# Red Sea Wind Energy (RSWE) 500MW Power Plant

# At the Gulf of Suez

## Cumulative Effects Analysis

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**Executive Summary**

This report presents the findings of a rapid analysis of the potential cumulative effects on biodiversity of wind farms in development by Red Sea Wind Energy Project on the Gulf of Suez, Egypt. The report builds on the findings of the Cumulative Effects Analysis that was undertaken for the Lekela Wind Farm, which is located in the vicinity of the RSWE project to the south. The analysis identifies priority bird Valued Environmental Components (VECs) (IFC 2013) and a preliminary list of other VECs. High-level mitigation and monitoring actions that will be adopted by RSWE are presented.

Additional actions that RSWE and other developers in the study area will undertake or support to address their contribution to the cumulative effects of their developments together with others in the region are also presented.

To determine priority bird VECs for the Projects, the approach that was followed was originally modelled on the Tafila Region Wind Power Projects Cumulative Impact Assessment (IFC 2017), and has been modified to the local conditions and data available through a previous Cumulative Effects Analysis that was undertaken for the Lekela 250 MW wind project (TBC, 2018). Similar to the Lekela approach, a staged screening of the list of preliminary bird species was undertaken, to develop a final list of priority bird VECs that were likely to be at greatest overall risk from the Projects. The data used in the process included all the data that was originally available for the Lekela CEA in addition to all recent data collected in the study area including RSWE's on-site assessments that were carried out in autumn 2019 and spring 2020.

The process has identified 14 species, which had an Overall Risk of Major or Moderate, are considered priority bird VECs for the Projects. 13 of these species were already identified by the Lekela CEA while the current analysis has produced a modified overall risk status for some of them. **An additional species was identified to have a moderate overall risk and therefore was added into the list, namely Lesser Spotted Eagle *Clanga pomarina*.**

Step 4 of the Tafila approach, identifying fatality thresholds for priority bird VECs, has not yet been undertaken as part of this process, but is planned to be undertaken in the near future and will be included in an updated version of the report.

In step 5, mitigation measures and monitoring actions are proposed, to be adopted by the RSWE project, and others that are proposed to be undertaken collectively and collaboratively by all wind energy developers across the study area. These mitigation and monitoring actions focus on the potential impacts to the 14 priority VECs are based on industry good practice while building on the already existing experience of adaptive management at operational wind farms along the Gulf of Suez.

# 1 INTRODUCTION

## 1.1 Scope and objectives

A Cumulative Effects Analysis (CEA) is a multi-layered analysis approach that aims at identifying and analysing the impacts of a set of projects on a pre-defined set of ecological elements; habitats and species. The CEA comes into context for the RSWE project since it is located in an area that includes multiple wind farms while being also located along a major bird migratory flyway, namely the Rift Valley Red Sea flyway. Although the impact of wind power project infrastructure on Migratory Soaring Birds (MSBs) is well documented, it should be highlighted that the CEA will not be limited to this context and will also take into consideration other ecological elements, including habitats and volant mammals (bats).

The CEA follows a series of multi-layered steps that would eventually identify the potential cumulative impacts of the projects of concern in order to eventually provide monitoring and mitigation measures that would be applied through an adaptive management approach. These steps would follow the approach that was developed under the Cumulative Effects Assessment for the Tafila Region Wind Power Projects in Jordan (IFC, 2017).

This analysis represents the initial steps in understanding potential cumulative effects to biodiversity of wind farm developments by RSWE S.A.E. and other operations in the Gulf of Suez, Egypt. It aims to identify priority Valued Environmental Components (VECs) which are most at risk from the combined impacts of all the existing and potential wind developments identified within the study area, building on the CEA that was undertaken by Lekela Power Ltd. For Lekela 250MW Wind Farm, which is located to the south of RSWE Project. Most importantly, this CEA integrates the avifaunal in-flight monitoring assessments that were undertaken at RSWE 500MW project during autumn 2019 and spring 2020 migration seasons. This analysis also proposes mitigation, monitoring and other management actions for projects operating within the study area to address potential impacts to the identified priority VECs.

## 1.2 The Geographic Boundaries

The Project is located in the Red Sea Governorate of Egypt, around 200km to the southeast of the capital city of Cairo. More specifically, the Project is located near the Red Sea shoreline and within the Ras Ghareb Local Governmental Unit of the Red Sea Governorate, where the closest residential areas include Ras Ghareb city (located 40km to the southeast) and Zaafarana village (45km to the north). The Project is located within a 1,200km$^2$ area that has been allocated by the Government of Egypt to NREA for development of wind farms, (presented in red in Figure 1 below), which is the area for assessing potential cumulative effects on biodiversity covers the area targeted for potential wind farm development in the Ras Gharib – Gebel El Zeit area, Red Sea Governorate, Egypt. Within this, a land area of approximately 70km$^2$ (presented in blue in Figure 1 below) has been allocated to the Developer by NREA for the development of this Project.

Being located by the western coastline of the Gulf of Suez, the project site is located along the Red Sea/Rift Valley flyway, which is one of the most important migration flyways for migratory soaring birds in the world with over 1.5 million soaring birds migrating through it twice a year (Birdlife, 2020). The flyway links the European breeding grounds with the African wintering areas of for a total of 37 migratory soaring birds. Regular migration monitoring along the western coast of the Gulf of Suez where the project is located has shown that there is a significant difference in the level of use of the area during migration seasons. Research has shown that this part of the flyway is used by much larger numbers of birds during spring migration in comparison with autumn migration seasons.

