Biodiversity Action Plan and Offset Feasibility Study for Project Blade

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THE BIODIVERSITY CONSULTANCY

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Table of contents

1 Introduction

This document includes the Biodiversity Action Plan (BAP) for the Actis 580 MW Project Blade (hereafter referred to as "the Project"). This is a the first draft BAP as it contains an indicative set of potential offset actions that will need to undergo further development and stakeholder engagement. Once a decision is made on a final offset package or approach, the BAP will need to be updated into a final version.

1.1 The Project

The Project comprises three adjacent operational wind farms in the Red Sea Governorate of Egypt, approximately 280 km southeast of the capital city of Egypt, Cairo: the KFW 240 MW wind farm, FIEM 120 MW wind farm and JICA 220 MW wind farm (Figure 1). The Project covers approximately 107.2 km^2 and consists of 290 wind turbines and associated infrastructure including cables connecting the turbines to an onsite substation; a substation and high-voltage connection to the grid; offices and a warehouse; and a network of access roads.

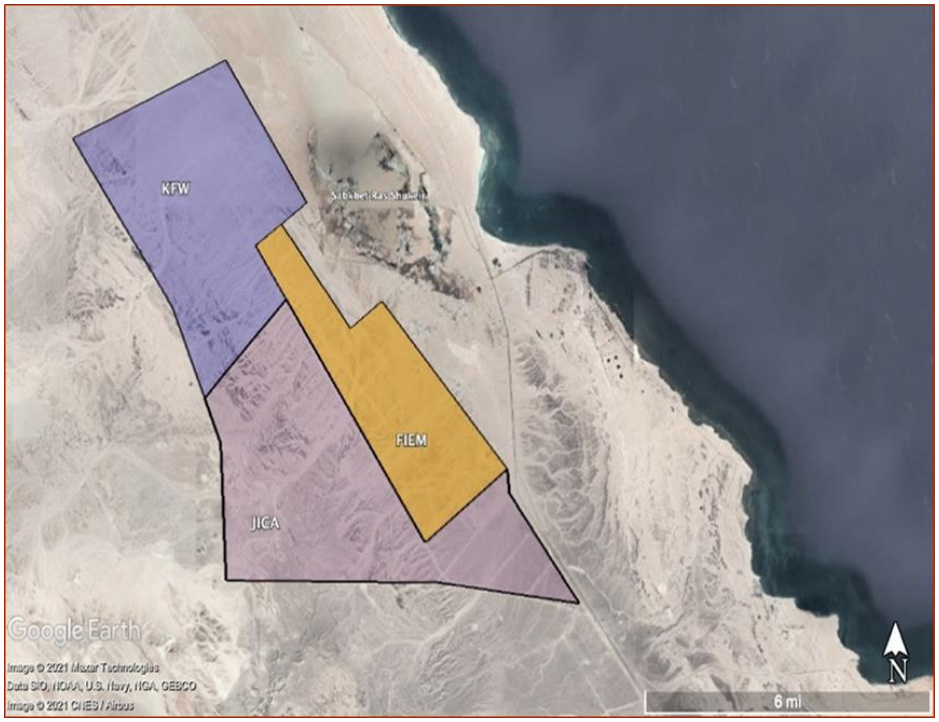

Figure 1. Project location and boundaries, showing the three adjacent wind farms (KFW 240 MW, FIEM 120 MW and JICA 220 MW). (source: NREA & SafeSoar 2023).

1.2 Purpose of this BAP

The Project is seeking finance from international lenders and therefore intends to align with the International Finance Corporation's (IFC) Performance Standard 6 (PS6) on Biodiversity Conservation and Sustainable Management of Living Natural Resources (IFC 2012, IFC 2019) and other good practice guidance such as the World Bank Group's Environmental Health and Safety Industry General and Sectoral Guidelines on Wind Energy (World Bank Group 2015).

The Project lies in a desertic area of Natural Habitat and, although no Critical Habitat Assessment has been conducted for the site, it is widely acknowledged that it lies very likely in Critical Habitat *sensu* IFC PS6 and EBRD PR6. This is mostly because the Project area is crossed by a large proportion (> 1%) of the global populations of several migratory soaring birds (e.g., Hilgerloh *et al.* 2011, (STRIX 2018) (qualifying under criterion 3a, IFC 2019). The assumption of the likely qualification of the Project area as Critical Habitat is also reinforced by the fact that the Amunet Wind Farm, located further north in an area marginally overlapping the Gebel El Zeit Key Biodiversity Area (KBA) / Important Bird Area (IBA) and that holds less significant numbers of migratory soaring birds, was found to qualify as Critical Habitat for multiple species of migratory soaring birds (EcoConsult 2022).

Due to the Project's location in Natural Habitat and likely location in Critical Habitat, PS6 requires No Net Loss (NNL) for priority species (or significant biodiversity) and Net Gain (NG) for species that exceed Critical Habitat thresholds. The purpose of the current BAP is to detail the strategy and process to achieve NNL or NG as appropriate, while considering that a formal assessment of which species would qualify as Critical Habitat has not yet been conducted..

