



Cumulative Effects Assessment for the Shadwan Wind Farm, Egypt



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Citation: TBC. (2026). Cumulative Effects Assessment for the Shadwan Wind Farm, Egypt. The Biodiversity Consultancy, Cambridge, United Kingdom.

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Document information	
Document title	Cumulative Effects Assessment for the Shadwan 900 MW Wind Farm Project, Egypt.
Document subtitle	
Project No.	RCR03
Date	03 August 2026
Version	Final
Author	Lucy Murrell, Filipe Canário, Vineet Katariya, Mihai Coroi
Client name	Regional Center for Renewable Energy and Energy Efficiency (RCREEE)

Document history						
Revision no.	Author/s	Reviewer 1	Reviewer 2	Date	Comments	Final/draft
1	LM, FC, VK	MC		30 January 2026	For client review	Draft
2	LM, FC, VK	MC		16 February 2026	Updated in response to comments by RCREEE and the developer	Draft
3	LM, FC, VK	MC		9 July 2026	Updated in response to comments by the Lenders	Draft
4	LM, FC, VK	FC		03 August 2026	Updated in response to comments by the Lenders	Final

Signature of Technical Director

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Executive summary

This report is a Cumulative Effects Assessment (CEA) of biodiversity for the Shadwan Wind Farm (the Project) and other wind energy developments in the Gulf of Suez, Egypt. This assessment identified 13 migratory bird species, three bat species, and one ecosystem/habitat type as priority Valued Environmental Components (VECs) for the Project ([Table 1](#)), which are most at risk from the combined impacts of existing and potential wind developments. Impact thresholds have been set for each priority bird VECs, which range between zero and five annual fatalities, above which an adaptive management response is triggered.

In addition, the Project has carried out a Critical Habitat Assessment (TBC 2026) which identified two bird species as Critical Habitat (CH)- qualifying features, as well as 98 bird, one reptile and one mammal species as Priority Biodiversity Features (PBFs) ([Table 1](#)). The Project has a Net Gain target for CH-qualifying features and a No Net Loss target for priority VECs and PBFs.

This CEA proposes a set of mitigation and monitoring actions (Section 7) aimed at minimizing turbine blade and power line collision fatalities for the eight bird and three bat priority VECs, as well as impacts on the habitat VEC (wadis) and reptile and mammal PBFs. The approach follows Good International Industry Practice (GIIP) and focuses on: i) on-site mitigation and monitoring measures, and ii) collaborative efforts with other wind farm entities.

Table 1. Priority VECs (in bold), CH-qualifying species and PBFs¹ for the Shadwan Wind Farm Project

Species	Scientific name	Type	IUCN status	CH	PBF	Overall risk	Threshold (fatalities/year)
Black Kite	<i>Milvus migrans</i>	Bird	LC		✓	Major	3
Black Stork	<i>Ciconia nigra</i>	Bird	LC		✓	Major	0
Booted Eagle	<i>Hieraaetus pennatus</i>	Bird	LC		✓	Moderate	0
Common Crane	<i>Grus grus</i>	Bird	LC		✓	Major	0
Common Kestrel	<i>Falco tinnunculus</i>	Bird	LC		✓	N/A	5
Eastern Imperial Eagle	<i>Aquila heliaca</i>	Bird	VU		✓	Moderate	0
Egyptian Vulture	<i>Neophron percnopterus</i>	Bird	EN		✓	N/A	0
Eleonora's Falcon	<i>Falco eleonora</i>	Bird	LC		✓	N/A	0
Eurasian (Steppe) Buzzard	<i>Buteo buteo</i>	Bird	LC		✓	Major	5
Eurasian Hobby	<i>Falco subbuteo</i>	Bird	LC		✓	N/A	3
Eurasian Sparrowhawk	<i>Accipiter nisus</i>	Bird	LC		✓	N/A	0
European Honey-buzzard	<i>Pernis apivorus</i>	Bird	LC		✓	Major	5
Great White Pelican	<i>Pelecanus onocrotalus</i>	Bird	LC		✓	Major	0
Greater Spotted Eagle	<i>Clanga clanga</i>	Bird	VU		✓	Major	0
Griffon Vulture	<i>Gyps fulvus</i>	Bird	LC		✓	N/A	0
Lanner Falcon	<i>Falco biarmicus</i>	Bird	LC		✓	N/A	0

¹ Note that bird PBFs that are not considered Migratory Soaring Birds are not shown here. See the CHA (TBC 2026) for a full list of bird PBFs.

Species	Scientific name	Type	IUCN status	CH	PBF	Overall risk	Threshold (fatalities/year)
Lesser Kestrel	<i>Falco naumanni</i>	Bird	LC		✓	N/A	3
Lesser Spotted Eagle	<i>Clanga pomarina</i>	Bird	LC		✓	N/A	3
Levant Sparrowhawk	<i>Accipiter brevipes</i>	Bird	LC		✓	Major	3
Long-legged Buzzard	<i>Buteo rufinus</i>	Bird	LC		✓	N/A	3
Montagu's Harrier	<i>Circus pygargus</i>	Bird	LC		✓	N/A	3
Oriental Honey-buzzard	<i>Pernis ptilorhynchus</i>	Bird	LC		✓	N/A	0
Osprey	<i>Pandion haliaetus</i>	Bird	LC		✓	N/A	0
Pallid Harrier	<i>Circus macrourus</i>	Bird	NT		✓	Moderate	0
Peregrine Falcon	<i>Falco peregrinus</i>	Bird	LC		✓	N/A	0
Red-footed Falcon	<i>Falco vespertinus</i>	Bird	VU		✓	N/A	3
Short-toed Snake-Eagle	<i>Circaetus gallicus</i>	Bird	LC		✓	N/A	0
Sooty Falcon	<i>Falco concolor</i>	Bird	VU		✓	N/A	0
Steppe Eagle	<i>Aquila nipalensis</i>	Bird	EN	✓		Major	0
Western Marsh-Harrier	<i>Circus aeruginosus</i>	Bird	LC		✓	N/A	3
White Stork	<i>Ciconia ciconia</i>	Bird	LC	✓		Major	5
Botta's Serotine	<i>Eptesicus bottae</i>	Mammal	LC			Moderate	Not established
Desert Pipistrelle	<i>Hypsugo ariel</i>	Mammal	DD			Moderate	Not established
Rüppel's Pipistrelle	<i>Pipistrellus rueppellii</i>	Mammal	LC			Moderate	Not established
Dorcas Gazelle	<i>Gazella dorcas</i>	Mammal	VU		✓	N/A	N/A
Egyptian Spiny-tailed Lizard	<i>Uromastyx aegyptia</i>	Reptile	VU		✓	N/A	N/A
Wadis with permanent vegetation		Ecosystem				Not evaluated	N/A

1 Introduction

1.1 Scope and objectives

This report presents a Cumulative Effects Assessment (CEA) of biodiversity for Scatec's Shadwan 900 MW Wind Farm (the Project) and other wind energy operations in the Gulf of Suez, Egypt. It aims to identify priority Valued Environmental Components² (VECs) for the Shadwan Wind Farm which are most at risk from the combined impacts of all the existing and potential wind developments identified within the study area (see Section 2), and sets impact thresholds for adaptive management of mitigation measures. The report presents the following information for the Project:

- A list of potential biodiversity VECs;
- Identification of biodiversity VECs with 'sensitivity' to wind farm developments.
- A list of priority biodiversity VECs assessed to be at highest risk of cumulative effects from wind farm development in the study area.
- Impact thresholds for priority bird VECs; and
- Mitigation, monitoring and other management opportunities for Scatec relevant to priority biodiversity VECs, including identifying opportunities where Scatec can contribute to the management of cumulative effects.

This assessment broadly follows the approach developed in the equivalent CEA reports for the Tafila Region Wind Power Projects in Jordan, the Lekela North Ras Ghareb wind farm (IFC 2017; TBC 2019) and other Scatec 200 MW wind development project (TBC 2025a), both in Egypt's Red Sea Coast, along with the International Finance Corporation's (IFC) and The International Union for Conservation of Nature's (IUCN) guidance on cumulative impact assessment (IFC 2013; Bennun *et al.* 2024). The approach has been adapted to the local context, particularly to account for the variation in quality and quantity of baseline data which have been collected by different developers in the landscape.

1.2 Project description

The Project is located in the Red Sea Governorate, within the Ras Gharib District, administratively under the Ras Gharib City Council (Figure 1). The closest community settlement to the Project site is Ras Gharib city that is located around 22 km to the northeast.

The Project site has an area of 90 km² and includes the following components:

² This analysis focuses only on globally significant biodiversity values, species and ecosystems. The analysis does not include any evaluation of potential ecosystem service VECs. In addition, consultation with Egyptian stakeholders has not been feasible, and therefore VECs which might be considered as a priority by local experts, but not readily identifiable with global data sets, might be missed. A stakeholder review and input process is recommended to address this gap (see Section 8)

- Wind turbines: The Project will be composed by 83 turbines (11 MW), each with a rotor diameter of 210 m and tip height of 220 m.
- Medium Voltage (MV) Cables: The wind turbines will be connected through underground transmission cables medium voltage cables (33kV or 35kV) to an onsite substation:
- Communications Network: The Project will have a Supervisory Control and Data Acquisition (SCADA) system for the remote operation of the facilities. A communication network will be installed in the same trenches as the MV cables which will consist of fibre optic cables connecting the turbines together to the SCADA system at the substation.
- Substation: This infrastructure collects and converts the output from the turbines to a higher voltage.
- Building Infrastructure: Onsite building infrastructure could include an administrative building (offices) used for normal daily operational related work, control room, workshop and a warehouse for storage of equipment and machinery.
- Road network: An internal road network will be required within the Project site for installation of the turbines during the construction process and for ease of access to the turbines for maintenance purposes during operation.
- Other Temporary Components: Temporary components include temporary offices, laydown areas, batching plant, borrow pits, generators
- Overhead Transmission Line (OHTL): A 220 or 500 kV s line that will connect the Project to the national grid. At this stage there are no details on the OHTL specifications (route, height, number of electrical towers, etc.) and therefore this infrastructure is outside the scope of this CEA.



Figure 1. Project location

1.3 Biodiversity context

The Project is located in the Red Sea Coastal Desert Ecoregion (Dinerstein *et al.* 2017), that extends along the Red Sea coast of Egypt and Sudan, characterized by its arid climate. This region represents a transition zone between the hyper-arid Sahara Desert and the marine environment of the Red Sea, consisting of a desert area of sand and gravel plains, bisected by several shallow wadis. Land cover consists primarily of bare ground with very scattered low-growing vegetation, supporting a low diversity and abundance of terrestrial fauna (Zahran & Willis 2008).

The site's topography is entirely flat, with no significant hills or plateaus, dissected by several wadis and drainage channels that flow eastward (Safe Soar 2025). There is a large number of quarries operating in the region, which are scattered throughout the area.

The Project overlaps with the Red Sea/Rift Valley flyway for migratory soaring birds which connects breeding grounds in Europe with wintering areas in Africa (BirdLife International 2015). This flyway is used by over 1.5 million individuals from 37 species of migratory soaring birds, as well as a suite of migratory passerines and other bird groups (Porter 2005; BirdLife International 2015; Jobson *et al.* 2021).

The Shadwan Wind Farm Project has completed a Critical Habitat Assessment (CHA) (TBC 2026) which determined that the Project is located in an area of Critical Habitat for two bird species, the Steppe Eagle (*Aquila nipalensis*) and White Stork (*Ciconia ciconia*), following IFC Performance

Standard 6 (IFC PS6), the European Bank for Reconstruction and Development Environmental and Social Requirement 6 (EBRD ESR6) and the European Investment Bank Environmental and Social Standard 4 (EIB ESS4). Additionally, 100 Priority Biodiversity Features (PBFs) (EBRD 2024, 2025) have been identified for the Project, comprising 98 bird species, along with the globally Vulnerable (VU) Dorcas Gazelle (*Gazella dorcas*) and the globally VU Egyptian Spiny-tailed Lizard (*Uromastix aegyptia*). The CHA also found that the Project was in an area of primarily Natural Habitat as defined by IFC (IFC 2012, 2019).