**Figure 1: Project Site (Red) as Part of the National-Decree Area Allocated for Wind Farm Developments (Consultant, 2019)**

**Figure 2. Main routes used by migratory soaring birds as part of the Red Sea/Rift Valley Flyway (BirdLife, 2020)**

## 1.3 The Temporal Scope

The different wind farms in the study area are in varying stages of development. Some have been operational for a few years while others have started operating less than a year while others are in the pre-construction preparation phase. The temporal boundaries will be determined on the basis of monitoring, to take place during the first three years of RSWE project operations.

## 2 IDENTIFICATION AND SCREENING OF VECS

VECs are defined as attributes, both environmental and social, that are considered important in assessing the risks that a project, or suite of projects poses to the environment. Identification of VECs was restricted to flora and fauna species (biodiversity), physical features and habitat via a desk-based exercise using published and grey literature.

Priority VECs were selected through an iterative process in consultation with the stakeholders. For each VEC group and/or potential impact, the following elements were discussed and were reviewed in the literature:

- Sensitivities
- Available data sources
- Activities and/or drivers other than wind projects
- Data ownership and access

## 3 THE APPROACH

**The framework is based on internationally accepted approaches to risk assessment practices to identify priority VECs and aligns with IFC's GN6. This framework for birds has two objectives: to identify those species at highest risk from the potential impacts of developments in the study area, and to propose mitigation, monitoring and other management activities to address risks to those species. This framework follows a five-**

**step process, as follows, see**

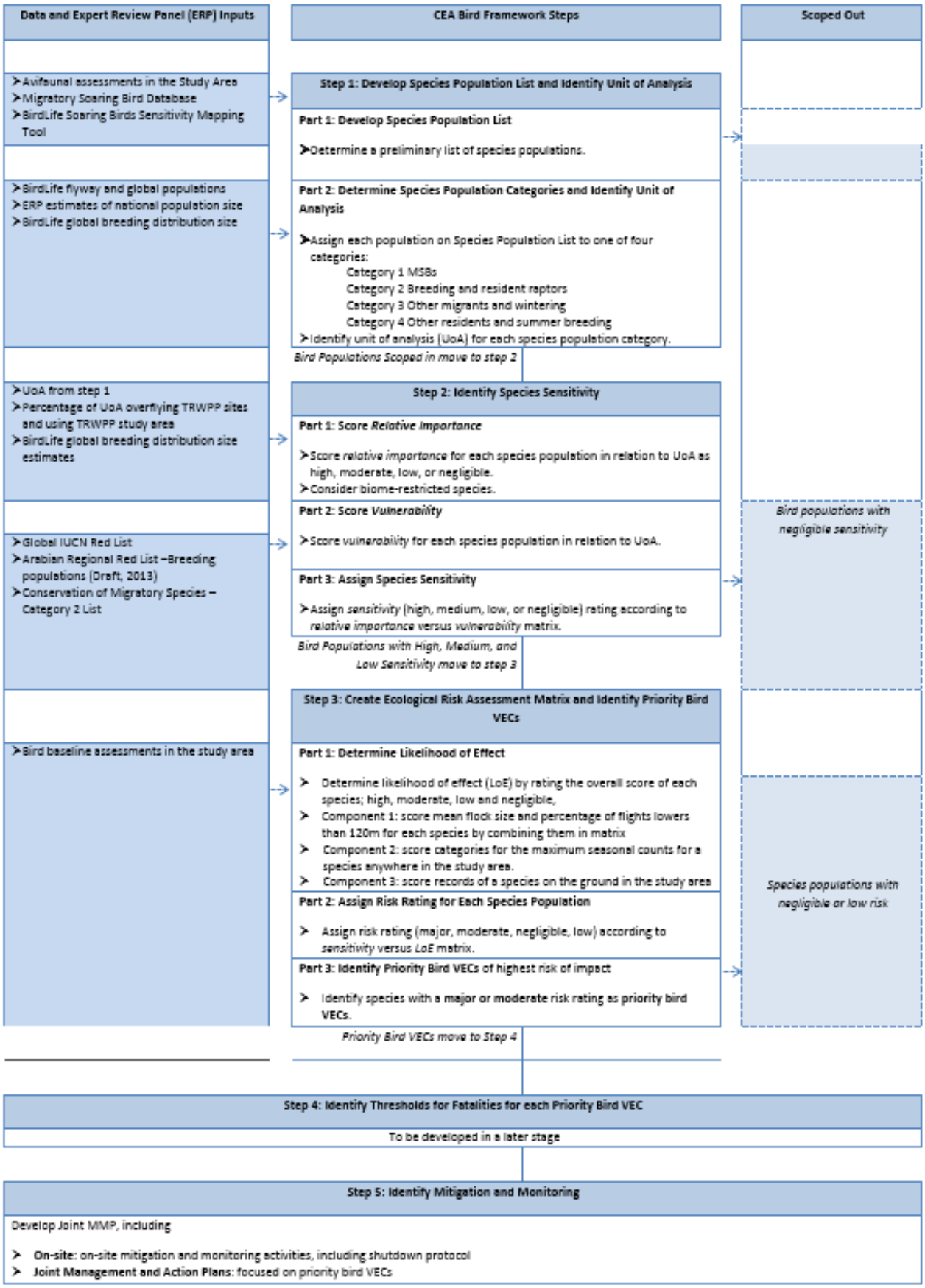


Figure 3:

- Step 1: develop a preliminary list of potential VECs, comprising species potentially at risk from developments in the study area, because they are either known or predicted to occur in the study area.

