governorates for inquiry of data and information,
- Interviews with local people, and
- Several special field investigations inside and next to the Project Area between spring 2016 and spring 2017.

The focus of the physical environment investigation was on climate, geomorphology, hydrological conditions and water resources.

To describe the biological environment of the Project Area, baseline data on protected areas, habitats, flora and fauna was collected with a special focus on migrating, roosting and local birds, as certain birds species are known to be affected by wind turbine operation. In this context, an extensive bird monitoring was undertaken in spring 2016 (1 April to 25 May, i.e. the second and third parts of the spring season), autumn 2016 (20 August to 15 November) and spring 2017 (20 February to 31 March, i.e. the first third of the spring season). The main objective of the standardised monitoring was describing migration patterns of relevant species in a quantitative way. In 2016, only a part of the spring migration period could be covered due to the monitoring starting late. For that reason, the monitoring in spring 2017 aimed to cover the missed part. The results gained in spring 2016 and 2017 are very consistent. Hence, one can conclude that the approach of dividing up the survey on spring migration into two phases in different years was appropriate. Spring migration in the area was fully covered by this approach. The split of the survey did not affect the main findings on bird migration in spring and, hence, there was no need for any adjustments on the approach (e.g. overlapping of survey periods in 2016 and 2017) in order to increase the explanatory power of

the data. Furthermore, the occurrence of bats was investigated at certain plots in the Project Area in spring and autumn 2016.

The focus of the investigation of the social environment was on general and administrative issues, existing infrastructure such as paved access roads and power grid, current land-use and sociological conditions.

5.3 Technical and Land-use Criteria for Classification of Area as preclusive of less favourable

Based on the information gathered, the East-Wind-1 and East Wind-2 subareas were screened with regards to constraints due to competing land-use and technical constraints, which impede wind power development or make it more difficult. This leads to areas defined to be preclusive, i.e. not usable for wind energy developments, or to be less favourable. In this context, the relevant criteria were: accessibility/remoteness, geomorphology and competing land-use (e.g. farming).

5.4 Basic Approach for the Impact Assessment

An impact is defined where project activity-receptor interactions occur. According to ISO14001:2004, an impact is defined as: “Any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organisation`s environmental aspects (activities, products or services)”.

Once the impacts, either adverse or beneficial, are fully understood, it is necessary to judge the significance of each impact and to determine whether it is acceptable, requires mitigation or is unacceptable. Within the assessment process, impacts are ranked according to their “significance” which is a function of “event magnitude” and “receptor sensitivity”. Determining event magnitude requires the identification and quantification (as far as practical) of the sources of potential environmental and social effects from routine and non-routine project activities. Event magnitudes are classified according to the extent, frequency, duration and the intensity of an event as low, medium or high. Receptor sensitivity requires an understanding of the physical, biological and social environment. Criteria for the assessment of receptor sensitivity (low, medium, high) are for instance: the area of influence, percentage of resource affected, persistence of effects and sensitivity of resources. Impact significance is obtained by superimposition of event magnitude and receptor sensitivity with an overall classification in four attributes: negligible, minor, moderate or major.

6 Existing Environment

6.1 Physical Environment

The Project Area and its surrounding are characterised by a hyper-arid desert climate with high temperature differences between night and day of more than 15°C. The average maxima vary between 19°C (winter) and 37°C (summer). The monthly means vary between 12°C and 29°C at the nearest met stations. Precipitation was measured sporadically (1 or 2 mm) during winter months only. However, that does not mean that uncommonly convective heavy rains of high intensities may occur at rare intervals, such as in October 2016.

The underground of the Project Area is formed in the Eocene. It consists of thick marine limestone with chert and minor clay beds. It is overlain by layers of gravel and sand of limited depth in general varying from few centimetres to 1 or 2 metres at Wadibeds and hangs. In some subareas to the south of the East Wind-1 subarea, the upper layers contain blocks and bombs of an unknown nature. The assessed geological map shows one major fault line forming an escarpment of more than 100 m height difference, which is partly inside the East Wind-2 subarea. Otherwise, the two subareas are mostly uniform, consisting mostly of slightly undulated land, except for some cuts by major Wadis in the East Wind-1 subarea, especially in the southern and western part. All Wadis have a moderate slope and sandy underground. The Wadibeds were free from erosion marks (e.g. accumulation of stones) that indicate any major water flow that occurred at rare frequency.

Figure NTS 6-1: View over the low part of the East Wind-2 subarea to the fault line (cliff) in the background

In general, the areas show good foundation conditions (except the cliff at in the East Wind-2 subarea). Soft soils or migrating sand dunes are not observed in the two East Wind areas. However, due to the marine limestone underground, the subsurface may contain caves.

An evaluation of the physical environment with regards to technical and land-use aspects, according to the defined criteria, leads to the following conclusions:

East Wind-1 subarea (see Map NTS 6-1)

- No preclusive zone was identified due to accessibility.
- No preclusive zone was identified due to geomorphology, however some zones were identified to be less favourable due to the inhomogeneous geomorphology (steep slopes, small ridges).
- With regards to land-use, the following areas are preclusive for wind power development:
  - Small roadhouse subarea at the road crossing in the north-west,
  - Farmland already existing, even connected to the MV line along the El Minya – Assiut National Road and the other portion is currently developed) in the south-west, and
  - Asphalt plant and farmland partly existing, partly under development in the south.

East Wind-2 subarea (see Map NTS 6-2)

- No preclusive zone was identified due to accessibility.
- Geomorphology: The fault line (cliff) is unstable and prone to continuous erosion, thus, accumulating rock and gravel material at its footing. Moreover, the wind, predominantly blowing from the north, transports sand towards the luv side of the cliff, causing the accumulation of fines at the footing. Occasional rains sometimes cause runoff over the rim of this escarpment causing erosion by water flow. Accordingly, the cliff area itself and its near environment (about a 300 m border zone on top and about a 1 km zone from the footing) are assessed to be unfit for wind power development (preclusive area).
- With regards to land-use, the following area is preclusive for wind power development: Farming and farmland development was identified in the lowlands of the East Wind-2 subarea.

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Map NTS 6-1:
Zones preclusive or less favourable
for wind power development in the East Wind-1 subarea

Bordering of East Wind-1 subarea

East Wind-1 subarea

Main road

main road

Zones preclusive for wind power development

due to farming area

due to industrial area

due to service buildings

Zones unfavourable for wind power development

due to geomorphology

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Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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Map NTS 6-2:
Zones preclusive or less favourable
for wind power development in the East Wind-2 subarea

Bordering of East Wind-2 subarea

East Wind-2 subarea

Main road

main road (Ras Ghareb-El Sheik Fadl road)

Zones preclusive for wind power development

due to farming area

due to geomorphology

Zones unfavourable for wind power development

due to acess accessibility

0 5.000 Meter

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Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

6.2 Biological Environment

East Wind-1 subarea

The investigation reveals that there exist no legally protected site / area, no national park or important bird area and no internationally recognised area of biodiversity value in the East Wind-1 subarea or its surrounding.