IFC PS6 requires a net gain (NG) of Critical Habitat- qualifying features, and EBRD ESR6 requires no net loss (NNL) and preferably NG of PBFs over the long term to achieve measurable conservation outcomes. IFC PS6 also requires NNL of Natural Habitat and associated significant biodiversity, where feasible.

1.4 Potential impacts and on-site management of biodiversity risk

One of the main negative impacts caused by wind farm developments is bird mortality from collisions with turbines and associated power lines (Bennun *et al.* 2021). The Project area is crossed by over 120 thousand soaring birds in spring (Camina 2025a) and 50 thousand in autumn (Camina 2025b).

The Project's Power Purchase Agreement (PPA) includes a 'Bird Migration Protocol'. This stipulates that the Project will participate in a region wide Active Turbine Management Program (ATMP) coordinated by RCREEE. The ATMP will take place during the spring and autumn migration periods and consists of a shutdown on demand program.

1.5 Periodic review of the CEA

This CEA will be reviewed every two years by Scatec and updated in response to any new or changed information that has become available since the initial document or previous update. Changes which may affect the findings of this CEA include the following information:

- Conclusions of the ongoing Strategic Environmental and Social Assessment and Cumulative Effects Assessment for wind energy projects in the Gulf of Suez, sponsored by the European Bank for Reconstruction and Development (EBRD).
- Results from ongoing monitoring at the site: e.g. higher counts for a species than used in the priority VEC identification process, a lesser proportion of a species flying at collision risk altitudes; or
- About the regional or global threat status of a species: e.g. a species being upgraded from Vulnerable to Endangered, a species' population trend changing from 'declining' to 'stable'.

Any implications for the Project from changes to the findings of this CEA in response to an update of this document (e.g. either the species which are considered as priority VECs or the thresholds

defined for a priority VEC) will only apply from the time that such an update is published and will not be applied retrospectively.

2 Study area

The region where the Project is going to be developed has been designated by the Egyptian New and Renewable Energy Authority (NREA) for wind energy development, and NREA as acquired this land from the Government of Egypt and identified five clusters of individual wind farm plots within the area. To appropriately capture all projects in the vicinity of the Project that could result in cumulative impacts on the priority biodiversity VECs, RCREEE provided information on the current (operational and in development) and planned projects in the region (Figure 2). The study area was a 10 km buffer around these project's areas (Figure 2). As a rule of thumb on how to set geographical boundaries for a CEA, IFC (2020) suggests including the area that will be directly affected by the project or activity. The 10 km buffer was selected based on evidence from a neighbouring population of Dorcas Gazelle (*Gazella dorcas*) in Wadi El Gemal National Park, where individuals were observed to avoid the coastal road up to 10 km (Nagy *et al.* 2022), indicating the spatial extent at which direct disturbance effects are felt

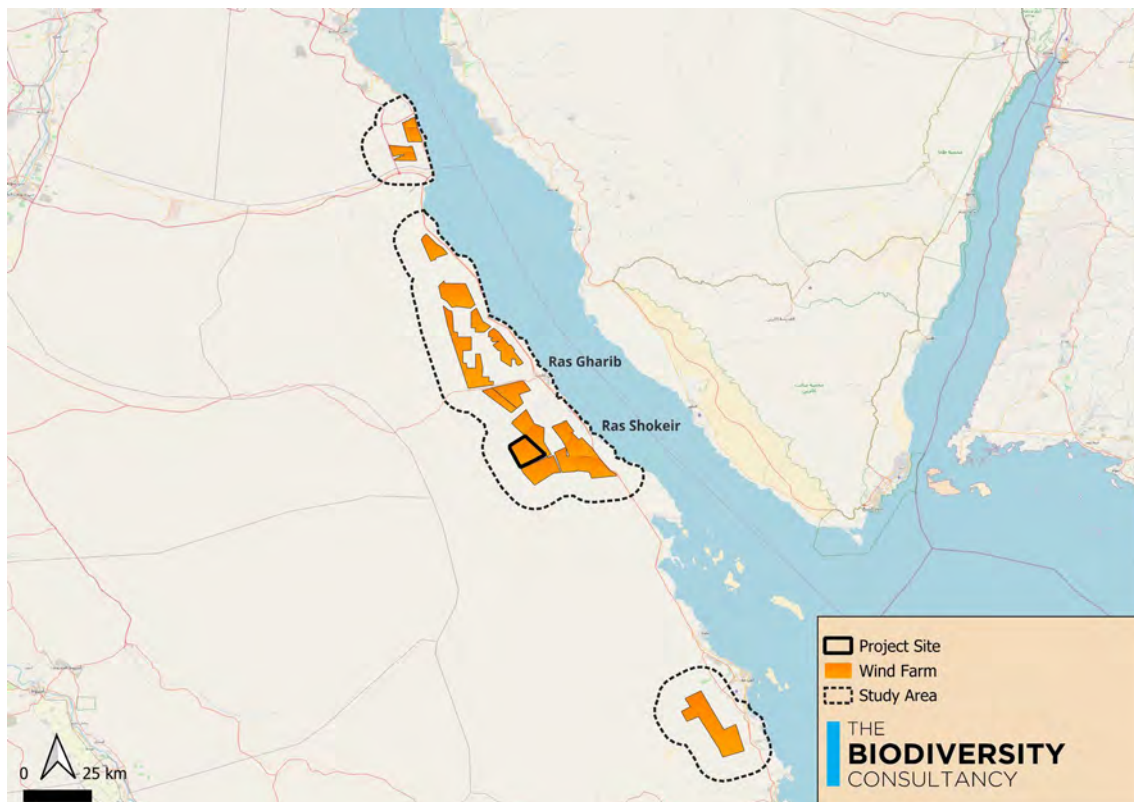


Figure 2. Location of the study area.

3 The VEC screening process

VECs are attributes, both environmental and social, that are considered important in assessing the risks that a project, or suite of projects poses to the environment. VECs may include (IFC 2013):

- Physical features, habitats, wildlife populations (e.g., biodiversity);
- Ecosystem services.
- Natural processes (e.g., water and nutrient cycles, microclimate);
- Social conditions (e.g., health, economics); or
- Cultural aspects (e.g., traditional spiritual ceremonies).

Identification of VECs in this assessment is restricted to flora and fauna species and habitats. The analysis was carried out via a desk-based exercise using published and grey literature, and available spatial databases (accessed under licence from the [Integrated Biodiversity Assessment Tool](#) (IBAT)³.

The process for identifying VECs and the framework for assessing cumulative effects was different for birds, other animals and habitats, and this is described in the following separate sections.

4 Cumulative assessment framework for birds

4.1 Overview of the framework for birds

The assessment framework for birds has two objectives: to identify bird 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 bird species. This framework follows a five-step process (Figure 3):

- **Step 1:** Develop a preliminary list of potential bird 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 (see Section [4.2](#)).
- **Step 2:** Determine the relative *sensitivity* of the species, being a combination of the:
 - o *Vulnerability* of the species; and

³ IBAT is a global biodiversity dataset setup by a partnership between BirdLife International, Conservation International, the International Union for Conservation of Nature (IUCN) and United Nations Environment Program World Conservation Monitoring Centre (UNEP-WCMC). It enables the access to key biodiversity datasets, such as the IUCN Red List, IUCN/UNEP-WCMC Protected Planet, IUCN-BirdLife Key Biodiversity Areas, etc. [Integrated Biodiversity Assessment Tool \(IBAT\)](#).

- o *Relative Importance* of the species' population in relation to the appropriate Unit of Analysis (UoA), i.e. the flyway population or global distribution (see Section [4.3](#)).

Species which were determined to have negligible *sensitivity* were dropped from analysis before proceeding to Step 3. For 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:
 - o *Sensitivity* of the species, as identified in Step 2; and
 - o Cumulative *Likelihood of Effect* (LoE) rating for each species (see Section [4.4](#)).

Those species with an *overall risk* of Major or Moderate are considered to be priority bird VECs for the project.

- **Step 4:** Determine an impact threshold for each priority bird VEC, being the point at which further fatality would be a risk to long-term viability of the population (see Section [4.5](#)); and,
- **Step 5:** Propose 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 (see Section [7](#)).

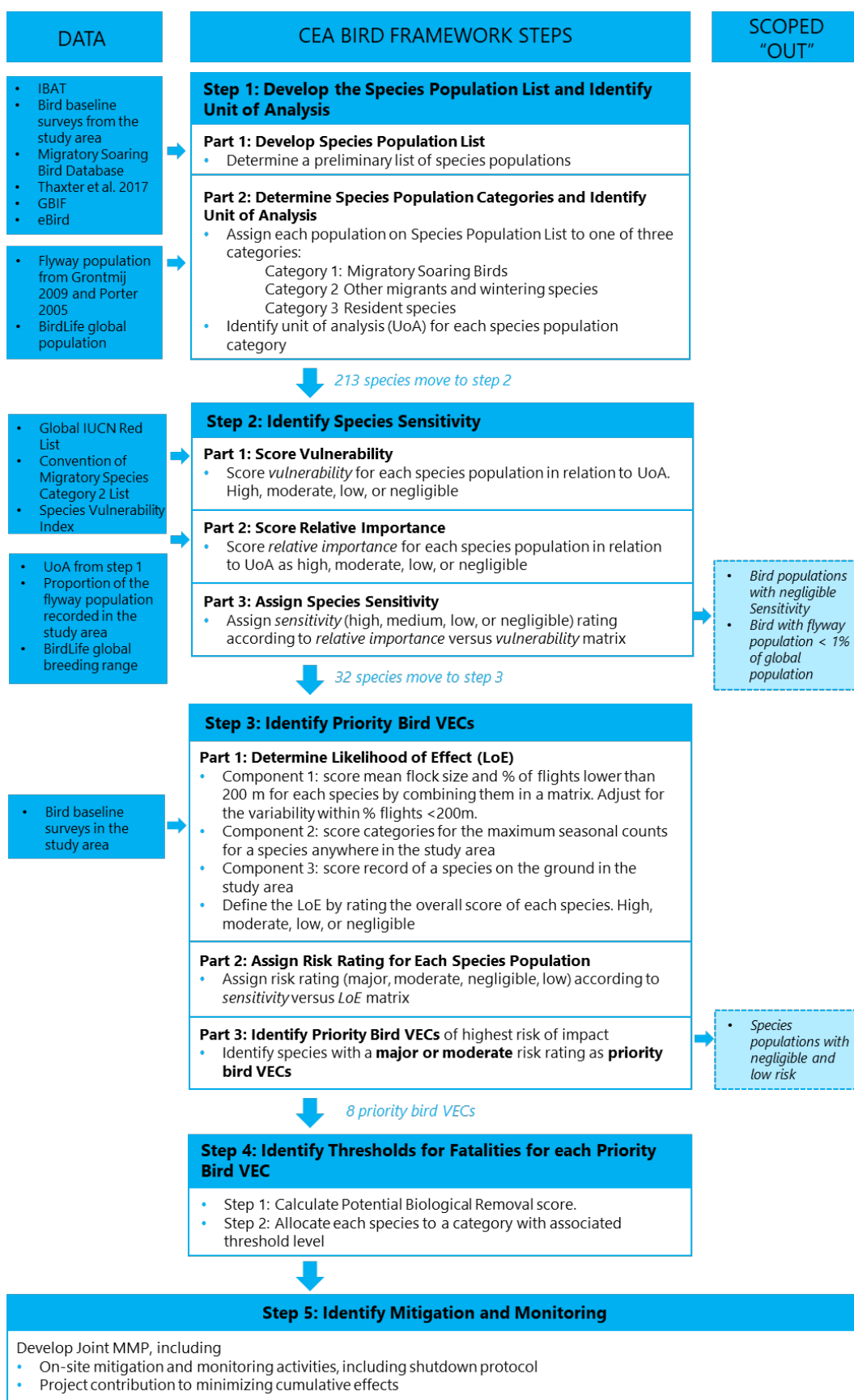


Figure 3. Process for cumulative effects analysis for priority bird VECs (adapted from IFC (2017))

4.2 Step 1 – Develop the bird species population list and identify the Units 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 of wind energy developments in the study area and to determine a relevant UoA by which any effects on each species or population should be measured.