- Step 2: determine the relative 'Sensitivity' of the species, being a combination of the vulnerability of the species and Importance of the population recorded in the study area relative to the appropriate Unit of Analysis (UoA), i.e. the flyway population or global distribution. Species which were determined to have negligible sensitivity were dropped from analysis before proceeding to Step 3. Species where the flyway population comprised <1% of the global population, and for which any impact would be negligible for the species at a global level, were also dropped at this stage.
- Step 3: determine the Overall Risk to the species from the cumulative effects of wind farm developments within the study area, being a combination of the sensitivity, as identified in Step 2; and cumulative Likelihood of Effect (LoE) rating for each species. Those species with an Overall Risk of Major or Moderate are considered to be priority bird VECs for the project.
- Step 4: identify thresholds for fatalities for each priority bird VECs, by setting the point at which further loss is considered a risk to long-term viability of the population. Threshold setting takes into account species-specific biological and demographic parameters, the cumulative risk associated with WPPs, and the likely effects of external stressors on the population defined by the UoA. This step has not been undertaken and is planned to be undertaken at a later stage and will be included in a reviewed version of this report.
- Step 5: proposes a range of mitigation, monitoring and management actions, to avoid fatalities of priority bird VECs, and to accurately estimate priority bird VEC fatalities to facilitate compliance with thresholds and inform adaptive management responses.

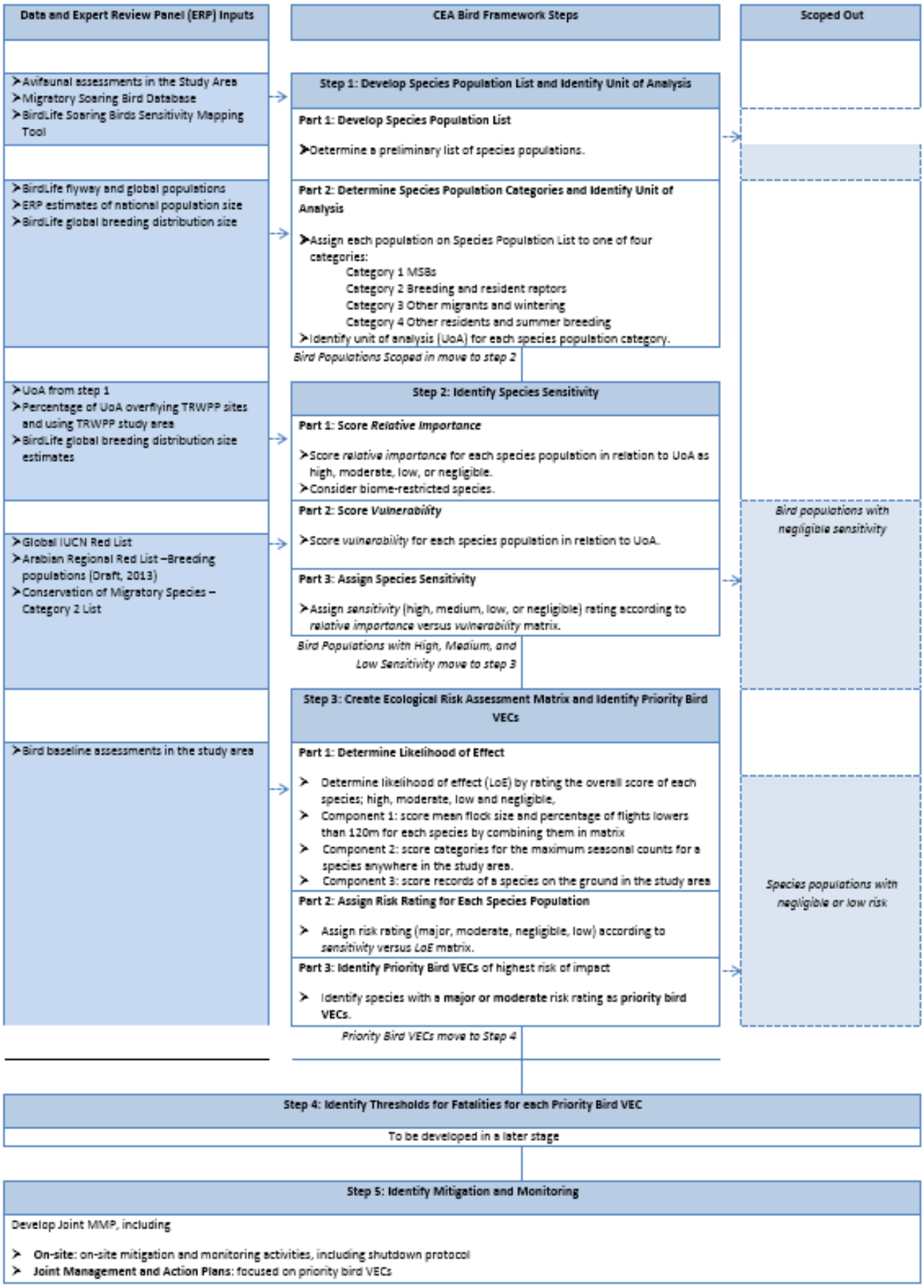


**Figure 3. Process for identification of priority VECs**

# 4 THE APPLICATION

## 4.1 Step1: Develop Species Population List and Identify Unit of Analysis

The purpose of step 1 is to identify all bird species or populations that could potentially be at risk from the cumulative effects within the study area and to determine a relevant UoA by which any effects on each species or population should be measured. A species population list of all bird species known or likely to be present in the study area was compiled from:

- RSWE 500 MW autumn 2019 and spring 2020 avifaunal and biodiversity assessments (RCREEE and ECOConsult, 2020);
- RSWE 500 MW Environmental and Social Impact Assessment (ESIA) (RCREEE and ECOConsult, 2020)
- Lekela North Ras Gharib 250 MW Environmental and Social Impact Assessment (ESIA) (Environics 2018);
- Lekela North Ras Gharib 250 MW baseline bird studies from autumn 2015, spring 2016, spring 2017 and autumn 2016 (Environics 2016b, 2016a, 2017a, 2017b);
- RCREEE Strategic and Cumulative Environmental and Social Assessment Active Turbine Management Program (ATMP) for Wind Power Projects in the Gulf of Suez (RCREEE 2018);
- The ESIA of the area located to the west of Lekela North Ras Gharib 250 MW Project area (Ecoda 2013);
- The ESIA of Alfa Wind Project (EcoConServ 2016);
- Italgen Gabal El-Zeit 320 MW bird baseline studies in autumn 2008, spring 2009, autumn 2013, spring 2014 and autumn 2016 (Grontmij 2009; EcoConServ 2014, 2017);
- The ESIA of the area located north of Italgen Gabal El-Zeit 320 MW presenting bird baseline studies from spring and autumn 2010 (Ecoda 2011) and additional bird baseline studies from spring 2014 (El-Gebaly & Al-Hassani 2017);
- The Feasibility Study of NREA concession presenting bird baseline studies presented from autumn 2006 and spring 2007 (Decon 2007);
- A survey in autumn 2006 in Gebel El Zeit Important Bird Area (Hilgerloh et al. 2011);
- A survey in spring 2020 in AMUNET 500 MW Wind Farm (RCREEE, 2020)
- Species qualifying the listing of Gebel El Zeit as an Important Bird and Biodiversity Area (BirdLife International 2018a);
- The Migratory Soaring Bird Database (BirdLife International 2018b), filtered by species mapped as occurring in the project area; and,
- The lists of bird and bat species included in the assessment of global vulnerability to wind power development compiled by Thaxter et al. (2017), filtered by species mapped in IBAT as occurring in the project area as.

These species were then allocated to one of three categories, and an appropriate Unit of Analysis (UoA) determined for each category:

- Category 1: Migratory Soaring Birds (as per BirdLife International 2018b), with the UoA being the Rift Valley / Red Sea flyway population. Data on populations of these species were sourced from Grontmij (2009), supplemented with information from Porter (2005) as needed;
- Category 2: Breeding and resident raptors, including species that were recorded at the study area and are known from literature to be breeding in the study area and its vicinity;

- Category 3: Other migrants and wintering species, with the UoA being the global breeding range extent (taken from BirdLife International 2017) as no national, regional or flyway-level estimates were available to allow a definition of a smaller UoA;
- Category 4: Other resident species, with the UoA being the same as for Category 2 species

Step 1 produced a species population list of 194 bird species, see Table 1

**Table 1. Species population list of potential bird VECs**

| Order | Number of Potential VECs |
|---|---|
| Accipitriformes (diurnal birds of prey) | 31 |
| Anseriformes (waterfowls) | 8 |
| Apodiformes (swifts, treeswifts and hummingbirds) | 3 |
| Bucerotiformes (hornbills, hoopoe, wood-hoopoe) | 1 |
| Charadriiformes (shorebirds) | 43 |
| Ciconiiformes (storks) | 4 |
| Columbiformes (pigeons and doves) | 3 |
| Coraciiformes (kingfishers and allies) | 5 |
| Falconiformes (falcons and caracaras) | 10 |
| Galliformes (ground-feeding birds) | 2 |
| Gruiformes (cranes, crakes and rails) | 5 |
| Passeriformes (perching birds) | 60 |
| Pelecaniformes (ibis, herons and pelicans) | 14 |
| Podicipediformes (grebes) | 1 |
| Pteroclidiformes (sandgrouses) | 2 |
| Strigiformes (nocturnal birds of prey) | 1 |
| Suliformes (cormorants, gannets and boobies) | 1 |

## 4.2 Step 2 – Identify species sensitivity

The purpose of Step 2 is to determine the sensitivity of each species or population identified in Step 1 based on its vulnerability at a national, regional, or international scale, depending on the UoA, and the relative importance of the study area to the population. Sensitivity as considered here relates to the species population present in the study area, and combines two components:

- Relative Importance for each MSB species population was defined as an estimate of the proportion of the Rift Valley/Red Sea flyway population migrating through wind power projects within the study area. Owing to the practical difficulties of monitoring the entire flyway, the flyway population estimate for a species is given as the maximum seasonal count recorded at any of the Middle East bottleneck sites during the period of documented migration monitoring (Porter, 2005) recorded in the study area, and for other migrants and for resident species the global breeding range (sourced from Birdlife International species accounts), with ratings as per Table 2 and Table 3 respectively. For the population recorded in the study area, we have taken this number to be the maximum count recorded in any season for any survey.
- Vulnerability, for each species population, was scored using international and/or regional guidance on conservation status appropriate to its UoA and evidence of its vulnerability to wind farms. International guidance was applied to migrant and wintering species populations (categories 1 and 3) and regional guidance to the resident and summer breeding species populations (categories 2 and 4), see Table 4.