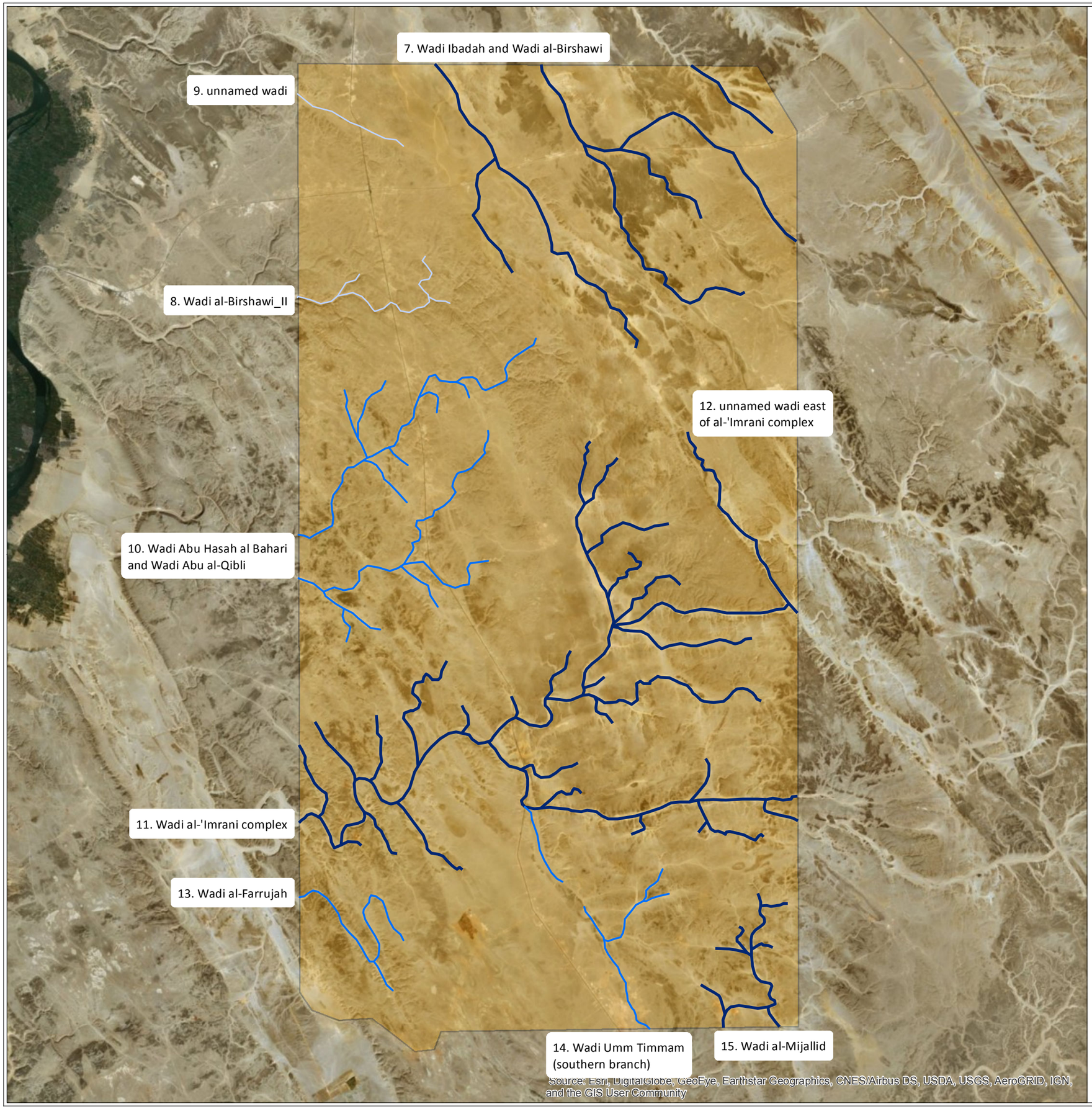
Due to the extreme aridity of the Eastern Desert, the gravely and pebbly plains, elevated areas and small hills within the East Wind-1 subarea do not serve as a suitable habitat for plants. Hence, large parts of the subarea have a very low to no importance as a habitat for plants and animals.

No Wadi within the East Wind-1 subarea was assessed to have a very high or high importance as a habitat for plants and animals. Wadi Ibadah and Wadi al-Birshawi in the very north, the Wadi al-'Imrani complex and the unnamed Wadi east of 'Imrani complex and, finally, Wadi al-Mijallid in the south provide appropriate living conditions for single plant and animal species and, thus, differ remarkably from the vast desert habitats dominating the East Wind-1 subarea. The aforementioned Wadis are important for plants and animals (see Map NTS 6–3). The importance of all other Wadis as a valuable habitat for plants and animals was assessed to be low or very low.

As caves form particular structures in the desert offering habitats for animals, caves in the East Wind-1 area, which can be particularly found in the canyon-like Wadis and on slopes, are important as a habitat for plants and animals.

Most parts of the East Wind-1 area are completely without vegetation. Plants can only be found in the Wadis. Even there, the vegetation is neither rich in species nor dense in populations. All species recorded in the Wadis of the East Wind-1 subarea are considered to be of “Least concern” in the IUCN Red List of Threatened Species. Hence, besides the Wadis mentioned above, the East Wind-1 area is not important for plants.

According to the findings of the comprehensive investigation on bird migration in the East Wind-1 subarea conducted in spring 2016, autumn 2016 and spring 2017, bird migration of relevant species revealed no remarkable spatial differences between the 16 observation sites. Migratory activity was low at every observation site (for detailed data, see Annex B5 of the SESA Wind Report). No threatened species was recorded during spring migration (both, in 2016 and 2017). In autumn 2016, four species of special interest (according to the IUCN Red List of Threatened Species) occurred in low numbers: the Egyptian Vulture (5 birds), Steppe Eagle (22 birds; both species assessed by IUCN as “Threatened”), Pallid Harrier (8 birds) and Sooty Falcon (7 birds, both species assessed as “Near-threatened”). All other species which are particularly relevant for the study have been classified by IUCN as of “Least concern”. A relevant portion of the eastern flyway population of the Short-toed Snake Eagle crossed the East Wind-1 subarea in autumn. However, one has to acknowledge that the subarea covers a huge part of the Eastern Desert, extending about 20 km from west to east and about 40 km from north to south and that there is no indication of a concentration of migrating Short-toed Snake Eagles in the subarea. The species can be regarded as a regular migrant, but the subarea is not of particular importance for migration of this species. In addition, Short-toed Snake Eagle is assessed by IUCN as of “Least concern” and is thus not a threatened species. To summarise, the results clearly reveal that the East Wind-1 subarea is not of particular importance for migrating birds – neither in spring nor in autumn. This is valid for species of special interest and for species of minor relevance which mainly migrated on a broad front.



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Map NTS 6-3:
Assessment of the importance of main wadis in the East Wind-1 subarea as a habitat for plants and animals

Bordering of East Wind-1 subarea

East Wind-1 subarea

Importance of main wadis
(note: no wadi was assessed to have a high or very high importance)

- wadi of importance
- wadi of low importance
- wadi of very low importance

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Single sedentary birds species that are adapted to the harsh climatic conditions of the Eastern Desert can find a suitable habitat in the larger Wadis in the East Wind-1 subarea, in particular, Wadi Ibadah and Wadi al-Birshawi, the Wadi al-'Imrani complex and the unnamed Wadi east of the 'Imrani complex and, Wadi al-Mijallid, which comprise patches of vegetation. However, the obtained results clearly show that the local bird community is very poor in species and bird density is very low. The species recorded in the East Wind-1 subarea are quite widespread and can be found in several desert habitats in Egypt. According to the IUCN Red List of Threatened Species, no recorded species is assessed as endangered or threatened. Consequently, the East Wind-1 subarea is not an important habitat for local birds.

The larger Wadis in the East Wind-1 subarea (see above) also form a stopover habitat (mainly for a single day) for passerines during migration. However, according to the low numbers of roosting birds, the East Wind-1 subarea has no significant importance as a roosting habitat.

In addition, the larger Wadis form suitable habitats for single animal species from different groups (mammals, reptiles, insects, spiders). However, the obtained results of the investigation clearly show that the local fauna is poor in species and density is low. The species recorded in the East Wind-1 subarea are quite widespread and can be found in several desert habitats in Egypt. None of the recorded species is known to be endangered or threatened. Consequently, the East Wind-1 subarea is not an important habitat for other animals.

The review of secondary data revealed that desert areas, like the East Wind-1 subarea, are usually not populated by bats (Hoath 2009). Consistently, the activity of bats within the East Wind-1 subarea was found to be very low during the conducted bat monitoring. The subarea apparently does not serve as a significant habitat for bats.

To conclude, in the East Wind-1 subarea, no zones preclusive for wind power development with regards to the biological environment were identified.

East Wind-2 subarea

The investigation reveals that no legally protected site or area exists, nor any national park nor important bird area or internationally recognised area of biodiversity value in the East Wind-2 subarea or its surrounding area.

Due to the extreme aridity of the Eastern Desert, the gravely and pebbly plains and the huge cliff within the East Wind-2 subarea do not serve as a suitable habitat for plants. No larger Wadi exists in the subarea and, thus, it is nearly completely free of vegetation. The East Wind-2 subarea has a very low to no importance as a habitat for plants and animals.

Caves likely to be found at the huge scarp (fault line) might form particular structures in the desert in offering habitats for animals. Hence, such caves are important as a habitat for plants and animals.

According to the findings of the comprehensive investigation on bird migration in the East Wind-2 subarea, conducted in spring 2016, autumn 2016 and spring 2017, bird migration of relevant species revealed no remarkable spatial differences between sites. Migratory activity was low at both observation sites (for detailed data, see Annex B5 of the SESA Wind Report). No threatened species was recorded during spring migration (neither in 2016 nor 2017). In autumn 2016, only one species of special interest (according to the IUCN Red List of Threatened Species) occurred in very low

numbers (2 individuals): the Steppe Eagle (assessed by IUCN as "Threatened"). All other species, which are particularly relevant for the study, have been classified by IUCN as of "Least concern". A total of 29 Short-toed Snake Eagles were recorded at the two observation sites, i.e. 0.3 % of the eastern flyway population. This species can be regarded as a regular migrant, but the subarea is not of particular importance for migration of this species. In addition, the Short-toed Snake Eagle is assessed by IUCN as of "Least concern" and is, thus, not a threatened species. To summarise, the results clearly reveal that the East Wind-2 subarea is not of particular importance for migrating birds – neither in spring nor in autumn. This is valid for species of special interest and for species of minor relevance which mainly migrated on a broad front.