While further improvement in Project-specific mitigation measures already implemented has the potential of reducing observed collision impacts on priority bird species (see Section 2.2 and Section 3), the Project will still need to generate biodiversity gains to comply with the required NNL or NG goals. To identify viable actions to generate such gains, a preliminary Offset Feasibility Study is included within this BAP summarising each of the identified options that may be appropriate for inclusion as NNL or NG actions in a final Project BAP (Section 5).

1.3 Scope of the BAP

This BAP has been developed for the 15 avian species selected as priority Valued Environmental and Social Components (VECs; for selection process see Section 2.2; Table 1), including six species that very likely qualify as Critical Habitat (CH) (see Section 2.1). The BAP does not consider any other potential Critical Habitat-qualifying species or Natural Habitat which may be identified as part of future studies for the Project. The geographical scope covered by this BAP is the Project boundaries (Figure 1), including the full extension of the Overhead Transmission Lines (OHTLs) associated with the Project. The technical details on voltage, extension and operator of these lines are not available at the time of writing the present draft BAP. The temporal scope of the BAP is the operation lifetime of the Project.

This BAP is based on the existing layout and composition of the three wind farms which comprise the Project and assumes that no further/additional development (e.g. additional turbines or transmission lines) is undertaken. Should the Project change, this BAP would need to be updated.

The BAP has been based on existing project documents and secondary data. No specific field surveys have been completed to inform the development of the BAP. A number of data gaps exist that will need to be filled if the BAP is to be operationalised by Actis. Where possible, reasonable assumptions have been made to fill data gaps (e.g. to inform residual impact assessment or the preliminary analysis of offset options) to enable completion of the BAP.

1.4 Stakeholder consultation

IFC PS6 requires that a BAP should be developed with engagement with relevant experts and stakeholders to ensure that the BAP is widely supported. In the present case, all wind farms comprising the Project have been fully operational for multiple years and include a comprehensive monitoring program for migratory soaring bird, as well as a turbine shutdown program to avoid bird collisions (ATMP - Active Turbine Management Program). Additional information was obtained for the BAP from stakeholders such as RCREEE (Regional Center for Renewable Energy and Energy Efficiency) and SafeSoar, in particular regarding monitoring results and the efficiency of ATMP. However, the stakeholder engagement process is still ongoing, focusing on the evaluation of the feasibility of the different offset options (see Section 5).

1.5 Corporate and project policies and commitments

1.5.1 Corporate policy

Actis has a high-level Responsible Investment and Sustainability Policy that applies to all Actis investments (Actis 2023). The company approach seeks to align with the principles of international conventions, standards and guidelines (e.g., the UN-supported Principles for Responsible Investment ("PRI"), the UN Sustainable Development Goals ("SDG"), the IFC Operating Principles for Impact Management, and the Task Force on Climate-related Financial Disclosures (TCFD)).

Regarding the environment, Actis aims at "avoiding investment in businesses or projects with potential for significant adverse impacts on the environment, including but not limited to biodiversity, habitats or ecosystem services". Actis also aims to protect and promote the improvement of the environment through its investments, wherever possible.

1.5.2 Lender requirements

To align with Actis' corporate policy and meet lender requirements, the Project intends to align with IFC PS6 (IFC 2012, 2019) and other good international industry practice (GIIP) guidance such as the World Bank Group's Environmental Health and Safety Industry General and Sectoral Guidelines on Wind Energy (World Bank Group 2015).

Specific PS6 requirements applicable to this BAP are highlighted in the relevant sections of this document. As part of these requirements, NG is required for those biodiversity values for which

the Project is in an area of Critical Habitat. Gains can either be generated via biodiversity offsets (that achieve measurable, additional outcomes) where there are likely to be significant impacts to Critical Habitat values or via supporting additional conservation activities that are focused on the Critical Habitat values in projects that do not have a significant residual impact.

2 Biodiversity context

The Project is in the Red Sea Coastal Desert Ecoregion[1], which runs south from the Suez Canal, parallel to the coastline. It occupies 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 (e.g., Al Amar Consulting Group *No date*, STRIX 2018).

The Project occurs within the Red Sea/Rift Valley flyway for migratory soaring birds which connects breeding grounds in Europe with wintering areas in Africa (Figure 2). 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. Due to the Project's location and potential interaction with migratory birds, systematic bird migration monitoring (associated with the implementation of the ATMP) was initiated in spring 2016, with the start of the operation phase of the first individual wind farm within the Project, the KfW wind farm (Ehab Ameen No date, STRIX 2018). In Autumn 2020, a wider monitoring program started, involving all three wind farms within the Project and the monitoring of both Spring and Autumn migratory periods (Ehab Ameen No date).

The number of migratory soaring birds crossing the Project area is very high during both the spring (northward) and autumn (southward) migration periods, exceeding 400,000 individuals (e.g., STRIX 2018, GreenPlus 2022, NREA & SafeSoar 2023). Most abundant species include White Stork (*Ciconia ciconia*), European Honey Buzzard (*Pernis apivorus*), Eurasian (Steppe) Buzzard (*Buteo buteo vulpinus*), Black Kite (*Milvus migrans*), Levant Sparrowhawk (*Accipiter brevipes*), Great White Pelican (*Pelecanus onocrotalus*) and Steppe Eagle (*Aquila nipalensis*).