These two factors are combined in a matrix to determine to overall species sensitivity, see Table 5. Species with a negligible sensitivity were not progressed to Step 3. Additionally, we discounted species where the estimated flyway population was <1% of the total estimated global population to reflect the very low importance of the Rift Valley / Red Sea flyway population at a global level: this removed four additional species that were rated above a negligible sensitivity (White-tailed Sea Eagle *Haliaeetus albicilla*, Griffon Vulture *Gyps fulvus*, Hen Harrier *Circus cyaneus* and Red Kite *Milvus milvus*).

**Table 2. Relative importance scoring for migratory soaring birds**

| Relative Importance | Maximum total count for a species within a single season from any one project in the study area as a percentage of flyway population |
|---|---|
| Negligible | ≤ 1% |
| Low | >1% and ≤ 5% |
| Moderate | >5% and ≤10% |
| High | >10% |

**Table 3. Relative importance scoring for other migrants and resident species**

| Relative Importance | Global resident or breeding range (km²) – extent of occurrence |
|---|---|
| Negligible | > 10,000,000 |
| Low | > 100,000 and < 10,000,000 |
| Moderate | > 50,000 and < 100,000 |
| High | < 50,000 |

**Table 4. Vulnerability scoring criteria**

| Vulnerability rating | Migratory soaring birds (and other species where an SVI has been designated) | Other migrants and resident species |
|---|---|---|
| Negligible | LC on IUCN Global Red List, and SVI of 6 or below | LC on IUCN Global Red List |
| Low | VU or NT on IUCN Global Red List and SVI 6 or below;<br>LC on IUCN Global Red List and SVI of 7 or 8; or<br>CMS Category 2 Species and SVI of 6 or below | NT on IUCN Global Red List |
| Moderate | VU or NT on IUCN "Global" Red List and SVI of 7 or 8;<br>LC on IUCN Global Red List and SVI of 9 or 10; or<br>CMS Category 2 Species and SVI of 7 or 8 | VU on IUCN Global Red List |
| High | CR or EN on IUCN Global Red List;<br>VU or NT on the IUCN Global Red List and SVI of 9 or 10; or<br>CMS Category 2 Species and SVI 9 or 10 | CR or EN on IUCN Global Red List |

**Table 5. Sensitivity matrix**

| Sensitivity | | Relative Importance | | | |
|---|---|---|---|---|---|
| | | **Negligible** | **Low** | **Moderate** | **High** |
| **Vulnerability** | **Negligible** | Negligible | Negligible | Low | Low |
| | **Low** | Negligible | Low | Low | Medium |
| | **Moderate** | Low | Low | Medium | High |
| | **High** | Low | Medium | High | High |

Step 2 produced a list of 35 avian species with their sensitivity being low or above, which means 159 species populations were scoped out as a result, see Table 6.

**Table 6. Scoring at step 2 for species sensitivity rates as Low, Moderate and High**

| Species | Vulnerability | Relative Importance | Sensitivity |
|---|---|---|---|
| European Turtle-dove *Streptopelia turtur* | Negligible | Moderate | Low |
| Bar-tailed Godwit *Limoa lapponica* | Low | Low | Low |
| Curlew Sandpiper *Calidris ferruginea* | Low | Low | Low |
| Great Snipe *Gallinago media* | Low | Low | Low |
| Yellow-billed Stork *Mycteria ibis* | Moderate | Negligible | Low |
| White-eyed Gul *Larus leucophthalmus* | Low | Low | Low |
| Black-winged Pratincole *Glareola nordmanni* | Low | Low | Low |
| Black Stork *Ciconia nigra* | Moderate | High | High |
| White Stork *Ciconia ciconia* | Moderate | High | High |
| Common Crane *Grus grus* | Moderate | High | High |
| Dalmatian Pelican *Pelecanus crispus* | High | Negligible | Low |
| Great White Pelican *Pelecanus onocrotalus* | Moderate | High | High |
| European Honey-buzzard *Pernis apivorus* | Moderate | Low | Low |

| Species | Vulnerability | Relative Importance | Sensitivity |
|---|---|---|---|
| Bateleur *Terathopius ecaudatus* | Moderate | Negligible | Low |
| Egyptian Vulture *Neophron percnopterus* | High | Low | Moderate |
| Cinereous Vulture *Aegypius monachus* | High | Negligible | Low |
| Lappet-faced Vulture *Torgos tracheliotos* | High | Negligible | Low |
| Black Kite *Milvus migrans* | Low | Moderate | Low |
| Bonelli's Eagle *Aquila fasciata* | Moderate | Negligible | Low |
| Tawny Eagle *Aquila rapax* | High | Negligible | Low |
| Steppe Eagle *Aquila nipalensis* | High | High | High |
| Eastern Imperial Eagle *Aquila heliaca* | High | Low | Moderate |
| Golden Eagle *Aquila chrysaetos* | Moderate | Negligible | Low |
| Verreaux's Eagle *Aquila verreauxii* | Moderate | Negligible | Low |
| Greater Spotted Eagle *Clanga clanga* | High | High | High |
| Lesser Spotted Eagle *Clanga pomarina* | Moderate | Moderate | Moderate |
| Booted Eagle *Hieraaetus pennatus* | Moderate | High | High |
| Short-toed Snake-eagle *Circaetus gallicus* | Low | Moderate | Low |
| Eurasian Buzzard *Buteo buteo* | Low | Moderate | Low |
| Long-legged Buzzard *Buteo rufinus* | Low | Moderate | Low |
| Levant Sparrowhawk *Accipiter brevipes* | Negligible | High | Low |
| Montagu's Harrier *Circus pygargus* | Moderate | Negligible | Low |
| Pallid Harrier *Circus macrourus* | Moderate | Moderate | Moderate |
| Saker Falcon *Falco cherrug* | High | Negligible | Low |
| Cyprus Warbler *Sylvia melanothorax* | Negligible | High | Low |