No larger Wadi exists in the subarea and thus it is nearly completely free of vegetation. Accordingly, the local bird community is very poor in species and bird density is very low. The species (namely the Spotted Sandgrouse, Greater Hoopoe-Lark and Brown-necked Raven) recorded in the East Wind-2 subarea are quite widespread and can be found in several desert habitats in Egypt. According to the IUCN Red List of Threatened Species, no recorded species is assessed as endangered or threatened. Consequently, the East Wind-2 subarea is not an important habitat for local birds.

Only very few roosting birds (e.g. single White Wagtails) were recorded in the subarea. Most roosting birds (especially most passerines) need at least small patches of vegetation, which form a stopover habitat (mainly for a single day) during migration. Due to the lack of vegetation, the East Wind-2 subarea has no importance as a roosting habitat.

The local fauna was found to be very poor in species and density was very low, too. Single records refer to Desert Pebble Mantis and Camel Spiders (local animals) as well as migrating dragonflies (e.g. *Sympetrum fonscolombii*), butterflies (e.g. *Vanessa cardui*) and grasshoppers (Migratory Locust). None of the recorded species is known to be endangered or threatened. Consequently, the East Wind-2 subarea is not an important habitat for other animals.

The review of secondary data revealed that desert areas, like the East Wind-2 subarea, are usually not populated by bats (Hoath 2009). It is reasonable to assume that the activity of bats in the subarea is very low, as verified for the East Wind-1 subarea during a bat monitoring conducted in spring and autumn 2016. The subarea apparently does not serve as a significant habitat for bats.

To conclude, in the East Wind-2 subarea, no zones preclusive for wind power development with regards to the biological environment were identified.

6.3 Social and Economic Environment

The Project Area is located in the Governorates of Beni Suef, El Minya and Assiut. Population is mainly located in the Nile Valley, whereas the Project Area indicates no permanent settlements.

<u>General characteristics</u>

- Land-use

  The region consists of a vibrant mining industry. Many mines exist at desert areas near to El Minya but outside the Project Area. The white bricks extracted from the mines are used for

construction. Mining is a very labour intensive industry and hosts a substantial number of workers at the areas. It's less likely that there will be an impact on mining activities, since most mines are not permanent and no brick mines are located inside the East-Wind-1 and East Wind-2 subareas. From discussion with mine owners, the potential to find a good source of extracting materials into the areas selected for the project is very low.

- Cultural heritages

  No cultural heritage sites are located in or within the zone of influence of the East Wind-1 and East Wind-2 areas except the Akhenaten tomb near Tal El Amarna, located at a distance of 1.5 km to the western border of the East Wind-1 area and requiring mitigation.

- Roads and traffic

  The Project Area is crossed by the El Minya – Assiut National Road and near to the Cairo – Aswan Highway. The road networks also connect the Project Area with the Red Sea ports (Ras Ghareb port and Safaga port) via the new highway Ras Gareb-El Minya. That allows project equipment to be transported from harbour to the East Wind-1 and East Wind-2 subareas.

- Bedouin community near the Project Area

  Although no Bedouin camp was identified during the site reconnaissance, the Consultant learnt from discussions with the authorities and local Bedouin that many Bedouin are already impacted and influenced by other projects. Those impacts have modified their original structure and the consequence of that is that they have constructed settlements, meaning they are not nomads anymore and they are not performing activities such as roaming for resources within the area.

- Stakeholder interviews

  In order to learn about the general views and attitudes of the local authorities and population towards the proposed project, meetings and discussion were conducted with the regional Governorates as described under section 4.2 of the SESA Wind Report and interviews were held with people encountered in the field. The overall knowledge about the project and its impacts was generally very limited in detail.

  The following beneficial impacts of the proposed wind farm project were mentioned by the local authorities / population:

  - A job opportunity for local people:

    One of the advantages of big projects like proposed RE developments are the potential job opportunities for semi-skilled and unskilled workers. The proposed project will open up job opportunities for the local people, especially during the construction phase. On top of that, local people get an opportunity to acquire new knowledge and skills that will benefit them.

  - Land-use:

    The planning shall not interfere with the existing cultural heritages and shall also consider possessed land though customer land rights. Regarding the mining activities, many statements obtained from the interviewed people concluded that there are be no reservation as

the mining areas will move to other sites in the case that wind power will be installed on their land. Many mining areas were deemed illegal, as the mine owners prefer not to apply for a formal permit since they will have to pay very high fees to the government.

- Cooperation with local Governorates:

  Officials on the Governorate level feel excluded, since they were not included in selecting the area. The presidential decree means they have no potential for future urban expansion into the Eastern Desert.

East-Wind 1 subarea

- Land-use

  During the site reconnaissance in October 2016, it was noted that in the Southwest of the East Wind-1 area farmland development activities (levelling and deep groundwater irrigation systems) are ongoing. Some farms are already in operation.

  Farmers which were interviewed indicated that the land development activities are coordinated by one family. They are responsible for dividing the plots and supporting the encroachment process until the person officially becomes the landowner.

  The process of land encroachment was explained during the interview and it was mentioned that most of the areas along the El Minya - Assiut National Road are already planned to be used for farming by many people. It was also highlighted that there are even some projects that are planned in the area.

  Other activities identified in the East Wind-1 area are gravel quarrying and screening and one Asphalt Plant.

- Roads and traffic

  The area is located more than 7 km away from the Nile Valley, but has good accessibility via well dimensioned asphalt roads next to or even crossing the area from El Minya (north), the Nile Valley (west) and Assiut (south).

Areas identified to be used for farming or being already under development as well as the asphalt plant and the gravel screening plant sites were defined to be preclusive for wind power development.

East-Wind 2 subarea

- Land-use

In the East Wind-2 subarea, only one land reclamation was observed only. Similar to the aforementioned activities as described in the previous section, the land reclamation activities are coordinated by one family.

- Roads and traffic

The southern portion of the East Wind-2 subarea, which is separate from the smaller northern portion of the area by a cliff of about 100 m in height can be reached via the Cairo – Aswan Highway and the El Shaikh Fadel - Ras Ghareb Road.

For the smaller northern part of the East-Wind 2 subarea, complete new access roads for transportation of heavy equipment would have to be built. The access to the area on top of the cliff (11 km linear distance from the toll-controlled Cairo – Aswan highway) or 40 km from next regular exit of this highway on land not allocated by presidential decree) is considered less favourable. The cliff area including a zone of 300 m on top and 500 m from the footing is assessed as preclusive for wind power developments. The accessibility of the residual lower area in the south is favourable as mentioned before.

7 Prediction of Impacts

7.1 Physical Environment

The expected impacts can be summarised as follows:

Air quality

During the construction phase, some emissions of exhaust gases from machinery and dust at individual working places (road construction and foundation excavation sites) may occur. During the operation phase, only occasional service visits will take place and no dust and gaseous emissions will originate from wind farms and/or associated infrastructure during operation.

Thus, minor significance of impacts on the ambient air quality is assumed during the construction phase, which is respectively negligible during the operation phase.

Water resources and wastewater

Water will have to be transported from the sources inside and next to the Nile Valley. These water sources are fed by the river Nile having an average discharge of about 2,000 m^3/s. Water supply will mainly be required for the construction phase, i.e. for concrete-making, anti-dust spraying and sanitary purposes. Minor amounts of biodegradable wastewater from the sanitary facilities of the temporary construction yard offices will be treated using a two stage septic tank and percolation into the sandy subsurface for post-treatment. Wastewater will not get into contact with groundwater. No wastewater emissions will originate during the operation phase of wind farms and the associated infrastructure, except from collector substation manned with few non-permanent personnel.

The water consumption impact significance is assessed to be minor for the construction phase. During the other phases, the impact significance is negligible.

Moreover, regarding wastewater, the impact significance is assessed to be minor during the construction phase. During the operation phase, the impact significance is negligible.

Domestic and Hazardous Waste

Considerable amounts of solid waste will be generated by wind power construction projects. The waste essentially consists of packing material (paper, plastics, wood) for transport of the turbine and auxiliary equipment components. The waste will occur mostly at the individual turbine erection sites and in the construction yard. The waste can easily be spread by wind over the desert and transported over large distances.