4.2.1 Methods

A species list of all bird species known or likely to be present in the study area was extracted from IBAT, supplemented with any additional species recorded in:

- The Bird Migration Studies (BMS) for the Shadwan wind farm, which present bird baseline studies from spring and autumn 2025 (Camina 2025a, 2025b);
- The BMS, Environmental & Social Impact Assessment (ESIA) and CHA for the Suez Wind Energy (SWE) wind farm Plot 2, which present bird baseline studies from spring and autumn 2022 and 2023 (EcoConServ *et al.* 2023, 2024a, 2024b, 2024c, 2024d);
- Migration of Soaring Birds at Gebel el Zeit (IBA) in relation to wind energy developments (Camina *et al.* 2024);
- RCREEE Strategic and Cumulative Environmental and Social Assessment Active Turbine Management Program (ATMP) for Wind Power Projects in the Gulf of Suez (Lahmeyer International & Ecoda 2018);
- 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);
- A survey in autumn 2006 in Gebel El Zeit Important Bird Area (Hilgerloh *et al.* 2011);
- Species qualifying the listing of Gebel El Zeit as an Important Bird and Biodiversity Area (BirdLife International 2024a);
- The Migratory Soaring Birds Tool (BirdLife International 2023), filtered by species mapped as occurring in the project area;
- The list of bird 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;
- The Global Biodiversity Information Facility ([GBIF](#)), filtered by records in the study area; and,
- [eBird](#), filtered by records in the study area.

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

- **Category 1:** Migratory Soaring Bird populations (as per BirdLife International 2018), 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) and TBC (2023) as needed;

- **Category 2:** Other migrants and wintering species' populations, with the UoA being the global breeding range extent (taken from BirdLife International 2024b), as no national or regional estimates exist which would allow definition of a smaller UoA; or,
- **Category 3:** Resident species populations, with the UoA being the same as for Category 2 species.

4.2.2 Results

Step 1 produced a list of 213 bird species ([Table 2](#), Appendix 1).

Table 2. List of bird species known or likely to be present in the study area

Order		Unit of Analysis			Number of potential VECs
Common Name	Family	Category 1 – MSB populations	Category 2 - Other migrants and wintering populations	Category 3 - Resident populations	
Diurnal birds of prey	<i>Accipitriformes</i>	19	0	2	21
Waterbirds	<i>Anseriformes</i>	0	7	0	7
Swifts, tree swifts and hummingbirds	<i>Apodiformes</i>	0	3	0	3
Hornbills, hoopoes, wood hoopoes	<i>Bucerotiformes</i>	0	1	0	1
Nightjars	<i>Caprimulgiformes</i>	0	1	0	1
Shorebirds	<i>Charadriiformes</i>	0	51	3	54
Storks	<i>Ciconiiformes</i>	2	0	0	2
Pigeons and doves	<i>Columbiformes</i>	0	2	3	5
Kingfishers and related species	<i>Coraciiformes</i>	0	5	0	5
Cuckoos	<i>Cuculiformes</i>	0	2	0	2
Falcons and Caracaras	<i>Falconiformes</i>	9	0	0	9
Ground feeding birds	<i>Galliformes</i>	0	1	1	2
Cranes, crakes and rails	<i>Gruiformes</i>	2	3	0	5
Perching birds	<i>Passeriformes</i>	0	70	11	81

Order		Unit of Analysis			Number of potential VECs
Common Name	Family	Category 1 – MSB populations	Category 2 - Other migrants and wintering populations	Category 3 - Resident populations	
Ibises, herons and pelicans	<i>Pelecaniformes</i>	1	9	0	10
Flamingos	<i>Phoenicopteriformes</i>	0	1	0	1
Sandgrouse	<i>Pteroclidiformes</i>	0	0	2	2
Nocturnal birds of prey	<i>Strigiformes</i>	0	1	0	1
Cormorants, gannets and boobies	<i>Suliformes</i>	0	1	0	1
Totals		33	158	22	213

4.3 Step 2 – identify bird 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.

4.3.1 Methods

Sensitivity as considered here relates to the species' population known or likely to be present in the study area, and combines two components:

- **Vulnerability** was determined using; IUCN global threat status (IUCN 2024); IUCN North African threat status (Garrido *et al.* 2021); Category 2 of Annex 3 of the Convention of Migratory Species (CMS), reflecting species considered to have an unfavourable conservation status at a regional level within the Range States and territories, and also the Species Vulnerability Index (SVI) for species, mainly soaring birds, where this has been assessed (BirdLife International 2018). The guidance and associated ratings used to assess vulnerability are summarised in [Table 3](#);
- **Relative importance** for Migratory Soaring Birds (MSBs) is the proportion of the Rift Valley / Red Sea flyway population recorded in the study area, and for other migrants/wintering populations and for resident species the global Extent of Occurrence (EOO). The scoring and associated ratings used to assess relative importance for (1) MSBs and, (2) other migrants/wintering, and resident populations are summarized in [Table 4](#) and [Table 5](#) respectively. For the population recorded in the study area, this number was taken as the maximum count recorded in any season for any survey.

The *sensitivity* of the species is subsequently assigned based on a matrix ([Table 6](#)) that accounts for the combined *vulnerability* and *relative importance* ratings for each species. Species with a

negligible *sensitivity* did not progress to Step 3. Additionally, species where the estimated flyway population was <1% of the total estimated global population were discounted, to reflect the very low importance of the Rift Valley / Red Sea flyway population at a global level⁴.

Table 3. Vulnerability rating criteria

Vulnerability	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, or LC on North African Red List (for resident species)
Low	- VU or NT on IUCN Global Red List and SVI 6 or below; - LC on IUCN Global Red List and SVI of 7 or 8; or - CMS Category 2 Species and SVI of 6 or below	NT on IUCN Global Red List, or NT on North African Red List (for resident species)
Moderate	- VU or NT on IUCN "Global" Red List and SVI of 7 or 8; - LC on IUCN Global Red List and SVI of 9 or 10; or - CMS Category 2 Species and SVI of 7 or 8	VU on IUCN Global Red List, or VU on North African Red List (for resident species)
High	- CR or EN on IUCN Global Red List; - VU or NT on the IUCN Global Red List and SVI of 9 or 10; or - CMS Category 2 Species and SVI 9 or 10	CR or EN on IUCN Global Red List, or CR/EN on North African Red List (for resident species)
Note: * LC – Least Concern, NT – Near Threatened, VU – Vulnerable, EN – Endangered, CR – Critically Endangered		

Table 4. Relative importance rating 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%

⁴ This resulted in the exclusion of Eurasian Sparrowhawk and Oriental Honey Buzzard.

Table 5. Relative importance rating for other migrants and resident species

Relative Importance	Global Extent of Occurrence (km2)
Negligible	> 10,000,000
Low	> 100,000 and < 10,000,000
Moderate	> 50,000 and < 100,000
High	< 50,000

Table 6. Sensitivity rating 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

4.3.2 Results

Step 2 produced a list of 33 bird species with greater than negligible sensitivity (Table 7)⁵, of which four were assessed as High sensitivity.

Table 7. Rating at Step 2 for species with greater than negligible sensitivity

Species	Scientific name	Rating		
		Vulnerability	Relative importance	Sensitivity
Bar-tailed Godwit	<i>Limosa lapponica</i>	Low	Low	Low
Black Kite	<i>Milvus migrans</i>	Low	High	Medium
Black Stork	<i>Ciconia nigra</i>	Moderate	High	High
Black-winged Pratincole	<i>Glareola nordmanni</i>	Low	Low	Low
Bonelli's Eagle	<i>Aquila fasciata</i>	Moderate	Negligible	Low

⁵ One species that was initially rated above a negligible sensitivity but was not carried through to Step 3 due to the low importance of the flyway for the species were the Oriental Honey-buzzard (*Pernis ptilorhynchus*).

Species	Scientific name	Rating		
		Vulnerability	Relative importance	Sensitivity
Booted Eagle	<i>Hieraaetus pennatus</i>	Moderate	High	High
Broad-billed Sandpiper	<i>Calidris falcinellus</i>	Moderate	Low	Low
Common Crane	<i>Grus grus</i>	Moderate	High	High
Curlew Sandpiper	<i>Calidris ferruginea</i>	Moderate	Low	Low
Cyprus Warbler	<i>Curruca melanothorax</i>	Negligible	High	Low
Cyprus Wheatear	<i>Oenanthe cyprica</i>	Negligible	High	Low
Demoiselle Crane	<i>Anthropoides virgo</i>	Moderate	Negligible	Low
Eastern Imperial Eagle	<i>Aquila heliaca</i>	High	Moderate	High
Egyptian Vulture	<i>Neophron percnopterus</i>	High	Low	Medium
Eurasian (Steppe) Buzzard	<i>Buteo buteo</i>	Low	High	Medium
European Honey-buzzard	<i>Pernis apivorus</i>	Low	High	Medium
European Turtle-Dove	<i>Streptopelia turtur</i>	Moderate	Low	Low
Golden Eagle	<i>Aquila chrysaetos</i>	Moderate	Negligible	Low
Great White Pelican	<i>Pelecanus onocrotalus</i>	Moderate	High	High
Greater Spotted Eagle	<i>Clanga clanga</i>	High	High	High
Grey Plover	<i>Pluvialis squatarola</i>	Moderate	Negligible	Low
Griffon Vulture	<i>Gyps fulvus</i>	Moderate	Negligible	Low
Lanner Falcon	<i>Falco biarmicus</i>	Low	Moderate	Low
Lesser Spotted Eagle	<i>Clanga pomarina</i>	Moderate	Low	Low
Levant Sparrowhawk	<i>Accipiter brevipes</i>	Low	High	Medium
Long-legged Buzzard	<i>Buteo rufinus</i>	Low	Low	Low
Montagu's Harrier	<i>Circus pygargus</i>	Moderate	Negligible	Low
Pallid Harrier	<i>Circus macrourus</i>	Moderate	Moderate	Medium
Saker Falcon	<i>Falco cherrug</i>	High	Negligible	Low
Short-toed Snake-eagle	<i>Circaetus gallicus</i>	Low	Moderate	Low
Sooty Falcon	<i>Falco concolor</i>	Low	Low	Low
Steppe Eagle	<i>Aquila nipalensis</i>	High	High	High

Species	Scientific name	Rating		
		Vulnerability	Relative importance	Sensitivity
White Stork	<i>Ciconia ciconia</i>	Moderate	High	High

4.4 Step 3 – Conduct the ecological risk assessment and identify priority bird VECs

The purpose of Step 3 is to identify priority bird VECs from the 33 species populations scoped in at Step 2. This is done by combining each species' *sensitivity* score with an estimate of the *Likelihood of Effect* (LoE) which represents the site-specific risk, to identify those populations most at risk from adverse effects of the wind developments in the study area.

4.4.1 Methods

The LoE for each population was scored using three different collision risk components from the study area specific baseline dataset. The scores relate to; flight behaviour (component 1), abundance (component 2), and landing within the study area (component 3)⁶:

- **Component 1.** A matrix-derived score combining (i) the percent of individuals recorded flying below 200 m and (ii) the mean flock size (Table 8). This component is based on the reasoning that (i) those populations with a higher percentage of migrating individuals flying at approximately turbine rotor /powerline height (<200 m) will be at greater risk of collision, and (ii) populations with larger mean flock sizes will potentially have a higher risk of multiple fatality collision events. The percentage of individuals flying at approximately turbine rotor height was obtained from the Bird Migration Studies (BMS) for Shadwan Wind Farm. Species with no data were scored as having 39% of records <200 m, corresponding to the mean across the known species. Mean flock size was also obtained from the BMS for Shadwan Wind Farm. Species with no data on mean flock size were conservatively scored as having a maximum flock size equal to the maximum count recorded in a season.
- **Component 2.** A score based on the maximum total count for a species within a single season from any one project in the study area (Table 9) to reflect the reasoning that species with higher counts in the study area are more likely to be affected by wind developments; and,
- **Component 3.** A score to indicate whether a 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

⁶ All data were sourced from the Shadwan Wind Farm site.