### 4.3 Step 3 – Ecological risk assessment and identification of priority bird VECs

Step 3 aims to identify priority bird VECs from the 35 sensitive species remaining from Step 2. This is done by combining each species' sensitivity rating with an estimated of site-specific risk (the Likelihood of effect: LoE) to identify the species which are most at risk of significant impacts from wind farm developments in the study area. Bsed on the baseline bird data available, Likelihood of Effect comprised of three components:

- Component 1. A score for the combined effect of the percent of individuals recorded flying below 200 m and mean flock size, see Table 7. These are birds which are potentially at risk of collision with turbines or could collide with transmission lines. We took the weighted mean percent of individuals recorded flying below 200 m (i.e. sum total of individuals <200 m divided by the sum total individuals for all seasons) for all seasons where this value was reported. For species with no data for the percent of records <200 m, we scored these as having 50% of records <200 m. Mean flock size was derived from the average flock sizes reported during each survey period: no weighting was applied as not all surveys covered the full migration period for all species, and flocking behaviour might vary throughout this period. Larger flocks were considered to be at greater risk of multiple fatalities due to the higher numbers present and the reduced ability for individuals in the flock to see and avoid turbines or power lines. For species with no data on mean flock size, we conservatively scored these as having a maximum flock size equal to the maximum count recorded in a season (as per Component 2, below: i.e. equivalent to all individuals passing in a single flock). For species with values for both variables, the resulting matrix score was increased by one if the variability (taken as the standard deviation of all reported values for that species) of the percentage of flights <200 m was in the top two quartiles (i.e. the top 50% of values). We added this additional step to account for situations where flight height behaviour was very variable and the average value was less valid as a risk predictor;

- • Component 2. The maximum total count for a species within a single season from any one project in the study area to reflect the fact that species with higher counts in the study area are more likely to be affected by wind developments, see ; and,

- • Component 3. Whether or not that species had been recorded on the ground within the study area, irrespective of the numbers of individuals involved (species with records of landing scored 1, those without 0). Those species recorded on the ground must pass through the collision risk zone, and hence are at greater risk of collision than those species for which landing on the ground has not been recorded.

These three components were summed to arrive at a final LoE score for each species (theoretical range 2-10), which was separated into quartiles to derive a LoE rating for that species, see Table 9. This LoE rating was then combined with the Sensitivity rating from Step 3 to derive an Overall Risk rating from the project, see Table 10. Species which had an Overall Risk of Major or Moderate were considered Priority bird VECs for the study area

**Table 7. Matrix for scoring mean flock size and percentage of flights less than 200m for each species**

| Mean flock size | Percentage of flights < 200m | | | |
|---|---|---|---|---|
| | 0-25 | 26-50 | 51-75 | 76-100 |
| < 10 | 1 | 1 | 2 | 2 |
| 10–50 | 1 | 2 | 2 | 3 |
| 51-100 | 2 | 2 | 3 | 4 |
| > 100 | 2 | 3 | 4 | 4 |

**Table 8. Score categories for the maximum seasonal counts for a species in the study area**

| Maximum season count | |
|---|---|
| **Range** | **Score** |
| 0-10 | 1 |
| 11-1,000 | 2 |
| 1,001-10,000 | 3 |
| > 10,000 | 4 |

**Table 9. Likelihood of Effect rating based on overall score for each species evaluated at Step 3**

| Likelihood of Effect (LoE) | |
|---|---|
| **Overall Score (based on quartiles)** | **Level of Effect** |
| ≤2 | Negligible |
| >2 and ≤3 | Low |
| >3 and ≤6 | Medium |
| >6 | High |

**Table 10. Overall risk matrix**

| Overall risk | | Likelihood of Effect (LoE) | | | |
|---|---|---|---|---|---|
| | | **Negligible** | **Low** | **Medium** | **High** |
| **Sensitivity** | **Low** | Negligible | Minor | Minor | Moderate |
| | **Medium** | Minor | Minor | Moderate | Major |
| | **High** | Minor | Moderate | Major | Major |

Step 3 identified 14 species with an Overall Risk of Major or Moderate from the project, and these species considered priority VECs for this analysis, see Table 11.