The only possible source for hazardous waste caused during construction is spilt oil and grease originating from construction equipment (e.g. lorries, excavators, cranes) and from the handling and commissioning of deliveries (e.g. transformer or gearbox oil, hydraulic oil). Both waste littering and hazard spillages can easily be avoided by proper workmanship and strong supervision. Little domestic waste, if any, will be generated by personnel at the service facilities, and likewise for the power substations. The Zafarana experience shows that the domestic waste is small in quantities and mainly composed of biodegradable or burnable waste.

During the operating phase, waste generation is limited to used consumables, when servicing the machines, and smaller defective parts. These are non-hazardous materials, most of them valuables

and fit for recycling. Larger defective parts such as gearboxes or generators would, in any case, be returned to the factory for repair or re-use of materials. In the case that there are no gearless wind turbines, hazardous used oil will be exchanged once per year or once every two years and be sent off to be recycled. The practice at other Egyptian wind farms shows that this works without problems.

Noise, shadowing, vibrations and electromagnetic interferences

For the portions of land with economic activities within wind power development areas, standards for commercial or industrial properties apply. Relevant applicable ambient noise level standards are 70/70 dB (day/ night-time) according to IFC EHS Guidelines and 65/ 55 dB according to the Egyptian Law 4/1994, executive regulations, Annex 7 of the SESA Wind Report. The more strict Egyptian standards are considered.

Human receptors in the neighbourhood of some wind power development plots such as workers, farmers or service personnel at roadhouses, i.e. personnel in a few dispersed commercial or industrial properties, are not living permanently at the place of work. Moreover, the places of work are at fair distances from the wind farm plots (in addition to border safety distances of individual wind turbines added up to a minimum total distance to a WTG of 500 m), and that **noise** levels at the receptors' place will be well below the limit of 65 dB (construction works during daytime only) and 55 dB (during night-time, operation phase). Thus, a minor noise impact is expected during all phases.

Regarding shadowing, accepted standards is 30 hours per year and 30 minutes per day for residential areas during the operation phase of a wind farm. This can be achieved at places near to wind turbines only, where the observed transition time of the sun through the rotor area can achieve such durations. At 28°N, latitude transition of the sun during morning or evening hours is fast. Moreover, as there are only commercial and industrial activities at distances outside the wind farm areas, it is obvious that there is no impact from flickering beyond acceptable level.

Vibrations result from wind turbine operation. However, wind turbines working under regular conditions with the blades correctly balanced and the main shaft correctly adjusted show very little vibration. The propagation of the vibration is dampened by the foundation body and there is very little transmission into the underground, especially in soft rocks (like limestones predominating in the subareas). Thus, vibration effects will not be measurable in the underground already near the wind turbines.

Wind turbines could potentially cause electromagnetic interference with aviation radar and telecommunication systems (e.g. microwave, television, and radio). The nature of the potential impacts depends primarily on the location of the wind turbine relative to the transmitter and receiver, characteristics of the rotor blades, signal frequency receiver, characteristics, and radio wave propagation characteristics in the local atmosphere.

There was no radar observed inside or near the East Wind subareas. However, the area accommodates both, mobile phone masts and a radio link/telecommunication repeater. It is obvious that wind power development impact on this infrastructure could be significant. No wind farm shall block any signal from any directional transmitters and adversely affect the mobile phone signal transmission. Ample corridors between directional transmitters (300 m to each side from direct distance line are considered) need to be kept free and mobile phone masts shall not be affected by nearby wind turbines.

Archaeological, historical and cultural heritage

The site investigation revealed that the two East Wind subareas are free from archaeological, historical and cultural heritages. Sites of great national historical and archaeological value are the 3,500 years old ruins and tombs of the Akhetaton city next to Tal El Amarna, about 10 km south-west of Mallawi.

Assuming that the road to the Akhenaten tomb is anyhow blocked for access to the wind power area, there would still be the impact of one or more 150 m high wind turbine(s) at the western border of the East Wind-1 subarea as the distances are less than 2 km. Accordingly, the impact significance is assessed to be major, subject to mitigation. According to Egyptian law, a clearance distance of 3,000 m must be considered, as recommended in the SESA Wind Report under section 7-Mitigation measures, and this value exceeds the distance of 2 km as mentioned above. Thus, the tip height is not considered as critical in case the buffer zone of 3,000 m radius is applied.

Land-use

The net area coverage rate of land-use/land-take for wind power development (roads, platforms, foundations, auxiliary installations) is about 6 to 8 % during the construction phase and 5 % during the operation phase. These percentages will be even lower in subareas containing Wadis considering that wind power development will not extend into Wadis (because of lower wind energy resources) except for a few road or medium voltage line crossings. The land-use/land-take impact is evaluated against the different nature of ground. As the soil (receptor) is of low value (non-vegetated desert sand or rocks) with a high resilience (a little affected by construction measures only), the receptor sensitivity is evaluated to be low for all phases.

Because of a medium event magnitude and low receptor sensitivity, the impact significance of land-use/land-take is evaluated to be minor for both the construction and the operation phase.

Traffic and utility services and other infrastructure

Wind power developments will be independent from existing utility services as are water supply, wastewater treatment or electricity supply. Water will be provided by tankers from high yield sources at the Nile Valley (see water resources and wastewater before).

Wind power developments will have to be interconnected to the national power grid, which requires expansion before commissioning. This requires in-depth load flow analysis studies and power grid expansion planning and implementation.

Even when considering the extra traffic load during the construction phase, the overall traffic on the asphalt roads in the area is still low. Moreover, the roads are well dimensioned and have nowhere near reached their capacity. During the operation phase, the additional traffic load is not quantifiable.

Run-off / flash flood risk

The region is hyper arid with very minor precipitation during wintertime. However, occasionally rains of high intensity can occur.

If such torrential rains fall on areas with mountainous character (i.e. larger hangs with good gradients, narrow Wadis with high slopes) the caused runoff can accumulate and develop to become dangerous flash floods.

Desktop studies and field inspection to the East Wind-1 and East Wind-2 subareas revealed that the Wadis are not prone to such floods. Cross sections are wide, slope is low and hills only exist with heights of 50 m only above Wadibeds. Moreover, the Wadis don't show large stones or rocks at the low areas of the Wadibed.

Accordingly, no special risk from flash floods in the Wadis is expected. However, occasionally some discharge may occur.

Seismicity Risks

Possible elevated earthquake risks due to geological fault lines were presumed during scoping. The strength of earthquakes at an exceedance probability of 10 % in 50 years is discussed in section 5.1.1. of the SESA Wind Report. The strength for the areas is low to moderate, corresponding to a peak ground acceleration of 0.8 to 1.0 m/s². Risks can be well-controlled by applying adequate earthquake codes as part of construction norms.

7.2 Biological Environment

The following assessment of likely impacts caused by multiple wind farms is valid for both subareas (East Wind-1 and East Wind-2 subareas). Where impacts have to be assessed differently, this is explicitly mentioned in the text.

Construction

Construction works (including decommission) of multiple wind farms in the subareas might lead to:

- Compacting of soil due to land-use

  Compacting of soil might lead to a damage of local seed banks and a reduction of the suitability for plant growth. However, the affected area is limited (usually about 5 % of the overall area of a wind farm during the operation phase), leaving most of each subarea free from any interventions. Moreover, the potential for plant growth in this hyper-arid area is very limited. Finally, the subareas comprise no threatened species or plant communities of conservational concern. To sum up, the residual effects due to the construction of multiple wind farms in the subareas are assessed as a minor impact (medium event magnitude and low receptor sensitivity).

- Dust emissions

  Dust emissions will be limited to a very small area and limited to rather brief periods. Only negligible impacts on habitats, flora or animals are expected due to dust emissions (medium event magnitude and low receptor sensitivity).

- Waste

  Waste resulting from constructional work will cause no significant impact on habitats, flora or animals. However, it might pollute larger areas when drifted away by strong winds. Thus, waste should be removed immediately from the site and should be stored at or near the site in appropriate ways.

- Direct damage of habitats and plants or modification / direct loss of habitats for plants and animals by using areas for foundations of turbines and of auxiliaries, permanent access roads, erection platforms, storage positions for heavy machinery and other technical installations.

  During construction works of multiple wind farms which includes mobilisation and demobilisation, a removal and partial destruction of the top soil surface and some deeper soil layers will occur. However, the affected area is limited (usually about 5 % of the overall area of a wind farm during the operation phase) leaving most of the area free from any interventions. Consequently, the affected area will cover only a small fraction of each subarea (medium event magnitude).