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 ([Table 10](#)). This LoE rating was then combined with the *sensitivity* rating from Step 2 to derive an *overall risk* rating ([Table 11](#)). Species which had an *overall risk* of major or moderate were considered priority bird VECs for the study area.

Table 8. Matrix for scoring mean flock size and % of flights less than 200 m for each species.

Mean flock size	% of flights <200m			
	0-25	25-50	50-75	75-100
<10	1	1	2	2
10-50	1	2	2	3
50-100	2	2	3	4
>100	2	3	4	4

Table 9. Score categories for the maximum seasonal counts for a species in the study area.

Maximum season count	
Range	Score
0 to 10	1
10 to 1000	2
1000 to 10000	3
> 10000	4

Table 10. LoE rating based on overall score for each species evaluated at Step 3

LoE	
Overall score (based on quartiles)	Level of Effect
≤2	Negligible
3	Low
4	Medium
≥5	High

Table 11. Overall project risk matrix

Overall risk	Likelihood of effect			
Sensitivity	Negligible	Low	Medium	High
Low	Negligible	Minor	Minor	Moderate
Medium	Minor	Minor	Moderate	Major
High	Minor	Moderate	Major	Major

4.4.2 Results

Step 3 identified 13 species with an *overall risk* of major or moderate from the Project, and these species are considered priority bird VECs for this analysis ([Table 12](#))⁷. Therefore, the total list of 213 potential VECs has been filtered to 13 species ([Table 13](#)).

⁷ Note that this list is derived from existing reports and a desk-top analysis. No in-country expert consultation has been carried out for this rapid assessment. Local stakeholder review may identify additional species of particular concern, or provide additional data which could affect the findings.

Table 12. Details of scores and ratings allocated to the 13 species identified as priority bird VECs

Species	Scientific name	Category	Red List status	CMS Category 2	SVI	Vulnerability	Highest count	Flyway population	% of UoA	Relative importance	Sensitivity	% flights <200m	Mean flock size	Highest count	Landing in Area	LoE	Overall risk
Black Kite	<i>Milvus migrans</i>	1	LC	No	8	Low	39,090	132,700	29	High	Medium	22.8	9.7	39,090	No	High	Major
Black Stork	<i>Ciconia nigra</i>	1	LC	No	10	Moderate	6,738	19,500	35	High	High	33.2	8.1	6,738	No	Medium	Major
Booted Eagle	<i>Hieraetus pennatus</i>	1	LC	No	9	Moderate	362	3,169	11	High	High	30.9	1.3	362	No	Low	Moderate
Common Crane	<i>Grus grus</i>	1	LC	No	10	Moderate	17,518	35,000	50	High	High	3.4	103.5	17,518	No	High	Major
Eastern Imperial Eagle	<i>Aquila heliaca</i>	1	VU	No	9	High	147	2,125	7	Moderate	High	27.3	1	147	No	Low	Moderate
Eurasian (Steppe) Buzzard	<i>Buteo buteo</i>	1	LC	No	7	Low	153,471	1,250,000	12	High	Medium	19	17.7	153,471	No	High	Major
European Honey-buzzard	<i>Pernis apivorus</i>	1	LC	No	7	Low	157,055	1,000,000	16	High	Medium	4.9	48.4	157,055	No	High	Major
Great White Pelican	<i>Pelecanus onocrotalus</i>	1	LC	No	10	Moderate	54,231	70,000	77	High	High	22.8	312.3	54,231	No	High	Major
Greater Spotted Eagle	<i>Clanga clanga</i>	1	VU	No	9	High	3,985	2,180	183	High	high	39	1	3,985	No	Medium	Major
Levant Sparrowhawk	<i>Accipiter brevipes</i>	1	LC	Yes	6	Low	6,696	40,699	16	High	Medium	0.1	248.7	6,696	No	High	Major
Pallid Harrier	<i>Circus macrourus</i>	1	NT	No	8	Moderate	103	1,505	7	Moderate	Medium	60	1	103	No	Medium	Moderate
Steppe Eagle	<i>Aquila nipalensis</i>	1	EN	No	9	High	28,068	37,500	75	High	High	4.8	4.7	28,068	No	High	Major
White Stork	<i>Ciconia ciconia</i>	1	LC	No	10	Moderate	505,843	450,000	112	High	High	22.6	432.7	505,843	No	High	Major

Table 13. Scoping of species populations in steps 1 to 3 of the Cumulative Effects Analysis

Group	Number of species		
	Step 1	Step 2	Step 3
All birds	213	34	13
Category 1: Migratory Soaring Birds	33	24	13
Category 2: Other migrants and wintering species	158	8	0
Category 3: Resident species	22	2	0
<i>Filtered out</i>	-	179	200

4.5 Step 4 – The threshold setting process

This step establishes a fatality threshold for each priority bird VEC from wind farm impacts, being the point at which further losses would be a risk to long-term viability of the population. Exceeding threshold values triggers a requirement for adaptive management, and this will lead to a review of wind farm operations and improvements to mitigation measures.

Species which are globally EN or CR were automatically assigned a threshold of zero (see [Table 14](#)) as existing losses are already likely to have exceeded the level which would pose a risk to long-term viability of the population. For all other species, thresholds were assessed relative to the population size determined by their UoA, which was the Red Sea / Rift Valley flyway population for all species.

4.5.1 Methods

Stage 1: For each priority VEC (that is not EN or CR), the Potential Biological Removal (PBR) value was calculated, representing the annual number of fatalities that could be sustained without compromising long-term population viability. This precautionary approach is appropriate where there is only limited information on a species' population biology and uses species-specific rates of adult survival rate and year of first breeding to calculate an annual rate of human-caused mortality that, in the long term, would likely lead to a nonviable population. The PBR is calculated as:

$$PBR = \frac{1}{2} R_{max} N_{min} f$$

Where:

R_{max} is the annual recruitment rate, which can be calculated from the maximum annual population growth rate via $R_{max} = Y_{max} - 1$. Y_{max} is calculated as:

$$Y_{max} = \frac{(sa - s + a + 1) + \sqrt{(s - sa - a - 1)^2 - 4sa^2}}{2a}$$

with s as the mean annual adult survival and a as the mean age at first breeding (Niel & Lebreton 2005). Information on s and a were sought for each priority VEC, however where this was not available, parameters from a closely-related surrogate species were used (Table 14).

N_{min} is a conservative estimate of population size, and is calculated as:

$$N_{min} = \hat{N}e^{(Z_p CV_{\hat{N}})}$$

with $\hat{N}$ as the population estimate from the UoA, Z_p as the p^{th} standard normal variate (set at -0.842) and $CV_{\hat{N}}$ is the coefficient of variation for $\hat{N}$ (set at 10%) (Wade 1998; Dillingham & Fletcher 2008); and,

f is the recovery factor, applied as per Dillingham and Fletcher (2008), with $f = 0.5$ for LC species, 0.3 for VU species and 0.1 for CR or EN species.

Stage 2: The PBR values provide an indication of the potential significance of additional impacts, and were not used to set the thresholds, but rather to assign the species into management categories. Species with a PBR <1,000 were assigned to Category 1, with a PBR 1,000-10,000 were assigned to Category 2 and those with a PBR >10,000 were assigned to Category 3 (Table 14). The rationale behind the categorisation is that for the species with the lowest PBRs any additional impact will have a population-level effect, while those with higher PBRs can cope with some additional mortality.

Potential stakeholder concerns, and the project aim of NG / NNL, have also been considered in setting the thresholds and result in conservative thresholds well below the PBR.

4.5.1.1 Thresholds

During operations, the Project will undertake fatality monitoring and other observations will be continuously through the migration period. Each fatality encountered will be documented in a 'priority bird fatality incident report', including identifying the species, and potential cause of death. These data will be reviewed periodically (timing to be determined) to evaluate whether thresholds have been exceeded, and adaptive management is triggered.

The annual thresholds for each species have been set as follows:

- Category 1 species, and all species with a zero fatality threshold in neighbouring projects as a result of their CEA: zero fatalities.
- Category 2 species: three fatalities.
- Category 3 species: five fatalities.

An additional threshold for 'extreme events' is defined as a single fatality event of >5 individuals, irrespective of the priority species involved. Exceedance of this threshold would trigger an adaptive management response.

4.5.2 Results

Priority VECs and CH-qualifying species

One globally EN priority VEC, the Steppe Eagle, which is also CH-qualifying, was automatically assigned a fatality threshold of zero (see [Table 14](#)). The PBR-based threshold setting process led to an additional four priority VECs (Booted Eagle, Eastern Imperial Eagle, Greater Spotted Eagle and Pallid Harrier) being assigned to Category 1 and so also having a fatality threshold of zero. An additional three priority VECs (Black Stork, Common Crane and Great White Pelican) were assigned a fatality threshold of zero to align with the CEAs of neighbouring projects. For these species, adaptive management actions are required if any fatalities are recorded. Two species were assigned to Category 2 (and have a threshold of three) and three species to Category 3 (and have a threshold of five). Species-specific PBR values ranged from 63 (Booted Eagle) to approximately 43,700 (Eurasian Buzzard) ([Table 14](#)).

Other PBFs

Other migratory soaring PBF species⁸ were assessed in the same way as for priority VECs and CH-qualifying species. This led to one globally EN species, the Egyptian Vulture, being automatically assigned a zero fatality threshold. The PBR-based threshold setting process led to an additional nine species being assigned to Category 1 and also having a fatality threshold of zero. The remaining species were either assigned to Category 2 or 3 based on PBR values, and have thresholds of either three or five.

⁸ For non-soaring bird PBF species, the mortality recorded at the wind farms for which PCFM is being implemented is considered negligible. Most of these species have very large populations, so if fatalities do occur (which is not expected considering the vast majority of these species consistently migrate well above turbine height), the populations are not expected to be impacted. Therefore, mortality thresholds have not been set. However, if PCFM results differ in the future, they should be shared with relevant stakeholders (e.g. EEAA, RCREEE, regional ornithology experts, NGOs) to evaluate the need for threshold setting and adaptive management.

Table 14. Input parameters, sources and results for the calculation of the fatality threshold for each priority bird VEC, CH-qualifying species (in bold) and PBF.