The Project also overlaps with the Gebel El Zeit Key Biodiversity Area[2] (KBA) and Important Bird Area[3] (IBA). This IBA is a very important migration corridor for soaring migrants, particularly birds of prey and storks, and forms an important stop-off point in the Red Sea/Rift Valley flyway. This IBA is the narrowest point in the southern part of the Gulf of Suez and migratory birds using this flyway are funneled through the area during both spring and autumn journeys. The northern section of the IBA is a wide coastal plain with several areas of *sabkha* (coastal mudflat in which

[1] https://ecoregions.appspot.com/

[2] https://www.keybiodiversityareas.org/site/factsheet/6217

[3] https://datazone.birdlife.org/site/factsheet/gebel-el-zeit-iba-egypt

evaporite-saline minerals accumulate), containing pools of hyper-saline water and large patches of saltmarsh[4].

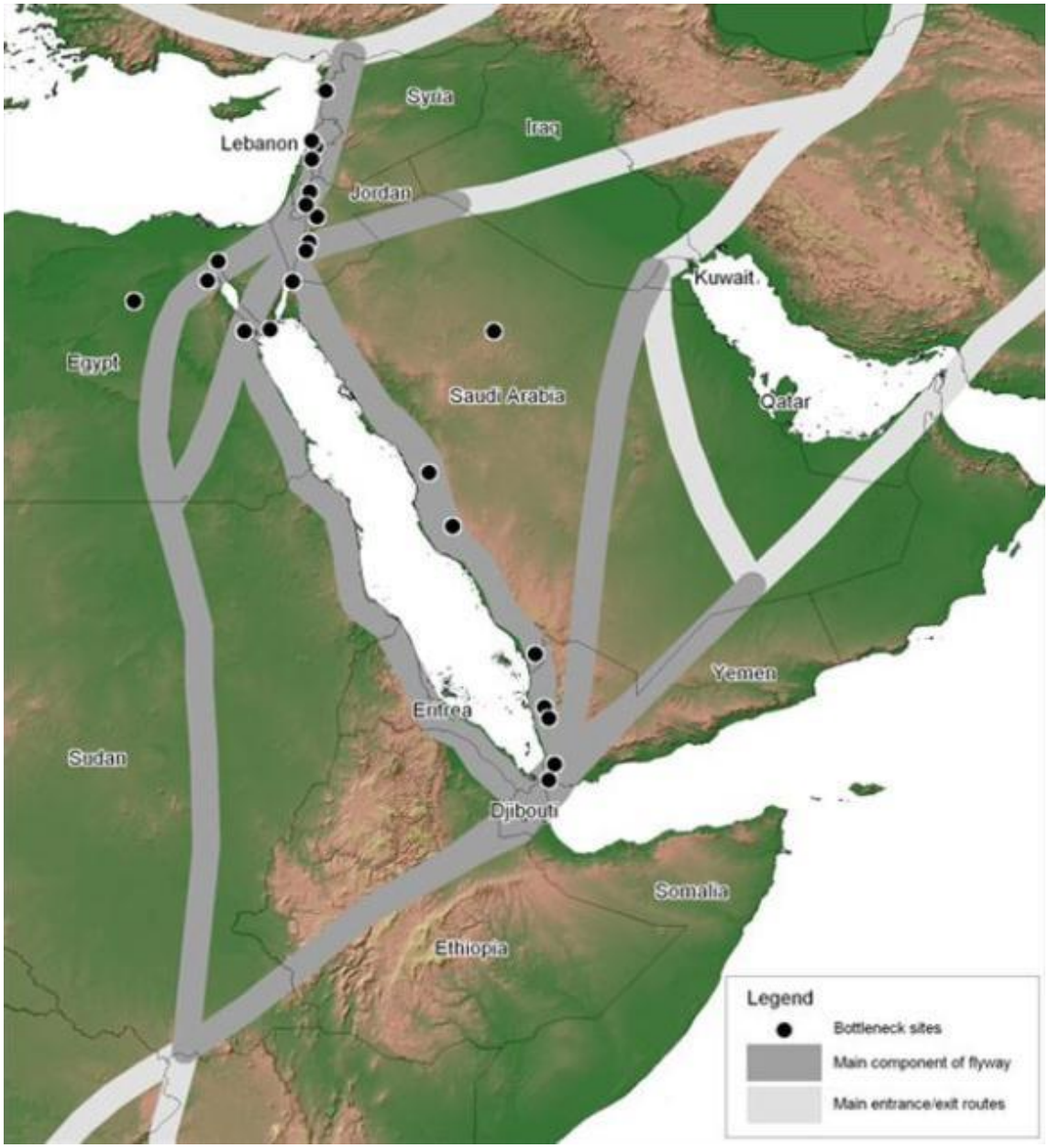

Figure 2. Map of the main elements of the Rift Valley/Red Sea flyway showing key bottleneck sites (source: BirdLife International).