  The vast majority of the East Wind-1 subarea and almost the complete East Wind-2 subarea have no significant importance as a habitat for plants, local or roosting birds, bats or other animals (low receptor sensitivity). Birds in active flight (migrating birds) will not be affected during the construction phase at all. The important Wadis in the East Wind-1 subarea, however, form specific sites in the desert and might form a suitable habitat for plants, single sedentary and roosting birds and single other animals. Therefore, no turbine shall be installed next to or inside important Wadis in the East Wind-1 subarea (no Wadis exist in the East Wind-2 subarea), namely Wadi Ibadah and Wadi al-Birshawi in the very north, the Wadi al-'Imrani complex and the unnamed Wadi east of 'Imrani complex and, finally, Wadi al-Mijallid in the south. Construction works in those Wadis shall be limited to a single crossing by gravel roads and by cable trenches carried out at less sensitive spots. In doing so, receptor sensitivity can be kept at a low stage. Hence, important Wadis in the East Wind-1 subarea have to be assessed as less favourable for wind energy developments (see Map NTS 8-1).

  To conclude, direct damage of habitats and plants or modification / direct loss of habitats for plants and animals caused by the construction of multiple wind farms within the East Wind-1 and East Wind-2 subareas will not lead to significant impacts. Expected residual impacts have been assessed as negligible or minor.

- Disturbance of animals by human activities with heavy machinery, traffic, noise and dust emission

  Local birds, such as Sandgrouse, Larks or Falcons, roosting birds or other animals might be affected by disturbances during the construction phase. However, disturbance effects are restricted to a rather small area. Thus, animals can find alternative habitats for the time of constructional works. Moreover, constructional work is limited to a rather short period of time. Local birds can reoccupy all areas after construction phase. To conclude, the impact on animals caused by disturbance during construction is assessed to be negligible.

- New species of urban and rural environments

  New species of urban and rural environments can be imported into the area together with construction materials and containers. This should be avoided as much as possible, because new species often affect indigenous species.

Operation and maintenance

Under the precondition that no turbines will be installed in the important Wadis (East Wind-1 subareas) and in the absence of other valuable habitats in the two subareas, it can be assumed that no important area will be affected during operation and maintenance of multiple wind farms. Moreover, operating wind turbines are not known to affect plants or plant growth. During periods of maintenance, human activities will be restricted to the roads and storage positions. In conclusion, operation and maintenance of multiple wind farms within the subarea will cause only negligible residual impacts on habitats, vegetation or plant communities. There are also no other activities in the subarea that might contribute to increased impacts to significant levels.

Migrating birds might be generally affected by collision or barrier effects during operation and maintenance phase.

During spring 2016, autumn 2016 and spring 2017, migratory activity of relevant species was low in both subareas (for detailed data see Annex B5 of the SESA Wind Report). No threatened species was recorded during spring migration (both, in 2016 and 2017) and only two (East Wind-1) and one (East Wind-2) threatened species occurred in low numbers in autumn 2016, respectively. Though there is not always a strict correlation between abundance of birds and collision rate (see Annex B6 of the SESA Wind Report), it is reasonable to assume that collision risk is low in areas with low migratory activity (low receptor sensitivity). Thus, collision risk for migrating soaring birds with operational wind turbines is not assumed to pose a major threat because migratory activity of relevant species in the two subareas was low in spring and in autumn. Rare collisions with wind turbines within the subareas might occur (low event magnitude), but the expected collision rate will not cause significant effects on populations. Hence, collision risk at multiple wind farms is assessed to be a negligible impact for migrating birds. This assessment is also valid for species of minor relevance, because

- the subareas are not of particular importance for those species,
- those species mainly migrate on a broad front, and
- those species are not particularly prone to collision with wind turbines.

In order to avoid a wind farm, birds might change horizontal flight direction or flight altitude (mostly by rising). Both reactions probably cause a certain additional expenditure of energy. However, one can suggest that the additional effort (e.g. an increased flight path of a few kilometres) seems unlikely to have a relevant impact on an individual bird. Moreover, due to the low migratory activity, only few birds will be affected, even if multiple wind farms are considered. To conclude, although the degree of additional energy expenditure cannot be estimated precisely, a possible barrier effect of multiple wind farms will not cause notable risk potential for the populations of relevant species. Due to the low migratory activity, only very few birds might be affected and possible effects are assessed as a negligible impact.

Migrating birds might even be endangered by overhead power lines associated with wind power projects in the subareas. In flight, birds can collide into the cables of power lines, because the cables are difficult to perceive as obstacles. In most cases, the impact of collision leads to immediate death or to fatal injuries and mutilations. Casualties from migratory soaring bird species have already been found at a power line on the Red Sea coast (EcoConServ 2015). The risk may even be higher in situations where power lines and wind turbines act together, e.g. migrating birds might encounter a critical situation at power lines while escaping the rotor blades of a wind turbine (or vice versa). However, as migratory activity of relevant species in the two subareas was low in spring and

in autumn, collision risk for migrating soaring birds at overhead power lines is not assumed to pose a major threat. Rare collisions at overhead power lines within or next to the subareas might occur (low event magnitude), but the expected collision rate will not cause significant effects on populations.

Operation and maintenance of wind farms might affect local and roosting birds or other animals as follows:

- Disturbance by operation of turbines leading to a decrease in habitat quality or total habitat loss

  Local birds, such as Sandgrouse, Larks or Falcons, and roosting birds might be affected by disturbance during the operational phase of multiple wind farms. However, most species (as resident birds) are known to be unsusceptible to the nearly constant acoustic and visual stimuli of wind turbines. Moreover, disturbance effects are restricted to a rather small distance and cover at most the area up to 300 m to a turbine. As the two subareas do not hold important habitats for local or roosting birds, the effects caused by disturbance related to operating turbines are assessed as negligible impacts.

  According to recent knowledge, bats, other (ground-living) mammal species and reptile species are not known to be displaced by operating wind turbines. Thus, disturbance effects on those species are assessed as negligible.

- Disturbance by human activities relating to the maintenance of multiple wind farms

  Local and roosting birds or other animals might be affected by disturbances from human activities during the operational phases of multiple wind farms. However, human activity is expected to be rather limited in time and space (low event magnitude) and the subareas do not hold important habitats for local and roosting birds or for other animals (low receptor sensitivity). In conclusion, effects on animals caused by disturbances related to maintenance are assessed as negligible impacts.

- Collision risk

  Local or roosting birds and bats will, in general, also face the risk of collision with operating turbines. However, resident birds are aware of turbines and their behaviour might be better adapted to the presence of turbines. As the local bird community is very poor in species, bird density is very low and no threatened species were found in the two subareas (low receptor sensitivity), collision risk is rather low and multiple wind farms will not lead to significant impacts on local populations (negligible impact).

To conclude, operation of multiple wind farms in the East Wind-1 and East Wind-2 subarea are not expected to affect animal wildlife significantly.

7.3 Social and Economic Environment

Workforce and jobs

With regards to job creation, the project will result in direct and indirect jobs. The following numbers are assumed for each 50 MW project: For electrical and civil works including transportation/delivery, about 140 unskilled workers plus 30 skilled personnel are needed for supervisory

tasks (duration 4-6 months), for turbine erection, 20 semi-skilled workers plus 20 skilled specialists are required (duration 5-6 months). In addition, assuming a common collector substation for eight 50 MW projects, the share per 50 MW project would be 10 unskilled workers and 10 skilled specialists for a period of about 8 months.

If three projects are carried out in parallel, this would require about 700 workers. The local communities at the Nile Valley could provide a larger proportion of this temporary labour force dependent on skills needed.

The project will allow the creation of some permanent jobs for wind farm O&M. It is expected that about 2 to 5 people will be required for O&M and about 4 people will be required as guards for a 50 MW wind farm.

Workers might be adversely impacted if fundamental principles and rights are not respected. Labour and working conditions defined in EBRD PR2 and IFC PS2 shall be maintained. This is also relevant for lodging in temporary facilities at the site.

Supply chain

The project will also result in positive opportunities for local companies that will be involved in supplying materials (e.g. cement, river sand and gravel, reinforcement, formwork, cables, construction equipment) or occasionally in repair works of defective parts.

Vehicle drivers will benefit from the project through the provision of transportation to those who work in the project. In addition, some of them might be contracted to transfer the workers to the Project Area.

Community members from the region and surrounding villages will benefit from some increase of the economic activities in order to serve the needs of the project developers and contractor's personnel. Hotels, shops and restaurants will also see their turnover increase.

The project might result in the development of the surrounding areas. Future wind farms will require new roads and enhanced basic infrastructure inside the selected zone.

Skilled and unskilled workers will get acquainted with modern technologies of wind and / or solar power, which will create more job opportunities for them in the future as other development will take place in Egypt for RE. Similar to for the workers, labour and working conditions defined in EBRD PR2 and IFC PS2 shall be maintained.