**Table 11. Scoring and rating details for the 14 species identified as priority VECs**

| Species | IUCN Red List Status | SVI | Vulnerability | Highest Count | Flyway Population | % of UoA | Relative Importance | Sensitivity | % flights <200m | Mean flock size | Landing in Area | LoE | Overall Risk |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Black Stork *Ciconia nigra* | LC | 10 | Moderate | 6,738 | 19,500 | 34.6 | High | High | 36 | 12 | Yes | High | Major |
| White Stork *Ciconia ciconia* | LC | 10 | Moderate | 212,030 | 450,000 | 47.1 | High | High | 35 | 653 | Yes | High | Major |
| Common Crane *Grus grus* | LC | 10 | Moderate | 12,004 | 35,000 | 34.3 | High | High | 19 | 100 | Yes | High | Major |
| Great White Pelican *Pelecanus onocrotalus* | LC | 10 | Moderate | 31,001 | 70,000 | 44.3 | High | High | 40 | 222 | Yes | High | Major |
| European Honey-buzzard *Pernis apivorus* | LC | 7 | Moderate | 35,423 | 1,000,000 | 3.5 | Low | Low | 38 | 42 | Yes | High | Moderate |
| Egyptian Vulture *Neophron percnopterus* | EN | 10 | High | 395 | 4,335 | 8.7 | Low | Moderate | 41 | 1 | No | Medium | Moderate |
| Black Kite *Milvus migrans* | LC | 8 | Low | 16,229 | 132,700 | 12.2 | Moderate | Low | 52 | 5 | Yes | High | Moderate |
| Steppe Eagle *Aquila nipalensis* | EN | 9 | High | 17,152 | 37,500 | 45.7 | High | High | 32 | 5 | Yes | Medium | Major |
| Greater Spotted Eagle *Clanga clanga* | VU | 9 | High | 341 | 2,180 | 15.6 | High | High | 23 | 2 | No | Medium | Major |
| Lesser Spotted Eagle *Clanga pomarina* | LC | 9 | Moderate | 1,705 | 59,700 | 2.9 | Moderate | Moderate | 14 | 5 | No | Medium | Moderate |
| Booted Eagle *Hieraaetus pennatus* | LC | 9 | Moderate | 858 | 3,169 | 27.1 | High | High | 26 | 1 | No | Medium | High |
| Eurasian Buzzard *Buteo buteo* | LC | 7 | Low | 86,740 | 1,250,000 | 6.9 | Moderate | Low | 36 | 24 | Yes | High | Moderate |
| Levant Sparrowhawk *Accipiter brevipes* | LC | 6 | Negligible | 30,134 | 75,000 | 40.2 | High | Low | 40 | 110 | No | High | Moderate |
| Pallid Harrier *Circus macrourus* | NT | 8 | Moderate | 100 | 1,505 | 6.6 | Moderate | Moderate | 85 | 1 | No | Medium | Moderate |

### 4.4 Step 4 – Identification of thresholds for fatalities for each priority bird VECs

Step 4 aims to identify thresholds for fatalities for each priority bird VECs, by setting the point at which further loss is considered a risk to long-term viability of the population. Threshold setting takes into account species-specific biological and demographic parameters, the cumulative risk associated with WPPs, and the likely effects of external stressors on the population defined by the UoA. As mentioned earlier, this step has not been undertaken at this stage and is planned to be undertaken in the near future and will be included in a reviewed version of this report.

### 4.5 Step 5 – Identify mitigation and monitoring

This section follows the broad mitigation and monitoring actions that were proposed by the Cumulative Effects Analysis that was undertaken for Lekela project. Following the same approach and building on the results of that analysis while adding to it more analysis by the more recent field assessments and literature, the actions follows the same approach and broad lines. These mitigation and monitoring actions focus on the 14 priority bird VECs, as identified in this document, but will, even if indirectly, will provide benefits for for other bird species passing through the area of all wind farms. In all cases, mitigation and monitoring actions are based on industry good practice, adapted to be locally-relevant. Mitigation and monitoring actions focus on two areas:

- On-site mitigation and monitoring methods, to minimise collision risk, validate the effectiveness of proposed mitigation methods, allow estimation of residual impacts and provide information to adapt monitoring and mitigation to prevailing conditions9; and,
- Collaborative efforts with other wind farm entities, to minimise the cumulative effects of all the proposed wind farm developments in the study area.

Since these measures and actions have already been included in the project's ESIA, which has been submitted for approval and they have also been adopted by existing developers in the study area, such as Lekela (TBC, 2018), and now to be adopted by RSWE, this will ensure the conservation of the VECs all across the area and would consequently help in protecting the species across a critical part of the flyway. By adopting best-practice mitigation measures and monitoring actions, RSWE will be able to reduce its impact for the identified VECs (see Table 12).