[4] https://www.keybiodiversityareas.org/site/factsheet/6217

2.1 Critical Habitat-qualifying biodiversity

Currently, no Critical Habitat Assessment has been completed for the Project. Nonetheless, the existing knowledge about the importance of the Project area for a very high number of migratory soaring birds strongly indicates that the area very likely qualifies as Critical Habitat for six species (Table 1; see also Section 1.2.).

Consequently, and according to paragraph 18 of IFC PS6 (IFC 2012), the Project should develop a BAP (this document) describing a mitigation strategy designed to achieve NG of those biodiversity values for which the critical habitat was designated.

2.2 Priority VECs

Valued Environmental and Social Components (VECs) is a concept used in the practice of cumulative impact assessment to indicate an environmental or social attribute that is considered important in assessing risk. While VECs have been mostly considered during the assessment of cumulative effects from several developments, they may also be directly or indirectly affected by a specific development (IFC 2013). Priority VECs are those at highest risk of effects from the Project in the study area, and identification of Priority VECs allows mitigation, monitoring and management measures to be focused on those species of highest risk.

The identification of priority environmental VECs followed the same stepwise approach as outlined in the Cumulative Effects Assessment for the Tafila Region Wind Power Projects, Jordan (IFC 2017) and also followed for the Lekela North Ras Gharib 250 MW wind energy project, Egypt (TBC 2019). Like these studies, the identification of environmental VECs was based on species, The current BAP focused uniquely on bird species, as informed by the existing knowledge from previous studies and ongoing monitoring that showed the higher relative importance of the region for this group of fauna which also shows a higher sensitivity to the impacts caused by the installed wind farms and OHTLs. The approach and different steps taken to the identification of Priority VECs for the Project is described in detail in Appendix 1. This resulted in the identification of 15 Priority VECs for the Project, all of which are migratory soaring birds (Table 1).

Table 1. List of screened-in Priority VECs for the Project and their global conservation status[5].

Common name	Scientific name	IUCN Red List [a]	Likely Critical Habitat species [b]
Black Kite	*Milvus migrans*	LC	No
Black Stork	*Ciconia nigra*	LC	Yes
Booted Eagle	*Hieraaetus pennatus*	LC	No
Common Crane	*Grus grus*	LC	No
Eastern Imperial Eagle	*Aquila heliaca*	VU	No
Egyptian Vulture	*Neophron percnopterus*	EN	No
Eurasian Buzzard	*Buteo buteo*	LC	No
European Honey-buzzard	*Pernis apivorus*	LC	Yes
Great White Pelican	*Pelecanus onocrotalus*	LC	Yes
Greater Spotted Eagle	*Clanga clanga*	VU	No
Lesser Spotted Eagle	*Clanga pomarina*	LC	Yes
Levant Sparrowhawk	*Accipiter brevipes*	LC	No
Pallid Harrier	*Circus macrourus*	NT	No
Steppe Eagle	*Aquila nipalensis*	EN	Yes
White Stork	*Ciconia ciconia*	LC	Yes

[a] LC = Least Concern, NT = Near Threatened, VU = Vulnerable and EN = Endangered.

[b] Noting that a Critical Habitat Assessment has not been conducted for the Project yet, some species were preliminarily considered as likely qualifying as Critical Habitat.

2.3 Project-related impacts to avian species

As the three wind farms comprising the Project are already operating, potential impacts during the construction phase were not considered relevant in the current BAP.

Previous Environmental and Social Impact Assessment studies conducted at the Project or wider area of the Gulf of Suez highlighted collisions with infrastructures and barrier effects as the main potential impacts on birds from operating wind farms in the region (Al Amar Consulting Group *No date*, Lahmeyer International & Ecoda 2011, Lahmeyer & Ecoda 2013).

The only impacts of relevance to the fifteen priority species covered by this BAP (Table 1) are from:

- Collision with turbine blades; or,
- Collisions or, more rarely, electrocutions on Project transmission lines.

No other impacts to biodiversity are considered further in this BAP.

[5] https://www.iucnredlist.org/

3 Mitigation strategies

3.1 Mitigation hierarchy

By aligning with IFC PS6, the Project is committed to sequential implementation of the mitigation hierarchy (see, e.g., CSBI & TBC 2015): i.e. avoidance and minimisation of impacts, restoration where possible, and if significant residual impacts remain, offset actions to achieve a NNL or NG target.

3.2 Overview of mitigation and monitoring actions

As the three adjacent wind farms that form the Blade Project are already installed and fully operational, **avoidance** of impacts (e.g., relocation of individual turbines or selection of a different, less sensitive, installation site) is not possible at this stage.