Species	Scientific name	Unit of analysis	Flyway population	Red List status	Recovery factor	Mean adult survival	Mean age at first breeding	Source for demographic parameters	PBR value	Threshold category	Fatality threshold
Priority VECs and CH-qualifying species											
Black Kite	<i>Milvus migrans</i>	Red Sea / Rift Valley flyway	132,700	LC	0.5	0.96	4	_9	2,626	2	3
Black Stork	<i>Ciconia nigra</i>		19,500	LC	0.5	0.84	3	Tamás (2011) in eastern Europe	1,804	2	0 ¹⁰
Booted Eagle	<i>Hieraetus pennatus</i>		3,169	LC	0.5	0.96	4	_11	63	1	0
Common Crane	<i>Grus grus</i>		35,000	LC	0.5	0.90	4	Mathews and Macdonald (2000) in the UK	1,005	2	0 ¹⁰
Eastern Imperial Eagle	<i>Aquila heliaca</i>		2,125	VU	0.3	0.87	4.5	Bird <i>et al.</i> (2020)	70	1	0
Eurasian (Steppe) Buzzard	<i>Buteo buteo</i>		1,250,000	LC	0.5	0.90	3	Kenward <i>et al.</i> (2000) in the UK	43,739	3	5
European Honey-buzzard	<i>Pernis apivorus</i>		1,000,000	LC	0.5	0.86	3	BTO (2018a) for adult survival, and Jais (2018) for age at first breeding	40,066	3	5
Great White Pelican	<i>Pelecanus onocrotalus</i>		70,000	LC	0.5	0.78	3	_12	3,334	2	0 ¹⁰
Greater Spotted Eagle	<i>Clanga clanga</i>		2,180	VU	0.3	0.85	4	Bird <i>et al.</i> (2020)	44	1	0

⁹ No demographic parameters exist for Black Kite, so information from Red Kite (Newton *et al.* 1989) was used as a surrogate

¹⁰ Precautionarily attributed a zero-threshold since this threshold had been attributed before for a neighbouring project applying a similar methodology (ECOConsult *et al.* 2023)

¹¹ No demographic parameters exist for Booted Eagle, so information from Red Kite (Newton *et al.* 1989) was used as a surrogate, as per IFC (2017)

¹² No demographic parameters exist for Great White Pelican, so information from American Brown Pelican (Walter *et al.* 2013) was used as a surrogate

Species	Scientific name	Unit of analysis	Flyway population	Red List status	Recovery factor	Mean adult survival	Mean age at first breeding	Source for demographic parameters	PBR value	Threshold category	Fatality threshold
Levant Sparrowhawk	<i>Accipiter brevipes</i>		40,699	LC	0.5	0.69	1	_13	5,206	2	3
Pallid Harrier	<i>Circus macrourus</i>		1,505	NT	0.3	0.71	2.5	Bird <i>et al.</i> (2020)	55	1	0
Steppe Eagle	<i>Aquila nipalensis</i>		37,500	EN	0.1	0.88	4.3	Bird <i>et al.</i> (2020)	220	1	0
White Stork	<i>Ciconia ciconia</i>		450,000	LC	0.5	0.78	3	Barbraud <i>et al.</i> (1999) in France	21,430	3	5
Additional PBFs											
Common Kestrel	<i>Falco tinnunculus</i>	Red Sea / Rift Valley flyway	325000	LC	0.5	0.69	1.37	Bird <i>et al.</i> (2020)	32,763	3	5
Egyptian Vulture	<i>Neophron percnopterus</i>		4,535	EN	0.1	0.85	5	Bird <i>et al.</i> (2020)	26	1	0
Eleonora's Falcon	<i>Falco eleonorae</i>		11,750	LC	0.5	0.75	2	Bird <i>et al.</i> (2020)	800	1	0
Eurasian Hobby	<i>Falco subbuteo</i>		102,500	LC	0.5	0.75	2	Bird <i>et al.</i> (2020)	7,041	2	3
Eurasian Sparrowhawk	<i>Accipiter nisus</i>		4,000	LC	0.5	0.65	2	Bird <i>et al.</i> (2020)	312	1	0
Griffon Vulture	<i>Gyps fulvus</i>		1,300	LC	0.5	0.91	5.7	Bird <i>et al.</i> (2020)	29	1	0
Lanner Falcon	<i>Falco biarmicus</i>		950	LC	0.5	0.72	2	Bird <i>et al.</i> (2020)	69	1	0
Lesser Kestrel	<i>Falco naumanni</i>		22,500	LC	0.5	0.61	1.5	Bird <i>et al.</i> (2020)	2,336	2	3
Lesser Spotted Eagle	<i>Clanga pomarina</i>		50,000	LC	0.5	0.83	3.5	Bird <i>et al.</i> (2020)	1,925	2	3
Long-legged Buzzard	<i>Buteo rufinus</i>		21,750	LC	0.5	0.83	2.5	Bird <i>et al.</i> (2020)	1,087	2	3
Montagu's Harrier	<i>Circus pygargus</i>		50,500	LC	0.5	0.72	2.5	Bird <i>et al.</i> (2020)	3,029	2	3

¹³ No demographic parameters exist for Levant Sparrowhawk, so information from Eurasian Sparrowhawk (BTO 2018b) was used as a surrogate

Species	Scientific name	Unit of analysis	Flyway population	Red List status	Recovery factor	Mean adult survival	Mean age at first breeding	Source for demographic parameters	PBR value	Threshold category	Fatality threshold
Oriental Honey-buzzard	<i>Pernis ptilorhynchus</i>		14	LC	0.5	0.86	2.6	Bird <i>et al.</i> (2020)	1	1	0
Osprey	<i>Pandion haliaetus</i>		17,500	LC	0.5	0.83	3	Bird <i>et al.</i> (2020)	736	1	0
Peregrine Falcon	<i>Falco peregrinus</i>		10,750	LC	0.5	0.79	2.2	Bird <i>et al.</i> (2020)	628	1	0
Red-footed Falcon	<i>Falco vespertinus</i>		65,000	VU	0.3	0.65	1.3	Bird <i>et al.</i> (2020)	4,284	2	3
Short-toed Snake-Eagle	<i>Circaetus gallicus</i>		8,783	LC	0.5	0.86	4	Bird <i>et al.</i> (2020)	283	1	0
Sooty Falcon	<i>Falco concolor</i>		2,800	VU	0.3	0.68	1.6	Bird <i>et al.</i> (2020)	148	1	0
Western Marsh-Harrier	<i>Circus aeruginosus</i>		96,843	LC	0.5	0.74	2.6	Bird <i>et al.</i> (2020)	5,500	2	3

4.5.3 Adaptive management

Adaptive management is triggered when target thresholds are exceeded and should follow a set of clear sequential actions, specifically:

- Conduct a review to determine the primary reasons why a threshold was exceeded; and,
- Review the effectiveness of existing mitigation; and,
- Determine whether a revised mitigation strategy is required.

Possible options for revised mitigation may be extending the temporal period of shutdown on demand, increasing the number of observers, additional observer training, using technology to assist shutdown on demand (e.g., cameras, radar) etc.

If improved mitigation proves insufficient, offsets or additional conservation actions may need to be considered to compensate for any losses above the thresholds.

An additional element of adaptive management is the periodic review of the CEA. This is necessary because increased information from the study area and from elsewhere along the flyway alter the level of risk to priority bird VECs or result in the identification of new priority species. Such information may include changes in species' Red List status, improved flyway population estimates, updated study area data (and therefore revised estimates of the proportion of flyway populations passing through the project area of influence), and improved understanding of the likelihood and magnitude of Project impacts.

It should be noted that the findings of this CEA are based on only one year of data collection, and that substantial interannual variation in bird passage numbers is well documented (e.g. crane counts, which are unusually low for this Project).

In addition, a regional SESA and CIA is currently being undertaken for the entire Gulf of Suez region. The results of this assessment which are expected to be available before the end of 2026, may influence both the selection of bird VECs and a revision of mortality thresholds. The new regional SESA is expected to provide guidance regarding mitigation for all projects operating in the region.

4.6 Step 5 – Identify a mitigation and monitoring approach for priority bird VECs

Section 7 presents the broad mitigation and monitoring actions that the Project will undertake or support to address their contribution to the cumulative effects from wind farm developments to priority bird VECs.

5 The Cumulative Assessment framework for other vertebrates

5.1 Overview of the framework for other terrestrial species

The assessment framework for non-volant vertebrate species (i.e. mammals and reptiles) has two objectives: to identify species at highest risk from the potential cumulative effects of developments in the study area, and to propose mitigation, monitoring and other management activities if species are identified to be at risk. This framework comprises a four-step process ([Figure 4](#)):

- **Step 1:** Develop a preliminary list of mammal and reptile species potentially at risk from developments in the study area, because they are known or predicted to occur in the study area (see [Section 5.2](#));
- **Step 2:** Determine the relative *sensitivity* of each species, being a combination of the following:
 - o *Vulnerability* of the species; and
 - o *Relative Importance* of the species in relation to the appropriate UoA, i.e. the extent of occurrence (EOO) for each terrestrial species within Egyptian national boundaries (see [Section 5.3](#)).

Species which were determined to have negligible *sensitivity* were dropped from analysis before proceeding to Step 3.

- **Step 3:** Determine the *overall risk* to each species from the cumulative effects of wind farm developments within the study area, being a combination of the:
 - o *Sensitivity* of the species, as identified in Step 2; and
 - o Cumulative *likelihood of effect* (LoE) rating for each species (see [Section 5.4](#)).

Species with an *overall risk* of Major or Moderate were considered as priority VECs for the project.

- **Step 4:** Propose a range of mitigation, monitoring and management actions for priority mammal and reptile VECs to, if necessary, minimise collision risk for bats, habitat loss for other terrestrial vertebrates, and to inform any adaptive management responses (see [Section 7](#)).

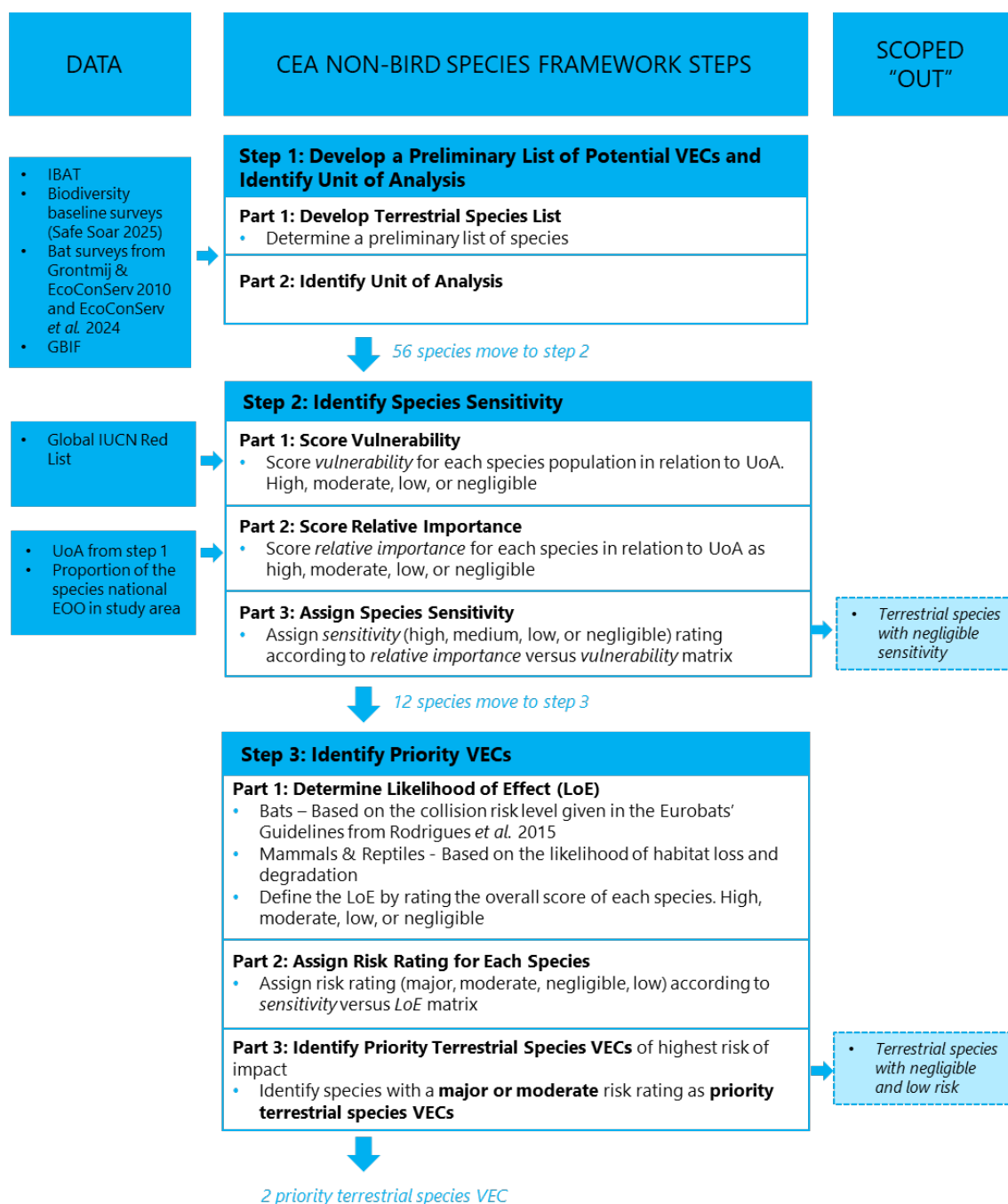


Figure 4. Process to identify priority non-bird species VECs

5.2 Step 1 – Develop the non-bird species list and identify the Unit of Analysis

The purpose of Step 1 is to identify all non-bird vertebrate species that could potentially be at risk from the cumulative effects from actions related to wind energy developments in the study

area and to determine a relevant UoA by which any effects on each species should be considered.