**Table 12. Proposed mitigation measures and monitoring actions for the project and the study area**

| Action | Measure | Description | Key objective | Responsible entity | Timeframe |
|---|---|---|---|---|---|
| **Site-specific mitigation actions** | | | | | |
| 1 | Development of appropriate protocols | All actions require clear and detailed protocols that can be followed by all survey teams: this information should be included in the relevant Project documents. Protocols should align with industry good-practice guidelines, and be designed by an ornithologist experienced in assessing bird risk at wind farm developments. This can build on the already available protocols prepared for the implementation of the ATMP that is already being implemented at the operational wind farms along the Gulf of Suez | Ensure that all actions are undertaken in a consistent manner, and collect appropriate data to make decisions. | Consultant / RCREEE | Approved protocols at least three months prior to commencement of operation |
| 2 | Shutdown On-demand | Shutdown on-demand' is an established method to mitigate the risk to birds of colliding with wind turbine rotors. It involves a coordinated team of field observers identifying situations when birds are at risk of colliding with turbines as they move within the wind farm, and initiating a temporary shut-down of one or more turbines. | To minimize the number of collisions between priority bird VECs and wind turbines. | Consultant / RCREEE | Protocols and tested system in place prior to commencement of operation |
| 3 | Installation of bird flight diverters on Project power lines | Many bird species are known to collide with power lines (particularly high-voltage lines), and installing bird flight diverters has been shown to lessen this risk. The configuration (type and frequency) of bird flight diverters should be based on industry good-practice, relying on local examples of successful installation if available. | Minimisation of collisions to priority bird VECs with Project power lines | EETC | During power line erection |
| 4 | Monitoring of priority VECS in-flight monitoring | 'In-flight monitoring' is a bird surveillance programme and method that is designed to monitor activity and track the flight paths of Priority Birds[1] and flocks of non-priority Migratory Soaring Birds (MSBs) relative to operational wind turbines. The principal aim of in-flight monitoring is to inform turbine shutdown decisions and to identify 'Elevated Risk Situations'. Similar to shutdown on-demand, in-flight monitoring of priority birds follows a protocol that can be developed following the protocols developed as part of the ATMP that is being implemented as part of the operational monitoring of wind farms along the Gulf of Suez | To ensure that shut-down on demand protocols can be initiated with sufficient time to minimize bird collisions | Consultant / RCREEE | Prior to commencement of operation |
| 6 | Carcass search surveys | This involves regular surveys of the area beneath turbines to detect carcasses from individual birds that have collided with turbine blades. Similar surveys are being already implemented, according to best-practice guidelines, in operational wind farms along the Gulf of Suez as part of the ATMP and can be applied similarly at the project site. | To determine the level of observed fatalities due to collisions with turbines and power lines at the wind farm site. | Consultant / RCREEE | On-going for at least the first three years of operation, then reassessment |
| 7 | Carcass bias-correction trials | Bias-correction trials aim to convert the observed carcasses to an actual estimate of mortalities, as some carcasses will be removed prior to carcass surveys occurring (carcass removal bias), and searchers will not detect all carcasses present (searcher efficiency bias). Such trials are being already implemented, according to best-practice guidelines, in operational wind farms along the Gulf of Suez as part of the ATMP and can be applied similarly at the project site. | To determine the correction factor to apply to detected carcasses to estimate true project-related mortality. | Consultant / RCREEE | Annually for three years, then reassessment.<br>Can begin prior to commencement of operation. |
| 8 | Review to improve monitoring and | Periodic reviews of Actions 1, 2, and 4-8 will be undertaken to improve the effectiveness of monitoring and mitigation actions. This will include: | Adaptive management to reduce risk | RSWE | On-going from start of construction |

[1] These are bird populations identified by the CEA as least able to tolerate adverse effects on their populations and remain viable in the long-term.

| Action | Measure | Description | Key objective | Responsible entity | Timeframe |
|---|---|---|---|---|---|
| | mitigation effectiveness | Immediate review of process in the event of a recorded mortality for a priority bird VEC, to determine if additional actions could be implemented to further reduce collision risk. | | | |
| **Actions to be implemented on the level of the study area** | | | | | |
| 9 | Data sharing | All developers to make annual summaries of their respective monitoring and mitigation efforts publicly available to support baseline knowledge, increase transparency and understanding of the work being undertaken. | Maximise the knowledge base in the region. | All developers | Variable, depending on the data released |
| 10 | Joint training of observers | All developers to contribute to the joint training of a pool of skilled bird observers who are able to carry out baseline and monitoring surveys throughout the study area, and adjacent Important Bird Area | Ensure comparable observer standards are maintained across all project sites. | All developers | On-going, with establishment prior to commencement of operation |
| 11 | Coordination of observer networks | All developers to co-ordinate in the Project area to site observer networks where these can be of greatest benefit | Maximise the benefits from an extended observer network | All developers | On-going, with establishment prior to commencement of operation |
| 12 | Discussion forum | Facilitate / support an annual biodiversity workshop / conference for all wind farms in the Project area, to facilitate knowledge exchange, share experiences and plan cumulative actions…. | Improve regional knowledge of priority avian VECs and improve wind farm operations | All developers | Annually |
| **Other actions** | | | | | |
| 13 | Determine mortality thresholds for priority bird VECs | For each priority bird VEC, RSWE will set a threshold of acceptable mortality, beyond which offsets for that species will need to be developed (Step 4 – not yet undertaken). | Set a threshold for acceptable mortality | ECOConsult / RCREEE | On-going and will be included a in an updated version of the report. |

# 5 NEXT STEPS

The CEA has focused on identifying priority bird VECs and outlining appropriate mitigation and monitoring actions. In order to complete the cumulative effects analysis the following actions are required:

- Determine impact thresholds and whether they are likely to be exceeded (per TRWPP-CEA process Step 4)
- Share the findings for review and input with stakeholders including (but not limited to): government agencies, RCREEE, wind farm developers, lenders, NGOs (e.g. Nature Conservation Egypt, BirdLife International), environmental impact experts, and ecologists with local expertise.
- It is well documented that avifauna and more specifically MSBs are potentially the taxa that are at the highest risk from the development of wind power projects, however it would be worth expanding the CEA to include taxa other than avifauna to ensure that any additional VECs identified can be included in the future mitigation and monitoring actions of the study area. Determination of non-bird biodiversity priority VECs through stakeholder/expert consultation and potentially additional field work and mapping.

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