Soaring bird collision mortality has been identified as the main biodiversity risk associated with the Project. **Minimisation** of such impacts on migratory soaring birds has been implemented in the Project since the start of operation, through the adoption of shut-down on demand following the protocols established under the overarching framework of the ATMP for Wind Power Projects in the Gulf of Suez (e.g., GreenPlus 2021, GreenPlus 2022, NREA & SafeSoar 2023). The Project has adopted a Radar-Assisted Shut-down On-Demand (RASOD) approach during spring, involving 13 vantage points with trained observers detecting migratory soaring birds and two radars that further support early detection. During autumn, radars are not used, and monitoring and surveillance rely on an Observer-Led Shut-Down on Demand (OLSOD) approach. Observers at vantage points use walkie-talkies (and mobile phones, as a backup) to communicate between each other and the SCADA coordinator (when a shutdown is necessary).

This monitoring takes place during 90 days during spring (20 February – 20 May) and 78 days during autumn (12 August – 28 October), covering the full migration periods for soaring birds in the region. Monitoring lasts for 10 – 12 hours each day, between *c.* one hour after sunrise and *c.* one hour before sunset.

During RASOD, observers detect and count all migratory soaring birds in the Project area and map their movements. They also evaluate collision risk and determine whether one or more wind turbines should be temporarily shut-down, based on pre-determined shut-down criteria, that include:

- *Condition 1 – Threatened species*

  Whenever a targeted soaring bird(s) of a threatened species (according to up-to-date IUCN Red List) is detected in the wind farm area or heading towards it at risky flight altitudes (≤200 m).

- *Condition 2 – Flocks with 10 or more targeted soaring birds*

Whenever flocks with 10 or more soaring birds are detected in the wind farm area, or heading towards it, at risky flight altitudes (≤200 m).

- *Condition 3 – Imminent risk of collision*

  Even when the previous conditions are not met, one or more turbines should be shut down whenever there is an imminent high risk of collision of migratory soaring bird(s) with turbine(s).

- *Condition 4 – Extreme weather*

  Turbines should be shut down during extreme weather events (e.g., sand/dust storms) or other precarious events that threaten the safety of the monitoring team or the targeted soaring birds, whenever conditions 1 or 2 have been verified in the two hours that preceded the event.

- *Condition 5 – Roosting inside or near windfarm area*

  Whenever bird(s) of a threatened species (Condition 1) or flocks with 10 or more soaring birds (Condition 2) is detected roosting or attempting to roost inside or near the windfarm area (≤2000 m); risky turbines should be shut down until the bird(s) depart the risk zone, or until the risk is assessed as low by the Field Coordinator.

The Project also conducts Post-Construction Fatality Monitoring (PCFM) during spring and autumn, to better access and improve the efficiency of shut-down on demand implementation in avoiding collisions. Although PCFM actions started with the operational phase of the first wind farms comprised by the Project, only since 2021 it has been conducted in a systematized way (e.g., (Riad 2021a, 2022). This includes conducting periodic searches under all turbines throughout the monitoring seasons, as well as conducting bias correction trials (e.g., searcher efficiency and carcass removal trials) and calculating corrected estimated fatalities using a generalized mortality estimator (GenEst). Non-systematic PCFM has also been conducted on Overhead Transmission Lines (OHTLs) associated with the Project. Results from PCFM are reported and analyzed after each migratory season (see also Section 4).

Onsite **restoration** of habitats is not possible for the priority species of the BAP as none are likely to regularly use any terrestrial habitat present.

The requirement for **offsets** is discussed below.

3.2.1 Proposed improvements in mitigation

While the operation of the ATMP has been successful in avoiding a large number of soaring bird collisions at the Project, some fatalities of priority VECs have been reported (see Section 4). Based on the experience from last years in the operation of the ATMP, several improvement opportunities can be identified and are recommended to further enhance the efficiency of this minimization measure in avoiding collisions (Table 2).

Table 2. Recommended improvements to mitigation actions and their expected impact in reducing collisions of migratory soaring birds.

Improvement action	Stage	Expected impact in reducing collision fatalities
Overall revision and standardization of RASOD/OLSOD and PCFM protocols implemented in the three wind farms forming the Project, including details on the chain of responsibility and sequence of actions for successful implementation of shutdowns.	Planning	Low
ATMP period starting a week before and extending for an extra week at the end of each migratory season. This extended period may be performed with a reduced number of vantage points, but results obtained will be used to calibrate the ATMP implementation season for future campaigns.	Field work	Low
The number of observers should increase to 16 (13 observers in Vantage Points and 3 field coordinators).	Field work	Moderate
Implementation of two daily shift at each vantage point (currently observation periods may last 12 consecutive hours), to reduce fatigue and maintain detection efficiency.	Field work	Moderate
Installation of one or more additional radio repeater in strategic location(s) within the Project, to improve the communication between the field coordinators and the SCADA coordinator.	Equipment	Moderate
Use of the two existing radars in both monitoring seasons (spring and autumn) with re-location to optimized locations, that should be evaluated and indicated by experienced radar ornithologists. Additional, radar operators should receive comprehensive training in all aspects of RASOD, including bird migration.	Equipment	High
Installation of Bird Flight Diverters along the entire length of all OHTLs associated with the Project.	Equipment	High
All mortality events and observed near misses (turbines not shutting down before birds fly through or not shutting down at all) should be investigated to provide indications for improvement under adaptive management. For each carcass that is found an investigation must be conducted by the ATMP team in order to investigate what likely reasons leading to the failure in the RASOD system (e.g., communication failure, bird was not detected, adverse weather/sand storm, bird disturbed while roosting, SCADA failure). Results of this investigation, along with any resulting changes in protocols, should be included in the ATMP monitoring report.	Data analyses	Moderate
Reporting and analysis of all occurrences of birds roosting in the Project area or its vicinity (species, numbers and location) in the ATMP monitoring reports. If adequate, further measures should be adopted to reduce risk associated with this behaviour (e.g., setting	Data analyses	Low