5.2.1 Methods

A list of mammal and reptile species predicted to be present in the study area were extracted from IBAT, and supplemented with any additional mammal/reptile species identified in the Project surveys (Safe Soar 2025). For bats, the list was cross-checked with species listed in the field surveys for the nearby SWE site and the Italgen Gabal El-Zeit 320 MW EIA study in 2010 (Grontmij & EcoConServ 2010; EcoConServ *et al.* 2024e).

The UoA was identified based on a review of any available information on terrestrial species populations in Egypt and the wider Middle East region. The UoA identified for mammals and reptile species was the species' EOO within Egyptian national boundaries, based on IUCN global species distribution maps (IUCN 2024). Due to limited baseline data, no population estimates of any species known or likely to occur in the study area could be derived for the purpose of this analysis. Therefore, terrestrial species EOO in Egypt served as the best available information to be used for this study.

5.2.2 Results

A list of 29 mammal species and 27 reptile species, were identified as occurring, or potentially occurring in the study area.

5.3 Step 2 – Identify species sensitivity

The purpose of Step 2 is to determine the *sensitivity* of each species identified in Step 1 based on its *vulnerability* of the species at the international and regional scale and the *relative importance* of the study area to the species.

5.3.1 Methods

The *sensitivity* of each species takes into account a combination of two components:

- **Vulnerability** of the species using IUCN threat categories (IUCN 2025) and, for mammals, the National (Egyptian) threat categories (Basuony *et al.* 2010). The rating system is summarised in [Table 15](#).
- **Relative importance** of the study area in relation to the UoA was identified for each species. This was calculated using the equation below with the rating system summarised in [Table 16](#).

$$\frac{\text{Species EOO in study area}}{\text{Species EOO in Egypt (UoA)}} \times 100 = \text{Relative Importance (\%)}$$

Two bat species were confirmed to be present within the Project area during baseline surveys (ECO Consult 2026), the Egyptian Tomb Bat (*Taphozouas perforates*) and Kuhl's Pipistrelle

(*Pipistrellus kuhlii*). The range of the Egyptian Tomb Bat, as well as the ranges of three other bat species, the Botta's Serotine (*Eptesicus bottae*), Desert Pipistrelle (*Hypsugo ariel*) and Rüppel's Pipistrelle (*Pipistrellus rueppellii*), were not predicted to overlap with the study area, though bat surveys in the region (TBC *unpub. data.*) have indicated that these species are found, or likely to be found, within the study area. Since the IUCN range map is clearly underestimating these species range in Egypt, the equation above was not used and the study area was considered as having a low relative importance. If new data regarding the actual distribution of these species in Egypt becomes available, this classification will need to be updated.

The *sensitivity* of the species was subsequently assigned based on a matrix (Table 17) that accounts for the combined *vulnerability* and *relative importance* ratings for each species. Terrestrial species with a negligible sensitivity did not progress to Step 3.

Table 15. Vulnerability rating criteria for non-bird vertebrate species

Vulnerability	IUCN Global Red List of Threatened Species*
Negligible	LC on IUCN Global Red List, or LC on the National Red List of mammals
Low	NT or DD on IUCN Global Red List, or NT on the National Red List of mammals
Moderate	VU on IUCN Global Red List, or VU on the National Red List of mammals
High	CR or EN on IUCN Global Red List, or CR/EN on the National Red List of mammals
* LC – Least Concern, NT – Near Threatened, VU – Vulnerable, EN – Endangered, CR – Critically Endangered	

Table 16. Relative importance rating criteria for non-bird vertebrate species

Relative Importance	Percentage of Species EOO present within Study Area
Negligible	≤ 1%
Low	> 1% and ≤ 5%
Moderate	> 5% and ≤ 10%
High	> 10%

Table 17 Sensitivity matrix for non-bird vertebrate species

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

5.3.2 Results

Of the 56 species analysed in Step 2, two species have a *sensitivity* rating of medium, and ten species had a *sensitivity* rating of low (Table 18). All other mammal and reptile species had a negligible rating (Table 19) and are not considered in subsequent steps. The two bat species that were confirmed during baseline surveys, the Egyptian Tomb Bat and Kuhl's Pipistrelle, both had a negligible *sensitivity* rating at Step 2 (see Appendix 2: Non-bird VECs at Step 2) so did not progress to Step 3.

Table 18. Summary of rankings assigned at Step 2 for terrestrial species with a ranking above negligible. *range of these bat species in Egypt is considered to be underestimated, so the Relative importance was not calculated as a result of the % of the range in the study area, but considered to be low

Species	Scientific name	Vulnerability			Relative importance				Sensitivity
		IUCN Red List	National Red List	Score	Egyptian range (km²)	Study area (km²)	% of range in study area	Score	
Nubian Ibex	<i>Capra nubiana</i>	VU	EN	High	275,125	6159	2.2	Low	Medium
Dorcas Gazelle	<i>Gazella dorcas</i>	VU	VU	Moderate	995,398	6159	0.6	Negligible	Low
Botta's Serotine	<i>Eptesicus bottae</i>	LC	VU	Moderate	16,200	6159	38	Low	Low
Desert Pipistrelle	<i>Hypsugo ariel</i>	DD	VU	Moderate	14,100	6159	44	Low	Low
Rüppel's Pipistrelle	<i>Pipistrellus rueppellii</i>	LC	VU	Moderate	250,005	6159	2.5	Low	Low
Greater Mouse-tailed Bat	<i>Rhinopoma microphyllum</i>	LC	VU	Moderate	608,347	6159	1	Low	Low
Fat Sand Rat	<i>Psammomys obesus</i>	LC	LC	Negligible	80174	6159	7.6	Low	Low
Golden Spiny Mouse	<i>Acomys russatus</i>	LC	LC	Moderate	114326	6159	5.1	Low	Low
Blanford's Fox	<i>Vulpes cana</i>	LC	VU	Moderate	75,541	6159	8.2	Moderate	Medium
Rough Bent-toed Gecko	<i>Cyrtopodion scabrum</i>	LC	-	Negligible	21,183	6159	29	High	Low
Spiny Agama	<i>Agama spinosa</i>	LC	-	Negligible	63409	6159	9.7	Moderate	Low
Egyptian Spiny-tailed Lizard	<i>Uromastix aegyptia</i>	VU	-	Moderate	69,382	6159	4.7	Low	Low

Table 19 Details of scores allocated to the non-bird vertebrate species identified as priority terrestrial species VECs

Species	Scientific name	Sensitivity	Collision risk	LoE	Overall risk
Nubian Ibex	<i>Capra nubiana</i>	Medium	NA	Negligible	Minor
Dorcas Gazelle	<i>Gazella dorcas</i>	Low	NA	Low	Minor
Botta's Serotine	<i>Eptesicus bottae</i>	Low	Medium	Medium	Minor
Desert Pipistrelle	<i>Hypsugo ariel</i>	Low	High	High	Moderate
Rüppel's Pipistrelle	<i>Pipistrellus rueppellii</i>	Low	High	High	Moderate
Greater Mouse-tailed Bat	<i>Rhinopoma microphyllum</i>	Low	High	High	Moderate
Fat Sand Rat	<i>Psammomys obesus</i>	Low	NA	Low	Minor
Golden Spiny Mouse	<i>Acomys russatus</i>	Low	NA	Low	Minor
Blanford's Fox	<i>Vulpes cana</i>	Medium	NA	Low	Minor
Rough Bent-toed Gecko	<i>Cyrtopodion scabrum</i>	Low	NA	Medium	Minor
Spiny Agama	<i>Agama spinosa</i>	Low	NA	Low	Minor
Egyptian Spiny-tailed Lizard	<i>Uromastyx aegyptia</i>	Low	NA	Low	Minor

5.4 Step 3 – Conduct the ecological risk assessment and identify priority non-bird vertebrate species VECs

The purpose of Step 3 is to identify priority non-bird vertebrate species VECs from the twelve species carried through from Step 2, i.e. the Nubian Ibex, Dorcas Gazelle, four bat species, Botta's Serotine, Desert Pipistrelle, Rüppel's Pipistrelle, Greater Mouse-tailed Bat, Blanford's Fox and the two reptiles, Rough Bent-toed Gecko and Egyptian Spiny-tailed Lizard. This was carried out by combining each species' *sensitivity* rating with an estimate of site-specific risk, i.e. the *Likelihood of effect* (LoE), to identify species that were most at risk from potential adverse effects of the wind developments in the study area.

5.4.1 Methods

5.4.1.1 LoE for bat species

The LoE for each bat species was identified using the level of collision risk in Eurobats' *Guidelines for consideration of bats in wind farm projects – Revision 2014* (Rodrigues *et al.* 2015) (Table 20) and further informed by global collision rates given in Thaxter *et. al* (2017), as there was no available information on the collision risk of bat species in the study area or at the country or regional level.

5.4.1.2 LoE for terrestrial species

The LoE for the Nubian Ibex, Dorcas Gazelle, Blanford's Fox and two reptiles was based on the likelihood of habitat loss and degradation occurring from the cumulative effects of the potential wind farm developments in the study area (Table 21). The LoE rating was decided based on expert knowledge of the CEA team on the likely effects that are expected to occur from these developments.

5.4.1.3 Overall risk rating for non-birds

The LoE rating was then combined with the *sensitivity* rating from Step 2 to derive an *overall risk* rating (Table 22). Species which had an *overall risk* of major or moderate were considered priority VECs for the study area.

Table 20. LoE rating criteria for bat species

LoE Rating	Level of Bat Collision Risk (based on Eurobats' Guideline)
Negligible	Species and/or genus with low level of collision risk
Low	Species and/or genus with unknown level of collision risk
Medium	Species and/or genus with medium level of collision risk
High	Species and/or genus with high level of collision risk

Table 21. LoE rating criteria for terrestrial species

LoE Rating	Criteria
Negligible	Negligible risk from habitat loss and degradation due to the cumulative effects of the developments.
Low	Low risk from habitat loss and degradation due to the cumulative effects of the developments.
Medium	Medium risk from habitat loss and degradation due to the cumulative effects of the developments.
High	High risk from habitat loss and degradation due to the cumulative effects of the developments.

Table 22. Overall project risk matrix for non-bird vertebrate species

Overall risk		LoE			
		Negligible	Low	Medium	High
Sensitivity	Low	Negligible	Minor	Minor	Moderate
	Medium	Minor	Minor	Moderate	Major
	High	Minor	Moderate	Major	Major

5.4.2 Results

Of the 12 non-bird species carried through from Step 2, the the Desert Pipistrelle, Greater Mouse-tailed Bat and Rüppel's Pipistrelle have an *overall risk* rating of Moderate (Table 19). These three bat species are considered priority VECs for the study area

For Nubian Ibex, a LoE of 'Negligible' was applied as the area does not represent typical mountain habitat required by the ibex and does not contain relevant grazing areas (TBC 2026). For Dorcas Gazelle, a LoE of 'Low' was applied as the area lacks good quality habitat and food for the species (EcoConsult & Safe Soar 2025), even though this may correspond to previously unrecorded population (in recent times, TBC 2026). While this species did not qualify as a priority VEC it has been identified as a PBF in the Project's Critical Habitat Assessment (TBC 2026). For Banford's Fox, a LoE of 'Low' was applied as while a small area of suitable habitat will be lost under project infrastructure, if this species behaves as other *Vulpes* ssp., it is unlikely to avoid areas around turbines or other infrastructure, and their prey base is also unlikely to change with the presence of the projects. For the Egyptian Spiny-tailed Lizard a LoE of 'Low' was applied as there is evidence that burrows can be avoided during construction and translocation of the species is possible (M. Ezat, *pers. comm.*). While this species did not qualify as a priority VEC it has been identified as a PBF in the Project's Critical Habitat Assessment (TBC 2026). The LoE for the Rough Bent-toed Gecko was considered as 'Medium' as it is unlikely that similar avoidance of important habitat for this species is possible, however the overall project risk for this species was considered low.