New source of energy

The most important and positive impact is that the development of RE projects will result in a renewable source of electricity that will enrich the National Electricity Grid by:

- contributing to addressing a national energy shortage,
- reducing the use of fossil fuels in electricity generation, and
- displacing carbon-intensive sources of electricity.

Enhancement of community

Some enhancement of the services and utilities in the areas due to the project implementation can be expected. Moreover, the project will offset emissions from thermal installations and thus contribute to the improvement of air quality, particularly by reducing the CO_2 emissions.

Economic benefits and investment

The project will result in economic benefits through the long-term improvement of power supply.

Typically, the following positive impacts are expected from the development of wind farms:

- Development of a wind power economy (development of related industries, development of commercial activities and O&M services for such equipment). This will be a new field that will attract investors; consequently, hard currency will be increased.
- Provision of a renewable source of energy will result in a reduction of any subsidies allocated for non-renewable fuel. In addition, the new source of energy is considered to be clean energy.
- Additional tax income because the projects will be implemented as IPP projects.

Bedouin community

The wind farm development areas are located in the desert, an area traditionally used, and traversed, by Bedouins. During SESA fieldwork, no Bedouins were encountered but nevertheless, the development of wind projects will change the character of the Project area to a degree which may impact upon Bedouins. Furthermore, the potential influx of labour may also create an impact on Bedouin communities. Individual projects should seek engagement with Bedouins about project developments, afford project benefits and opportunities to Bedouins and put in place measures to avoid influx-related impacts.

To avoid the potential negative impacts associated with labour influx (including but not limited to issues such as discrimination, people trafficking, forced and child labour, community health impacts through worker influx, and avoidance of community tensions) a coordinated and comprehensive policy for developers at the East Wind-1 and East Wind-2 subareas should be developed. This impact is considered minor due to the fact that the two subareas are far from the villages at East Nile banks.

Impacts related to temporary inconvenience

Construction activities will be limited to small areas which will be blocked for short periods only (e.g. one or two days for erection at a WTG site). Considering that the selected wind farm areas are within fare distance of any community, no measurable inconvenience for local communities will arise.

Occupational Health and Safety

Major health and safety risks result from working at height (erecting wind turbines), working on electrical systems and working with tools and machinery. Investors will be contractually required to keep the World Bank Group Environmental, Health and Safety Guidelines (EHS Guidelines) as a minimum standard. Besides keeping to the general guidelines regarding environmental, occupational health and safety and community health and safety aspects of special relevance are the IFC guidelines: Environmental Health and Safety Guidelines for Wind Energy and the Environmental, Health, and Safety Guidelines for Electric Power Transmission and Distribution.

Moreover, future investors will be required to employ, through their contractors, an H&S engineer/supervisor who is fully authorised to sanction any wrongdoing. An H&S management plan will be established at the start of construction activities, subject to approval from the supervising authority, NREA. Important elements are safety training (for workers, machine drivers), emergency measures in case of accidents and a reporting system.

With the implementation of such measures, residual health and safety impacts are expected to be minor.

8 Mitigation Measures

8.1 General Management and Mitigation - Best Practice

After having thoroughly assessed the impacts, the so-called mitigation hierarchy shall be applied as the general mitigation strategy. The first step in this process comprises measures to avoid environmental or social impacts of a plan/project, by changes in the project design or in project activities. If it is not possible to avoid an impact, additional measures should be implemented to minimise the identified effect. The remaining impacts have to be rectified, e.g. by restoration of habitats to their original state or by relocation of the affected species or habitats. The last option in the mitigation hierarchy is to compensate for or to offset any residual, unavoidable loss or damage. Such biodiversity offsets generally take place in a different area and aim to secure a “no net loss” outcome.

The mitigation strategy shall be accompanied by a thorough risk management assessment, covering post-construction monitoring and adaptive management.

The following management and mitigation measures can be regarded as a best practice standard that shall be applied in both subareas and for each project under any condition and during any project phase (construction, operation, maintenance and decommission):

- All activities must be restricted to the boundaries of the construction areas, storage positions and access roads / tracks. Any use of the surroundings must be strictly avoided.
- Supplying or changing oil, lubricant or hydrocarbon to vehicles shall be done in gas stations and not on site. Strict control must be applied by a site supervisor. Contingency measures and plans for spill removal must always be ready on site.
- Waste has to be removed immediately and has to be safely stored at the site so that drifting is avoided.
- Awareness programmes to personnel shall be carried out. Behaviour and attitude of involved personnel during field activities shall be controlled by a site supervisor.
- Potential occupational health and safety hazards during the construction phase shall be controlled by appropriate measures according to internationally accepted standards.
- The contractor shall provide effective protection for land and vegetation resources at all times and shall be held responsible for any subsequent damage.
- The contractor shall be forced to good workmanship and housekeeping during construction by contractual stipulations and by assigning supervising engineers in order to assure adequate disposal of solid waste and wastewater and to avoid or collect spillages of used oils, greases, etc.
- The contractor shall be forced not to leave the construction site unless the area is left in a tidy condition, excavations are backfilled, heaps of excavation material are levelled and waste is adequately disposed of.
- Consider the regulations defined in Article 28 of the Egyptian Law no. 4/1994 for the Protection of the Environment amended by Law 9/2009, mainly: ban killing, hurting and unnecessary disturbing (incl. relocation) of any wildlife elements in the Project Area.

8.2 Physical environment

8.2.1 Land-use/land-take

Areas of current land-use are already designated to be preclusive for wind power development. This is to avoid social conflicts and at the same time to keep distances as required for noise protection and shadowing. The areas designated to be preclusive are sufficiently dimensioned to take care of such conflicts. In addition, safety distances for wind turbines at 150 m from the border of preclusive areas shall be applied. This needs consideration during planning and permitting process for the individual wind farm plots.

Mitigation measures

- A more detailed investigation for land-use impacts during preparation of ESIAs for individual 50 MW projects.
- Consider the potential for any displacement since the planning stage and try to avoid locating project components at any place that is considered the property of local people and used for some activities.
- If this is unavoidable, plans should be considered to compensate the affected person and allocations should be made available for that purpose.

8.2.2 Landscape character and visual impact

Considering the vast character of the landscape and little presence of human receptors at some spots only, no specific mitigation measures are required during planning and permitting process except for the archaeological kings' tombs area.

8.2.3 Water resources and wastewater

To protect water resources and to keep the withdrawal of water from wells at a moderate level during periods of high water demand (casting of foundations during the construction phase), equalisation water tanks shall be installed at both sites, at the wells and at the concrete batching plant. The volume of the water tank at the batching plant shall at least correspond with the water demand for one foundation; that one at the source shall correspond to the volume of the biggest tanker lorry.

Domestic wastewater treatment from the sanitary installations at the site during construction shall be collected and treated in a simple two-stage anaerobic treatment plant with rinsing of treated water into desert gravel for natural post-treatment. Sludge from domestic wastewater treatment shall be disposed of regularly to keep the treatment plant well-functioning.

8.2.4 Domestic and hazardous waste

The contractor shall be forced to carry out good workmanship and housekeeping during construction by contractual stipulations and by assignment of supervising engineers in order to assure adequate disposal or recycling of waste. This shall be carried out to the extent that potential packing material waste shall be returned to the delivery lorries.

To mitigate negative impacts during the construction phase, residual non-hazardous waste shall be collected and safely stored at the site so that drifting by wind is avoided. The recyclable or usable fraction (e.g. metals, reuse of wood) shall be separated and carried to the recovered substance cycle. The residual fraction of biodegradable or burnable waste will be collected in bags and in bins and disposed at designated waste treatment sites and landfills. In case of the absence of such sites, the waste shall be disposed at an environmentally safe waste disposal site (desert pits). To reduce volume, the waste is burnt. The residual waste will be covered by sand. The waste is inert and in absence of rain, there is no harm for the subsurface. Considering the small amounts of domestic waste (about 60 m^3 per year and a 50 MW plot of non-compacted waste equivalent to about 2 m^3/a after incineration), this simple method is considered to be acceptable.

Spillage or dispersion of hazardous waste, such as spilt oil and grease originating from construction equipment or from gearboxes or transformers into the soils at the site shall be avoided by carefully handling and collecting it in containers and through subsequent recycling.

8.2.5 Air Quality

The impacts on the ambient air quality during the construction phase are caused by dust development at the working sites of machinery during road and foundation excavation works and shall be mitigated under occupational health and safety aspects.

Mitigation measures are:

- spraying water;
- workers are to be assigned at the luv side from machinery; and
- wearing protective masks.