Improvement action	Stage	Expected impact in reducing collision fatalities
camera traps to investigating disturbance causes, limiting access to frequent roost sites).		
Compilation and analysis of the collective data on monitoring results (migration counts, shutdown on demand operations and fatalities) from all seasons and all wind farms that compose the Project (aiming to provide insights relevant to inform ongoing ATMP and fatality monitoring).	Data analyses	Low

4 Residual impact assessment

Residual impacts from the Project were calculated based on data from two years (2021 and 2022) for which there was standardized information from Post-Construction Fatality Monitoring (PCFM) for all the three wind farms comprised by the Project (KfW, FIEM and JICA) and covering both migratory seasons (spring and autumn) (GreenPlus 2021, 2022, Riad 2021a, 2022).

For the residual impact assessment, the corrected fatality estimates were used (column "Corrected estimated fatalities (residual impacts", Table 3), which were derived using a generalized mortality estimator (GenEst) on observed fatalities (column "Average annual observed fatalities", Table 3) , which accounts for the correction of different sources of bias (e.g., searcher efficiency, carcass persistence).

Data from 2021 and 2022 consisted of accurate and consistent fatalities data from three spring and three autumn samples, each from one of the wind farms within the Project. An average annual observed fatality for each species could then be derived from 2021 and 2022 data.

Corrected annual estimated fatalities for the Project totaled 89 soaring birds, of which 70 were priority VECs (Table 3). The remaining included ten Marsh Harriers (*Circus aeruginosus*), four Kestrels (*Falco tinnunculus*), three Eurasian Sparrowhawks (*Accipiter nisus*), one Montagu's Harrier (*Circus pygargus*) and one Harrier (*Circus* sp.).

Table 3. Estimated annual fatalities from collisions with wind turbines at the Project area for priority VECs.

Common name	Scientific name	Likely Critical Habitat [a]	Target [b]	Average annual observed fatalities [c]	Corrected estimated fatalities (residual impacts) [d]	Estimated fatalities after additional mitigation [e]
Black Kite	*Milvus migrans*	No	NNL	3	7	6-7
Black Stork	*Ciconia nigra*	Yes	NG	0	0	0
Booted Eagle	*Hieraaetus pennatus*	No	NNL	1	1	1
Common Crane	*Grus grus*	No	NNL	0	0	0
Eastern Imperial Eagle	*Aquila heliaca*	No	NNL	0	0	0
Egyptian Vulture	*Neophron percnopterus*	No	NNL	0	0	0
Eurasian Buzzard	*Buteo buteo*	No	NNL	1	2	2
European Honey-buzzard	*Pernis apivorus*	Yes	NG	9	23[f]	18-22
Great White Pelican	*Pelecanus onocrotalus*	Yes	NG	0	0	0
Greater Spotted Eagle	*Clanga clanga*	No	NNL	0	0	0
Lesser Spotted Eagle	*Clanga pomarina*	Yes	NG	0	0	0
Levant Sparrowhawk	*Accipiter brevipes*	No	NNL	0	0	0
Pallid Harrier	*Circus macrourus*	No	NNL	0	0	0
Steppe Eagle	*Aquila nipalensis*	Yes	NG	1	2	2
White Stork	*Ciconia ciconia*	Yes	NG	14	35[f]	21-33

[a] Noting that a Critical Habitat Assessment has not been conducted for the Project yet, some species were preliminarily considered as likely qualifying as Critical Habitat.

[b] Assuming that some species likely qualify as Critical Habitat and therefore require a NG goal.

[c] Based on the two years (2021 and 2022) for which complete, accurate, information from PCFM was available for the three wind farms comprising the Project and for both spring and autumn monitoring seasons. Only fatalities from collisions with wind turbines were considered.

[d] Using GenEst.

[e] Minimum values (as additional likely fatalities caused by OHTLs were not considered) and assuming all improvements in mitigation are implemented (see text).

[f] Likely to be higher if collisions with OHTLs are included.