5.5 Step 5 – Identify a potential mitigation and monitoring approach for priority terrestrial VECs

The broad mitigation and monitoring actions that Scatec will undertake or support to address their contribution to the cumulative effects from wind farm developments to priority terrestrial species VECs, is presented in Section 7.

6 The Cumulative Assessment for ecosystems

A qualitative approach to identifying priority ecosystem VECs has been followed as data on land cover in the study area is limited and a quantitative approach was not feasible. Additionally, there has been no Red List Assessment of Ecosystems within Egypt. In this context, the approach was to review what features in the landscape are likely to be valued as important for supporting the biodiversity of the region.

The study area is not considered to contain particularly unique or highly threatened ecosystems (discussed further in the CHA: TBC 2026). The Project area lies in the Red Sea Coastal Desert Ecoregion (Dinerstein *et al.* 2017) in an area of sand and gravel plains crossed by several shallow wadis, consisting primarily of bare ground with very scattered low-growing vegetation. No caves (potential bat roosting sites) have been identified in the Project area (EcoConsult & Safe Soar 2025).

Vegetation in the eastern desert region, in which the Project occurs, is largely restricted to salt marshes (sabkhas, which do not occur in the Project area) and wadis (Ministry State of Environment Affairs 2014). According to the ESIA, vegetation density within the Project site is very low and largely restricted to the floors of drainage lines (i.e. the shallow wadis) (EcoConsult & Safe Soar 2025). Wadis are known to have biodiversity value in their own right, and are also known to support mammal and reptile species in the Project area (EcoConsult & Safe Soar 2025). They are also of potential importance for other priority VECs, e.g. bats are likely to use wadis for foraging when they flood intermittently with water (Korine *et al.* 2016). Wadis are therefore considered a priority ecosystem VEC.

7 The mitigation and monitoring approach for priority VECs

This section establishes the broad mitigation and monitoring actions that will be adopted by Scatec for the Project, and actions that Scatec will undertake or support to address their contribution to the cumulative effects to priority VECs from wind farm developments in the study area. These mitigation and monitoring actions focus on the eight-priority bird VECs, as identified in this document, and will also deliver benefits for other bird species passing through the wind farms. Recommendations are also listed for mitigating and monitoring impacts to the three bat VECs and avoiding impacts to the wadi priority ecosystem VEC. In all cases, mitigation and monitoring actions will follow GIIP. The mitigation and monitoring approach will focus on two areas:

- **On-site mitigation and monitoring methods**, to minimise collision risk, validate the effectiveness of the proposed mitigation methods once they have been implemented, allow estimation of residual impacts and provide information to allow adaptive management of the monitoring and mitigation implemented; and,
- **Collaborative efforts with other wind farm entities**, to minimise the cumulative effects of all the proposed wind farm developments in the study area.

By adopting the proposed approach, Scatec will be able to reduce its impact as far as practicable for the identified VECs, adhering to an approach that will facilitate alignment with PS6/ESR6/ESS4, and particularly be pursuing a goal of No Net Loss. By doing this, Scatec sets a benchmark for other wind projects in the study area and provides an example of successful best-practice implementation for others to follow. A co-ordinated approach to mitigation, particularly migration monitoring and turbine shutdown would be beneficial to Scatec and all other wind projects in the study area. By adopting a single shutdown protocol across the whole study area and sharing real-time survey data, individual project operational costs and risks to birds can be reduced through optimized and coordinated use of field observers across multiple projects.

Table 23. Recommended Mitigation and Monitoring Actions for the Project

Action	Measure	Description	Key objective	Responsible entity	Time frame	Target VEC
On-site mitigation actions						
1	Development of appropriate protocols for mitigation and monitoring	All actions require clear and detailed protocols that can be followed by survey teams and project management: this information should be included in the relevant Project documents. Protocols should align with industry good-practice guidelines and be designed by specialists experienced in assessing biodiversity risk at wind farm developments.	Ensure that all actions are undertaken in a consistent manner and collect appropriate data to make decisions.	Scatec	Approved protocols at least three months prior to commencement of operation	Birds, bats and habitats
2	Monitoring of priority bird VECs	Monitoring the numbers, activities and flight paths of priority bird VECs within the wind farm is vital to inform mitigation actions. Birds must be monitored by trained and experienced field observers, and monitoring effort should cover the whole operational turbine area. The principal aim of monitoring is to initiate shut-down on demand protocols (see Action 3), to avoid collisions of priority birds with turbine blades. Additional aims are to record the numbers of priority bird VECs in the wind farm, determine flight paths and height, and to observe collisions or near misses (if or when these occur). Focus: monitoring should focus on priority bird VECs, with data recorded on other bird species as time allows. Unidentified species should precautionarily be considered priority bird VECs until proven otherwise. Method: monitoring should primarily use a series of pre-identified Vantage Points, the number and location of which will be dictated by local topography, turbine layout and activity patterns of priority bird VECs. Observers: should be experienced with identifying all priority bird VECs, and sufficiently knowledgeable about the goals of the project to alter methods if conditions warrant (e.g. move VPs if bird movement patterns change).	(i) To ensure that shut-down on demand protocols can be initiated with sufficient time to minimize bird collisions (ii) to allow for informed adaptive management decisions to be made	Scatec	In place prior to commencement of operation, with monitoring for the life of the project	Birds

Action	Measure	Description	Key objective	Responsible entity	Time frame	Target VEC
		Effort: as all priority bird VECs are migratory in the study area, monitoring must occur for the full spring and autumn migration periods, with start and end dates robustly justified (noting that the timing of migration varies considerably between species). Monitoring must also occur at all times of day when birds are known to be active. Reduced effort may be required outside of these periods and should be regularly reviewed as to its relevance. Records: observers must use standard data forms to record all observations, to allow for improvements to the methods and analysis of approach / responses in cases where collisions occur.				
3	Shut-down on demand	When field observers identify flight paths of priority bird VECs that are likely to result in collision, they must initiate a temporary shutdown of one or more turbines until the birds are no longer at risk, at which time the turbines can be restarted. This approach is a well-established method for minimizing the risk to birds of colliding with rotating wind turbine blades. Shut-down on demand may also be triggered by other events not involving VECs, as defined in site-specific management plans. Protocols will be established under Action 1, and will include the conditions for initiating and recording: • 'Near-miss incidents' (i.e. those situations where there was a failure to shut-down in a high-risk situation to a priority bird VECs; • Elevated risk situations (i.e. periods when environmental or other conditions result in specific or general risk to priority birds.); • Shutdown and resumption of operation, required communications between field observers and wind farm operator; and, • Information to record in the event a shutdown occurs (both outcomes for the bird(s) involved and the operator's actions).	To minimize the number of collisions between priority bird VECs and wind turbines.	Scatec	Protocols and tested system in place prior to commencement of operation, with the system operational for the life of the project.	Birds

Action	Measure	Description	Key objective	Responsible entity	Time frame	Target VEC
		When one or more individuals of a priority bird VEC are observed, the field observer should consider shutdown of specific turbines based on their judgment considering the following parameters: • Height at which bird is flying relative to the turbine risk height; • Likely flight path, flight pattern, and behavior of bird; and, • Distance from bird to turbine. Automated shut-down on demand system options (e.g. radar, camera) should be explored, but should only supplement field-based observers for at least three years until such approaches have been demonstrated to work effectively in this situation.				
4	Installation of wildlife-friendly Project power lines	Many bird species are known to collide with power lines (particularly high-voltage lines) and there is some evidence to suggest that both a) flight diverters, and b) line configuration might lessen this risk. The configuration (type and spacing) of bird flight diverters and alignment (height, number and spacing) of wires should be based on GIIP where available, and be informed by robust evidence of effective deployment at existing wind power projects in comparable environments.	To minimize the number of collisions between priority bird VECs with Project power lines	Scatec	During power line erection, with ongoing maintenance for the life of the project	Birds
5	Micro-siting and alignment of turbines	Turbines should be micro-sited to provide the maximum gap between turbines, or turbine arrays, especially along the axes of likely migration routes. This approach is recommended with precaution as the ability of species to navigate through a wind farm is poorly understood. Micro-siting should also be used to avoid areas containing habitat VEC (i.e. wadis).	(i) Allow priority bird VECs to pass through the wind farm (ii) to avoid impacts to terrestrial and habitat VECs	Scatec	In the project design phase	Birds and habitats
6	Carcass surveys – turbines	This involves regular surveys of the area beneath turbines to detect carcasses from birds and bats that have collided with turbine blades. Protocols for these searches, including frequency, number of turbines searched and the search area under each turbine will be determined	To determine the level of observed fatalities due to collisions with turbines at the wind farm site.	Scatec	On-going for at least the first three years of operation, then reassessed, but	Birds and bats

Action	Measure	Description	Key objective	Responsible entity	Time frame	Target VEC
		under Action 1 , and will be based on industry good-practice (IFC <i>et al.</i> 2023).			likely needed for the life of the project	
7	Carcass surveys – powerlines	The Project will conduct regular surveys under Project power lines to determine the levels of mortality from birds and bats colliding with lines. Collisions with power lines are a known source of mortality for many bird species. Protocols for these searches, including frequency and the search area will be determined under Action 1 .	To determine the level of observed fatalities due to collisions with power lines at the wind farm site.	Scatec	On-going for at least the first three years of operation, then reassessed, but likely needed for the life of the project	Birds and bats
8	Carcass and searcher efficiency correction factor determination	Correction factors need to be applied to convert the observed carcasses under turbines and power lines to an estimate of actual mortality, 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). These approaches are standard good-practice for wind farms, and if designed correctly, both trials can be conducted concurrently. Carcasses used should be as similar as possible to the type of expected fatalities to mimic real conditions. Experiments should be planned and led by someone familiar with the approaches, but the searchers used in the searcher efficiency trials should be those who will undertake the carcass surveys (Action 6 and Action 7). The number and distribution of carcasses used will depend on the habitat types and topography within the wind farm site. Analysis of resulting data should be through an established method: the Generalised Fatality Estimator developed by the USGS is recommended.	To provide species specific bird and bat fatality estimates 'corrected' for carcasses not found during fatality search surveys.	Scatec	During both spring and autumn migration periods for two years, then reassessment. Can begin prior to commencement of operation.	Birds and bats
9	Review to improve monitoring and	Periodic reviews of Actions 1, 2, 4-8, 10-11 will be undertaken to improve the effectiveness of monitoring and mitigation actions. This will include:	Adaptive management to reduce risk	Scatec	On-going from start of construction	Birds and bats

Action	Measure	Description	Key objective	Responsible entity	Time frame	Target VEC
	mitigation effectiveness	Immediate review of process in the event of a recorded mortality for a priority bird or bat VEC, to recommend what, if any, additional actions may be implemented to further reduce collision risk. Quarterly review of carcass survey results and effectiveness of shut-down on demand protocols. Bi-annual review of monitoring data, following the end of each bird migration season. Annual review of carcass correction factor determination and all bird monitoring and responses for the Project. If thresholds are triggered, this annual review must recommend additional mitigation measures that must be adopted during future monitoring.				
10	Avoid construction in wadis with permanent vegetation	Impacts to priority ecosystem VECs will be avoided during construction. All wadis with permanent vegetation will be mapped and infrastructure sited to avoid them.	Impact avoidance.	Scatec	Pre-construction	Wadis with permanent vegetation
11	Avoid and minimize impacts to Egyptian Spiny-tailed Lizard	The lizard is not a priority VEC but is a PBF (<i>sensu</i> EBRD ESR6, as identified in TBC 2026) and impacts need to be reduced as far as is practicable by: Mapping and avoiding burrows during construction; and, Driver training and awareness to ensure vehicles stay on demarcated roads and drivers avoid road fatalities.	Impact avoidance and minimization	Scatec	Pre-construction, construction and operations	N/A
12	Avoid and minimize impacts to Dorcas Gazelle	Additional surveys are required to clarify the status of the Dorcas Gazelle in the Project area and its vicinity. The gazelle is not a priority VEC but is a PBF (<i>sensu</i> EBRD ESR6, as identified in TBC 2026) and if regularly present in the Project's area of impact, impacts need to be reduced as far as is practicable by: Avoiding the creation of new access roads where possible	Impact avoidance minimization.	Scatec	Pre-construction, construction and operations	N/A