8.2.6 Noise and electromagnetic interferences

Mitigation of noise impacts on sites where workers are employed or even reside for periods of time shall be done by keeping distances of at least 500 m from any existing economic activity in the area. This applies for both the construction and the operation phase.

To avoid blockage of signals of existing directional radio link transmitters, ample corridors of 600 m (i.e. 300 m to each side, measured using a straight line) shall be kept from the wind turbine's influence. For siting, the rotor radius has to be added. As the mobile phone masts are next to the transmitter masts, such a corridor will protect the mobile phone signals from disturbance as well.

8.2.7 Archaeological, historical and cultural heritage

The impact on the 3,500 years old Akhenaten tomb near the Project Area was considered to be major. Mitigation of such a visual pollution impact shall be carried out by keeping wind turbine siting distances of at least 3 km to the tombs. This corresponds to the requirement of Law 117/1983 and its amendments by Law 12/1991, Article 20 related to not granting building permits at archaeological sites or lands and stating that this extends up to three kilometres in uninhabited areas.

8.2.8 Mitigation of impact on traffic

The effects of additional traffic load on the regional roads evaluated to be of minor significance during the construction phase shall be further reduced by shifting heavy haulage transportation to low traffic hours (such as late evening or night-time hours).

Further investors shall make sure that the employed drivers of construction machinery (such as lorries and loaders) have received sensitisation/training on safety utilisation of their machines in order to minimise risks of accidents. Heavy haulage transport shall be convoyed by safety cars.

8.3 Biological environment

No significant impacts caused by construction/decommission activities calling for particular mitigation measures have been identified during the process of the assessment. Nevertheless, applying general measures to avoid or, at least, minimising any impact on habitats, flora and fauna during construction and decommission is crucial. This covers:

- The restriction of all activities to the boundaries of the construction areas, storage positions and access roads/tracks. Any use of the surroundings must be strictly avoided.

To mitigate impacts on migrating, roosting and local birds caused by large wind farms in the subareas, the following measures should already have been taken into account during the planning and construction phase:

- Avoid turbines with lattice towers. Lattice towers offer suitable perching sites and, thus, might attract large soaring birds, which in turn might increase the risk of collision.
- Avoid lighting of wind turbines, as birds might be attracted to wind farm areas by lights, leading to an increased collision risk. If lighting of turbines is absolutely required (e.g. to meet aviation requirements of the civil and military aviation authority), the minimum number of intermittent flashing white lights of lowest effective intensity shall be used (Drewitt & Langston 2006).
- Build the electrical grid within a wind farm and between different wind farm areas by underground MT cables. If the use of overhead lines cannot be avoided (e.g. 220 kV OHL), such overhead lines should be designed according to available guidelines (e.g. BirdLife International 2015) in order to avoid the risk of electrocuting large birds.

Except for considering and applying the aforementioned measures, no further management and mitigation is required with regards to habitats, flora and fauna, because no residual significant adverse impacts are expected by the development of multiple wind farms in the Project Area.

Likewise, there is no need for particular mitigation measures with regards to migrating birds, because the results of the bird monitoring clearly show that migratory activity of relevant species was low, that no threatened species was recorded during spring migration and that only a single threatened species was present in very low numbers during autumn migration.

8.4 Social environment

Management of impacts related to health and safety

Potential impacts on workers and community health and safety during construction of a project are those associated with any construction project involving earthmoving, use of large equipment, transportation of overweight and oversized materials, and construction and installation of industrial facilities. Additionally, health and safety issues include either working high up or in trenches.

Mitigation measures:

- Investors will be contractually required to force contractors to keep the World Bank Group Environmental, Health and Safety Guidelines (EHS Guidelines) as a minimum standard. Besides keeping to the general guidelines regarding the environment, occupational health and safety and community health and safety aspects, of special relevance are the IFC guidelines: Environmental Health and Safety Guidelines for Wind Energy and the Environment, Health, and the Safety Guidelines for Electric Power Transmission and Distribution as well as EBRD'S PR 4.
- In accordance with the labour laws related to occupational health and safety No. 12 of the year 2003, workers shall be oriented about health and safety procedures.
- The contractor and subcontractors shall assign a health and safety supervisor fully authorised to sanction any non-observance of H&S procedures.
- The contractor shall establish a health and safety plan prior to the start of construction works. He shall make health and safety facilities (i.e. firefighting equipment, surgery room for first aid treatment, first aid materials, protective tools, etc.) available in the project site and shall have equipment for emergency evacuation to the next hospital standby at the site.
- As mentioned before, all personnel shall undergo an initial safety training specifically tailored to individual work tasks.

Mitigation of impacts on the Bedouin community

Bedouins are a special ethnic group with their own special culture, who traditionally consider the desert to be Bedouin land, even though the economic value of such ground, as in the subject Project Area, might be minor. The interests of Bedouin groups need to be considered when developing and implementing wind power projects.

This was an issue of concern for various stakeholders living in the villages in the Nile Valley or on new farms at the boundaries of the Project Area, as found out by the Consultant during the fieldwork. The fact that they have their own unique culture that distinguishes them should be respected and appreciated. The following are key relevant recommendations:

Mitigation Measures:

- Bedouins should be consulted during the planning of the individual projects to ensure that any proposed development plan does not conflict with their reasonable interests. Participatory consultation tools should be employed during project execution and operation.
- Affording potential benefits such as job opportunities shall be considered.
- Absence of information and statistics is a real challenge. There is a need to start by developing a database that includes information about the Bedouins community. This is essential for monitoring benefits from the project and to ensure that Bedouins are not excluded.

Mitigation of labour influx and of labour and working conditions

Mitigation measures:

- Minimising the number of workers from outside the Governorates close to the Project Area is highly recommended. The contractor should be advised to employ construction labour from the nearest villages in the Nile Valley. The incentives to contractors for such a measure include reducing the need for accommodation and transportation for workers.
- Community leaders could take part in the process of employment in terms of informing their local community about job opportunities. This will fall under the responsibility of the Social Development Officer.
- Fundamental principles and the rights of workers need to be respected in line with EBRD PR2 and IFC PS2 and with special reference to the national labour and employment laws.
- The temporary accommodation facilities at the site need to be appropriate for its location and be clean, safe and, at minimum, meet the basic needs of workers as per IFC and EBRD Workers' accommodation: processes and standards[1].
- Involve stakeholders and the public, implement consequential information disclosure, establish a grievance process and redress mechanism by NREA.

8.5 Special Mitigation Features in the individual East Wind Subareas

East Wind-1 subarea

Besides the general mitigation measures to be applied to all wind power development, special features in the East Wind-1 subarea were identified that require specific mitigation (see Map NTS 8-1):

- Larger Wadis, which hold sparse vegetation, form specific elements in the desert and can be used as a habitat for certain animals and temporarily as foraging or hunting sites for local birds. Hence, the four identified important Wadis systems have to be assessed as less favourable for wind power developments (see Map NTS 8-1). An appropriate mitigation measure is to avoid installation of turbines in the important Wadi systems and to minimise construction works in these Wadis as much as possible (limited to single crossing by gravel roads and by cable trenches carried out at less sensitive spots).
- Further restrictions in addition to the earlier identified preclusive areas of current economic activities must apply on the East Wind-1 subarea regarding the existing directional

[1] http://www.ebrd.com/downloads/about/history/workers.pdf

telecommunication transmitters. A corridor of 600 m (300 m to each side of the direct distance line) needs to be kept free from any interference of wind turbine rotors. The corridor is located near to the El Minya - Assiut National Road (see Map NTS 8-1).

- Moreover, a clearance distance of 3 km shall be kept from the Akhenaten kings' tomb to protect the national heritage site from disturbances (landscape pollution) by wind turbines. The clearance circle reaches up to 1.5 km into the East Wind-1 subarea (see Map NTS 8-1).

East-Wind 2 subarea

Besides the general mitigation measures to be applied to all the wind power development, no special features in the East Wind-2 area were identified that require specific mitigation - except the farmland and its development in the southern lower flat part of the East Wind-2 area, which is defined to be preclusive for wind power development.

JV LAHMEYER INTERNATIONAL ecoda

Strategic Environmental and Social Assessment of Renewable Energy Projects in the East Nile Region (Arab Republic of Egypt)
SESA Wind Report

client:
New and Renewable Energy Authority (NREA),
Ministry of Electricity and Renewable Energy

Map NTS 8-1:
Restrictions for wind power developments in the East Wind-1 subarea

Bordering of East Wind-1 subarea

East Wind-1 subarea

Main road and telecommunication tower

main road

telecommunication tower

Zones preclusive for wind power development

due to farming area

due to industrial area

due to service buildings

due to transmitter corridor

due to Royal Tombs

Zones unfavourable for wind power development

wadi of importance

due to geomorphology

0 10.000 Meter

1:170.000

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Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

9 Environmental and Social Management and Monitoring Plan

It is understood that NREA or another Egyptian authority will launch tenders for the selection of private investors for the individual 50 MW wind power plots and will supervise the investors, during the lifetime of the projects. NREA shall consider keeping the ESMP obligatory in the Tender Documents and in the later contract with private investors. As part of this supervisory task, NREA will also be the address and in charge to follow up any grievance during the lifetime of each project.