These estimates do not include fatalities from collisions with the Project's OHTLs. Between 2017 and 2021, unsystematic fatalities search along a limited extension of the Project's OHTLs found 10 carcasses of White Stork (*Ciconia Ciconia*) and three of European Honey-buzzard (*Pernis apivorus*) (GreenPlus 2017, Environics 2019, Migratory Soaring Bird Project 2020, Riad 2021a, 2021b, 2022). Also, PCFM along other OHTLs in the Red Sea coast showed that collision impacts can be relatively high to White Storks (11 fatalities during one year at Lekela wind farm site, along ~10 km; and 17 fatalities during a single autumn at Ras Ghareb/Zaafaran wind farm, along ~16 km; TBC 2022). Accurate information on the overall extension of OHTLs associated with the Project is not available at the time of writing the present draft BAP, hampering an estimate of the likely annual collision fatalities (particularly of White Storks) based on the known rates from other high-voltage transmission lines, and corrected to differences in length. Nonetheless, and even

assuming that the existing Lekela and Ras Ghareb/Zaafaran lines have Bird Flight Diverters (BFDs) installed, and that BFDs will also be installed on the Project's OHTL (refer to recommendations in Table 2), it is likely that the overall Project residual impacts for European Honey-buzzard and, particularly, White Stork, will be greater than the estimated fatalities from collisions only.
Mitigation implementation in the Project, mainly through the operation of the ATMP by trained teams, has proved quite successful in avoiding a large number of migratory soaring birds' fatalities in an area holding such an outstanding importance for hundreds of thousands of birds. Consequently, the potential for major improvement in ATMP effectiveness is probably limited, although some incremental improvements could be possible that to reduce collision risk. This is the case particularly with a better siting of radars, and a better use of radar information, and regarding the installation of BFDs along OHTLs (Table 2). Such changes will potentially be more beneficial for species occurring in larger and more compact flocks that may be detected and tracked at greater distances from the Project area (e.g. Common Crane *Grus grus*, Great White Pelican *Pelecanus onocrotalus*, White Stork), and that are also more affected/likely to be affected by collisions with OHTLs. Furthermore, the same species will also benefit from the recording and analysis of roosting areas near the Project area and potential actions to reduce the associated risk (Table 2). Consequently, the impact of additional mitigation measures (see Table 2) on reducing the annual fatalities of these species was estimated to vary between 5% and 40%. For the remaining species this interval was estimated at 5% to 20%.

Using this approach and correction percentages on the corrected annual estimated fatalities , and assuming that all potential enhancement in mitigation (Table 2) is implemented, minimum annual estimated fatalities (since not considering additional likely fatalities caused by OHTLs) range from ~0 (nine species) to 18-22 for European Honey-buzzard and 21-33 for White Stork, with only six species having predicted annual fatalities >0 (Table 3).

Ongoing PCFM (that should be extended to the OHTLs associated with the project) will allow to determine the effects of additional mitigation measures on actual fatalities of priority species, informing the need of revising the estimated residual impacts and of further adaptive management and mitigation.

5 Offset strategy

5.1 NNL/NG approach

Offsets should be used as the last resource in the mitigation hierarchy, if significant residuals impacts remain after the previous steps (avoidance, minimization, restoration) have been implemented (e.g. CSBI & TBC 2015).

Offset actions can generate biodiversity gains either through averted loss (i.e. conservation actions that prevent predicted impacts from happening) and/or improvement (i.e. actions that increase a species' survival or productivity).

5.1.1 Good practice for achieving NNL/NG

The development of potential offset actions should follow good practice (BBOP 2012, ICMM & IUCN 2013, Ledec & Johnson 2016) and key offset principles for achieving NNL/NG include:

- **Ecological equivalence**: Biodiversity gains from offsets will be planned as "like-for-like or better".
- **Landscape context**: Offsets will be designed accounting for connectivity across the landscape, avoiding fragmentation, and maintaining flows of ecosystem services.
- **Net gain**: Biodiversity offsets will be designed and implemented to achieve in-situ, measurable conservation outcomes that can reasonably be expected to result in a NG of biodiversity.
- **Additional**: Conservation gains will be clearly attributable to the Project's actions and will demonstrably be above and beyond results that would have occurred if the offset had not taken place.
- **Transparency**: The design, implementation and monitored outcomes of biodiversity offsets will be transparent, and communicated in the public domain.
- **Precautionary approach**: Estimates of gains and losses will be conservative and include a margin of precaution proportional to the risks involved in offset delivery.
- **Long-term outcomes**: Offsets will use an adaptive management approach, incorporating monitoring and evaluation, to secure outcomes that last at least as long as the Project impacts. Securing long-term financing is essential to ensuring permanence of the offset.
- **Stakeholder participation**: Offsets will be based upon appropriate, extensive and transparent stakeholder consultation.

5.2 Offset requirements

Annual residual impacts on priority VECs are predicted to be (Table 3):

- ~0 for nine species – Black Stork, Common Crane, Eastern Imperial Eagle, Egyptian Vulture, Great White Pelican, Greater Spotted Eagle, Lesser Spotted Eagle, Levant Sparrowhawk and Pallid Harrier;
- 1 for Booted Eagle;
- 2 for Eurasian Buzzard and Steppe Eagle;
- 6-7 for Black Kite;
- 18-22 for European Honey-buzzard; and
- 21-33 for White Stork.