Action	Measure	Description	Key objective	Responsible entity	Time frame	Target VEC
		Driver training and awareness to ensure vehicles stay on demarcated roads, and drivers keep to speed limits and avoid road fatalities.				
Scatec contribution to minimizing cumulative effects						
13	Data sharing	Scatec will make annual summaries data of its monitoring, including all fatality data, and mitigation efforts publicly available to support baseline knowledge, increase transparency and understanding of the work being undertaken. Scatec will also share raw data and relevant information in real time / monthly with other developers within the Project area to improve cumulative actions.	Maximize the knowledge base in the region. Provide examples of best-practice for other operators to follow	Scatec	Periodically for the life of the project	Birds, bats and habitats
14	Joint training of observers	Scatec will 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	Ensure comparable observer standards are maintained across all project sites.	All / other	On-going, with establishment prior to commencement of operation	Birds
15	Coordination of observer networks	Scatec will co-ordinate with other developers in the Project area to site observer networks where these can be of greatest benefit. Scatec will also establish protocols so that shut-down on demand can be initiated by observers from adjacent projects, where flight paths are well known.	Maximise the benefits from an extended observer network	Scatec	On-going, with establishment prior to commencement of operation	Birds
16	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 bird VECs and improve wind farm operations	All / Scatec	Annually	All
Other actions						

Action	Measure	Description	Key objective	Responsible entity	Time frame	Target VEC
A	Prepare and implement a Biodiversity Action Plan (BAP)	Overarching Project plan to guide the mitigation of biodiversity impacts. The BAP should summarise anticipated impacts, demonstrate how the Project will apply the mitigation hierarchy, and forecast how the Project will achieve at least no net loss for the VECs and other priority biodiversity. This would include a review of collision risk models to determine what, if any, residual impacts remain after the application of mitigation actions. If collision risk models indicate that such impacts do may remain, this will also need to include a plan for compensating or offsetting residual impacts on priority biodiversity.	Support the implementation of mitigation measures and deliver NNL ¹⁴ to priority bird VECs	Scatec	Must be implemented prior to operations commencing	Birds, bats and habitats

¹⁴ Following the Tafila Region Wind Power Projects CEA (IFC 2017), priority VECs in the CEA would be considered the focus of NNL in the project area.

8 Next steps

To maximise the effectiveness of this CEA, the following actions should be undertaken:

1. Provide the current draft of this document to stakeholders for review. Relevant stakeholders include but are not limited to: government agencies (e.g. NREA), RCREEE, other wind farm developers, lenders and relevant NGOs (e.g. Nature Conservation Egypt, BirdLife International, etc.). Comments, corrections and requests for additional information should be sought from stakeholders. Where appropriate, this assessment will be revised based on their feedback;
2. Share the findings of the CEA with any other parties doing, or likely to do, similar work in Egypt; and,
3. Provide the final CEA to developers, regulators and other relevant stakeholders in the Gulf of Suez.

9 References

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Appendix 1: Detailed results for steps 1-3 for bird VECs

Appendix 1 provided in the embedded excel workbook.



Appendix 1: Bird
VECs for ShadwanWF

Appendix 2: Non-bird VECs at Step 2

Scientific name	Common name	IUCN status	National status (mammals)	Vulnerability	Egypt EOO	Study area	% in area	Relative importance	Sensitivity
<i>Acanthodactylus boskianus</i>	Bosc's Fringe-toed Lizard	LC		Negligible	819762	6159	0.7	Negligible	Negligible
<i>Acanthodactylus scutellatus</i>		LC		Negligible	890173	6159	0.7	Negligible	Negligible
<i>Acomys cahirinus</i>	Cairo Spiny Mouse	LC	LC	Negligible	939457	6159	0.7	Negligible	Negligible
<i>Acomys russatus</i>	Golden Spiny Mouse	LC	LC	Negligible	114326	6159	5.1	Moderate	Low
<i>Agama spinosa</i>	Spiny Agama	LC		Negligible	63409	6159	9.7	Moderate	Low
<i>Asellia tridens</i>	Geoffroy's Trident Leaf-nosed Bat	LC	LC	Negligible	985919	6159	0.6	Negligible	Negligible
<i>Canis lupaster</i>	African Wolf	LC	LC	Negligible	968108	6159	0.6	Negligible	Negligible
<i>Capra nubiana</i>	Nubian Ibex	VU	EN	High	275125	6159	2.2	Moderate	Medium
<i>Cerastes cerastes</i>	Desert Horned Viper	LC		Negligible	971726	6159	0.6	Negligible	Negligible
<i>Cerastes vipera</i>	Sahara Sand Viper	LC		Negligible	729340	6159	0.8	Negligible	Negligible
<i>Chalcides ocellatus</i>	Ocellated Skink	LC		Negligible	903705	6159	0.7	Negligible	Negligible
<i>Cyrtopodion scabrum</i>	Rough Bent-toed Gecko	LC		Negligible	21183	6159	29.5	High	Low
<i>Echis coloratus</i>		LC		Negligible	210452	6159	2.9	Low	Negligible
<i>Eptesicus bottae</i>	Botta's Serotine	LC	VU	Moderate	16200	6159	38.0	Low ¹⁵	Low
<i>Felis lybica</i>	Afro-Asiatic Wildcat	LC	LC	Negligible	199002	6159	3.1	Low	Negligible
<i>Gazella dorcas</i>	Dorcas Gazelle	VU	VU	Moderate	995398	6159	0.6	Negligible	Low
<i>Gerbillus gerbillus</i>	Lesser Egyptian Gerbil	LC	LC	Negligible	967188	6159	0.6	Negligible	Negligible
<i>Gerbillus henleyi</i>	Pygmy Gerbil	LC	LC	Negligible	253933	6159	2.4	Low	Negligible
<i>Gerbillus pyramidum</i>	Greater Egyptian Gerbil	LC	LC	Negligible	713126	6159	0.9	Negligible	Negligible

¹⁵ range of these bat species in Egypt is considered to be underestimated, so the Relative importance was not calculated as a result of the % of the range in the study area, but considered to be low

Scientific name	Common name	IUCN status	National status (mammals)	Vulnerability	Egypt EOO	Study area	% in area	Relative importance	Sensitivity
<i>Hemidactylus turcicus</i>	Turkish Gecko	LC		Negligible	172093	6159	3.6	Low	Negligible
<i>Herpestes ichneumon</i>	Egyptian Mongoose	LC	LC	Negligible	450969	6159	1.4	Low	Negligible
<i>Hyaena hyaena</i>	Striped Hyaena	NT	LC	Low	985642	6159	0.6	Negligible	Negligible
<i>Hypsugo ariel</i>	Desert Pipistrelle	DD	VU	Moderate	14100	6159	43.7	Low ¹	Low
<i>Jaculus jaculus</i>	Lesser Egyptian Jerboa	LC	LC	Negligible	959716	6159	0.6	Negligible	Negligible
<i>Lepus capensis</i>	Cape Hare	LC	LC	Negligible	422748	6159	1.4	Low	Negligible
<i>Lytrohynchus diadema</i>	Crowned Leaf-nosed Snake	LC		Negligible	964285	6159	0.6	Negligible	Negligible
<i>Malpolon moilensis</i>	Moila Snake	LC		Negligible	961014	6159	0.6	Negligible	Negligible
<i>Meriones crassus</i>	Sundevall's Jird	LC	LC	Negligible	831908	6159	0.7	Negligible	Negligible
<i>Mesalina guttulata</i>	Small-spotted Desert Racer	LC		Negligible	779956	6159	0.8	Negligible	Negligible
<i>Mesalina olivieri</i>		LC		Negligible	210787	6159	2.9	Low	Negligible
<i>Mesalina rubropunctata</i>	Red-spotted Desert Racer	LC		Negligible	908184	6159	0.7	Negligible	Negligible
<i>Pipistrellus rueppellii</i>	Rüppel's Pipistrelle	LC	VU	Moderate	250005	6159	2.4	Low	Low
<i>Pipistrellus kuhlii</i>	Kuhl's Pipistrelle	LC	LC	Negligible	250005	6159	2.4	Low	Negligible
<i>Platyceps saharicus</i>		LC		Negligible	247073	6159	2.5	Low	Negligible
<i>Procavia capensis</i>	Rock Hyrax	LC	LC	Negligible	272889	6159	2.2	Negligible	Negligible
<i>Psammomys obesus</i>	Fat sand rat	LC	LC	Negligible	80174	6159	7.6	Moderate	Low
<i>Psammophis aegyptius</i>	Saharan Sand Snake	LC		Negligible	879938	6159	0.7	Negligible	Negligible
<i>Psammophis schokari</i>	Forskål's Sand Snake	LC		Negligible	961077	6159	0.6	Negligible	Negligible
<i>Pseudotrapelus chlodnickii</i>		LC		Negligible	631767	6159	0.9	Negligible	Negligible
<i>Ptyodactylus guttatus</i>	Fan-footed Gecko	LC		Negligible	628639	6159	0.9	Negligible	Negligible
<i>Ptyodactylus hasselquistii</i>		LC		Negligible	168006	6159	3.6	Low	Negligible
<i>Rattus rattus</i>	House Rat	LC	-	Negligible	474636	6159	1.3	Low	Negligible

Scientific name	Common name	IUCN status	National status (mammals)	Vulnerability	Egypt EOO	Study area	% in area	Relative importance	Sensitivity
<i>Rhinopoma cystops</i>	Egyptian Mouse-tailed Bat	LC	LC	Negligible	486754	6159	1.3	Low	Negligible
<i>Rhinopoma hardwickii</i>	Lesser Mouse-tailed Bat	LC	-	Negligible	978842	6159	0.6	Negligible	Negligible
<i>Rhinopoma microphyllum</i>	Greater Mouse-tailed Bat	LC	VU	Moderate	608347	6159	1.0	Low	Low
<i>Sekeetamys calurus</i>	Bushy-tailed Jird	LC	LC	Negligible	152394	6159	4.0	Low	Negligible
<i>Spalerosophis diadema</i>	Diadem Snake	LC		Negligible	985635	6159	0.6	Negligible	Negligible
<i>Stenodactylus petrii</i>	Anderson's Short-fingered Gecko	LC		Negligible	928317	6159	0.7	Negligible	Negligible
<i>Stenodactylus sthenodactylus</i>	Elegant Gecko	LC		Negligible	953468	6159	0.6	Negligible	Negligible
<i>Taphozous perforatus</i>	Egyptian Tomb Bat	LC	LC	Negligible	162768	6159	3.78	Low	Negligible
<i>Trapelus mutabilis</i>		LC		Negligible	109133	6159	4.9	Low	Negligible
<i>Tropicolotes steudneri</i>	Algerian Sand Gecko	LC		Negligible	795530	6159	0.8	Negligible	Negligible
<i>Uromastyx aegyptia</i>	Egyptian Spiny-tailed Lizard	VU		Moderate	130082	6159	4.7	Low	Low
<i>Varanus griseus</i>	Desert Monitor	LC		Negligible	735910	6159	0.8	Negligible	Negligible
<i>Vulpes cana</i>	Blanford's Fox	LC	VU	Moderate	75541	6159	8.1	Moderate	Moderate
<i>Vulpes rueppellii</i>	Rüppell's Fox	LC	LC	Negligible	915546	6159	0.7	Negligible	Negligible
<i>Vulpes vulpes</i>	Red Fox	LC	LC	Negligible	598326	6159	1.0	Low	Negligible