Two extensive bird surveys have been conducted in the wider region of El Minya west and east of the Nile Valley. Both investigations clearly revealed that the desert located at minimum distances of 10 km west and east to the Nile Valley has no particular importance for bird migration – neither in spring nor in autumn. As this conclusion can be regarded as well-founded and finally verified, sufficient baseline data is available for future impact assessments and no further baseline studies are required when developing wind power or PV solar power in the East Nile region.

Accordingly, no significant impact on migrating birds must be expected when installing and operating multiple wind power projects in the East Nile subareas. From a strict technical point of view, this assessment can be regarded as well-founded, and hence no post-construction monitoring is required to verify this assessment. However, if post-construction monitoring is regarded as good international practice by international financing institutes, carrying out such monitoring at individual operational wind farms might be required to double-check the findings of this SESA. The precise approach and the scope of such post-construction monitoring should be defined on a case-by-case basis in the context of project-specific ESIAs. Post-construction monitoring might, for example, include visual observations of migrating birds and carcass surveys at individual wind farms and associated power lines.

The implementation of mitigation measures require actions during the bidding, planning, construction and post-construction phase for each individual wind farm that would be erected in the accepted area. This can be summarised in the following Environmental and Social Management Plan (ESMP). These actions will apply to all wind power developments in the Project Area and where necessary will be supplemented with specific measures during individual project impact assessment and permission.

Table NTS 9-1: Environmental and Social Management Plan

Project activity	Environmental Concern	Requirement (Legislative, EBRD PR, Best Practice)	Mitigation Measures
All Phases	Grievance	EBRD PR1 and PR 10, Best Practice	Introduce a grievance mechanism that applies through the life cycle of the wind power development to be managed by the Egyptian Authority in charge
Bidding and Planning Phase	Health and safety risks	EBRD PR1 and PR4, Voluntary and Best Practice	Make keeping standards as defined in the IFC General Environmental, Health and Safety Guidelines of April 2007 and in the Environmental, Health, and Safety Guidelines Wind Energy of August 2015, a minimum obligation in the Tender Documents for each individual plot

Project activity	Environmental Concern	Requirement (Legislative, EBRD PR, Best Practice)	Mitigation Measures
			Make the assignment of a fully authorised health and safety and environmental engineer during the construction phase obligatory in the Tender Documents
			Make an HSE for each construction site obligatory in the Tender Documents
			Make provision of safety tools & equipment as per accepted standards by the Contractor, in a bidding condition in the Tender Documents
	Keeping mitigation measures	EBRD PR 1, Best Practice	As a minimum, make keeping mitigation measures defined for the construction, operation and decommissioning phase in this study obligatory to investors when tendering the 50 MW plots
	Safety distances		Make keeping internal safety distances of 150 m from plot border lines obligatory
	Impact on habitats, flora and fauna	EBRD PR 6, Best Practice	Avoid application of wind turbines with lattice towers. Avoid or minimise lighting of wind turbines. Avoid construction works in the four identified important Wadis systems as much as possible. Avoid impacting upon particular structures (like caves or crevices) that might form a suitable habitat for animals (to be considered in project-specific ESIAs). Consider the presence of sensitive habitats, if any, on a smaller scale in project-specific ESIAs.
			Build the grid within a wind farm and the grid between different wind farms using underground MV cables. If the use of overhead lines cannot be avoided, such overhead lines should be designed according to available guidelines (e.g. BirdLife International 2015).
Construction phase	Health and safety risks	EBRD PR4, EP3, Best Practice	Make keeping the "Environmental, Health and Safety Guidelines for Wind Energy, IFC 2007" and the Environmental, Health and Safety Guidelines Wind Energy of August 2015 a minimum condition. Furthermore, carrying this out shall comply with the EBRD PR 4 for Health and Safety.
		EBRD PR4, EP3, Best Practice	The Contractor and Subcontractor shall assign a health and safety and environmental engineer/supervisor fully authorised in giving health and safety instructions
		EBRD PR4, EP3, Best Practice	Establish an HSE plan prior to starting any construction measures
		EBRD PR4, EP3, Best Practice	Make safety tools and equipment available and have training in how to use it properly
		EBRD PR4, EP3, Best Practice	Construct and make available temporary hygienic sanitary facilities at the construction site

Project activity	Environmental Concern	Requirement (Legislative, EBRD PR, Best Practice)	Mitigation Measures
		EBRD PR4, EP3, Best Practice	Assure stoppage of erection during weather conditions beyond safety limits (e.g. sandstorms)
			Assure that work at the wind turbines is only carried out by personnel who have passed a special safety training course
	Protection of water resources	EBRD PR3, Best Practice	Install water tanks to protect wells from over-utilisation: One tank at the batching plant with a minimum volume corresponding to the water demand for concrete-making of one wind turbine foundation One tank at the water supply well with a minimum volume equal to the largest tanker lorry. Minimise water consumption.
	Traffic	EBRD PR4, EP3, Best Practice	Carry out heavy haulage transportation during hours of low traffic load (late evening or night-times) and safeguard them using convoy cars
	Pollution	EBRD PR3, Best Practice	Assure good workmanship and housekeeping supervised by skilled staff to assure minimise wastewater and solid waste generation and to assure adequate disposal of domestic, hazardous waste and wastewater
	Non-hazardous waste disposal	EBRD PR3, Best Practice	Collect and safely storage, separate recyclable fraction, bury biodegradable fraction, ash and residual waste on an environmentally safe waste disposal site (treatment sites and landfills). If this is not practicable, desert pits with final soil coverage of at least 1.5 m).
	Hazardous waste disposal	EBRD PR3, Best Practice	Avoid spillage of oil, diesel or grease into the soil. Collect used oils or greases and recycle them.
	Domestic wastewater treatment	EBRD PR3, Best Practice	Construct a simple two-stage anaerobic treatment plant and rinse treated water into desert gravel for post-treatment at the sanitary facilities of each construction yard.
		EBRD PR3, Best Practice	At the end of construction works: ensure that the contractor puts the construction site into tidy conditions. Excavations are to be backfilled, heaps of excavation material are to be levelled and waste is to be properly disposed of
	Impact on habitats, flora and fauna	EBRD PR 6, Best Practice	Restrict all activities to the boundaries of the construction areas, storage positions and access roads/tracks. Any use of the surroundings must be strictly avoided. Constructional works must avoid any sensitive habitats, if any (to be identified on a smaller scale in project-specific ESIAs)
		EBRD PR 6, Best Practice	Avoid importing new species of urban and rural environments into the area (e.g. together with construction materials and containers).

Project activity	Environmental Concern	Requirement (Legislative, EBRD PR, Best Practice)	Mitigation Measures
		National Legislation	Comply with the regulations defined in Article 28 of the Egyptian Law no. 4/1994 for the Protection of the Environment amended by Law 9/2009.
	Labour and working conditions	EBRD PR 7, Best Practice	Employ as much construction labour as possible from near the areas where construction works will take place, i.e. from the nearest villages to the Nile Valley.
		EBRD PR 2 and PR 7, IFC PR2, Best Practice	Comply with the fundamental principles and rights of workers and accommodation standards fulfilling the requirements of EBRD (PR2) and IFC (PS2) and of the national labour and employment laws.
		EBRD PR 7, Best Practice	Any temporary accommodation facilities at the site need to be appropriate for its location and be clean, safe and, as a minimum, meet the basic needs of workers.
Operation and maintenance phase	Health and safety risks	EBRD PR4, Best practice	Assure that O&M at the wind turbines is only carried out by personnel who have passed a special safety training course
	Hazardous waste	EBRD PR3, Best Practice	For Wind Turbines with gearboxes with required periodical exchange of oil: Avoid any spillage of used oils, collect it in safe containers and deliver it for recycling
	Cultural Heritages	EBRD PR 8, IFC PS 8, national Legislation	Develop a chance find procedure for use during construction. Train workers, contractors and sub-contractors in the implementation of the chance find procedure
Decommissioning	Land-use and landscape	EBRD PR 6, Best Practice	Remove the windfarm installations at the end of the lifetime and return the landscape to a tidy condition (levelling heaps, backfilling excavations)