As mortality threshold for the different species have not been discussed and determined for the Project, these residual impacts are currently assumed as the minimum losses that would need compensation. Therefore, offset actions should generate population gains aiming:

- equalizing residual impacts for species that probably do not qualify as CH (hence, targeting NNL): Black Stork, Common Crane, Eastern Imperial Eagle, Egyptian Vulture, Great White Pelican, Greater Spotted Eagle, Lesser Spotted Eagle, Levant Sparrowhawk, Pallid Harrier, Booted Eagle, Eurasian Buzzard, Steppe Eagle, Black Kite;

- surpassing residual impacts for species that probably qualify as CH (hence, targeting NG): Great White Pelican, European Honey-buzzard, White Stork.

However, even for the six species that are unlikely to qualify as CH and for which residual impacts are predicted to be null (Common Crane, Eastern Imperial Eagle, Egyptian Vulture, Greater Spotted Eagle, Levant Sparrowhawk, Pallid Harrier), an annual gain of ≥1 should be targeted, in order to accommodate eventual collision impacts on those species, that may have not been previously detected.

Investment in additional conservation actions would need to increase if annual impacts exceed the predicted gains from the offset actions.

5.3 Offset options

Given the number of species involved, there are a suite of potential offset projects which could be supported by the Project to meet its NNL/NG commitment. Currently, only a preliminary identification of a long list of options (11), and initial contacts with the involved stakeholders, have been conducted and these are presented below. Most of the priority species are only passage migrants with few threats in Egypt, hence there are few opportunities for conservation actions within the country. Therefore, conservation projects in other countries within the species' ranges were also included in the assessment of options.

A comprehensive Offset Feasibility Analysis will be developed in the next phase of the BAP preparation, aiming at the evaluation of the different options regarding the expected biodiversity gains, social and political feasibility, implementation risks and cost.

1. **Supporting raptor monitoring and capacity development to counter illegal killing along the Rift Valley / Red Sea Flyway**

- Responsible stakeholder: Batumi Raptor Count (BRC).

- Implementation countries: Georgia, Turkey and Lebanon.

- Summary description: since 2015 BRC BRC has been conducting community outreach to understand and reduce the impact of illegal hunting on migratory birds, leading to a significant decrease in illegal hunting in Batumi, an exceptionally important bottleneck for migratory soaring birds in Georgia. Further support to BRC and other partners would allow for an expansion of such actions in Georgia, Turkey and Lebanon.

- Target species: potentially all priority VECs except Great White Pelican and White Stork.

- Overlap with other offset programs: similar actions by BRC are being discussed in the scope of the offset needs for AMEA Power's Amunet Wind Farm (Egypt). Hence, the possibility of ensuring additionality by accommodating actions associated with the Blade Project needs further evaluation.
- Estimated budget: 269,000 USD over 5 years.

2. Retrofitting powerlines in Egypt

- Responsible stakeholder: Nature Conservation Egypt (NCE).
- Implementation countries: Egypt.
- Summary description: installing BFDs along high-voltage transmission lines not associated with the Project along the Rift Valley/Red Sea Flyway may reduce significantly collision mortality of migratory soaring birds.
- Target species: Black Kite, Black Stork, Common Crane, Eurasian Buzzard, European Honey-buzzard, Great White Pelican, Lesser Spotted Eagle, White Stork.
- Overlap with other offset programs: a similar action has been proposed in the scope of the offset needs for AMEA Power's Amunet Wind Farm (Egypt). Hence, the possibility of ensuring additionality by accommodating this action associated with the Blade Project needs further evaluation.
- Estimated budget: 300,000 USD over 5 years.

3. Nest protection and habitat restoration in Polesia

- Responsible stakeholder: British Trust for Ornithology (BTO).
- Implementation countries: Ukraine and Belarus.
- Summary description: developing habitat restoration actions in wetlands, and protection and surveillance of Black Stork and Greater Spotted Eagle nests, increasing breeding success and fledgling survival.
- Target species: Black Stork, Common Crane, Greater Spotted Eagle.
- Overlap with other offset programs: similar actions by BTO in the same region are being discussed in the scope of the offset needs for AMEA Power's Amunet Wind Farm (Egypt). Hence, the possibility of ensuring additionality by accommodating actions associated with the Blade Project needs further evaluation.

- Estimated budget: 25,360 USD over 5 years.

4. Supporting the rescue and recovery center for birds and capacity development against illegal killing actions in Malta

- Responsible stakeholder: BirdLife Malta.
- Implementation countries: Malta.
- Summary description: illegal killing impacts severely on several soaring birds during their migration movements over Malta. The action would aim at supporting vigilance, law enforcement and public awareness campaigns to reduce this threat, and recovery of injured birds.
- Target species: Egyptian Vulture, Eurasian Buzzard, European Honey-buzzard, Lesser Spotted Egle, Pallid Harrier.
- Overlap with other offset programs: no overlap.
- Estimated budget: 250,000 USD over 5 years.

5. Supporting hunting supervision and control of the trade with shot or illegally caught migratory birds in Eastern Mediterranean

- Responsible stakeholder: Komitee Gegen den Vogelmord E.V./Committee Against Bird Slaughter (CABS)
- Implementation countries: Lebanon and Malta.
- Summary description: supporting hunting supervision to avoid/discourage illegal killing and trade of migratory soaring birds, law enforcement and public awareness campaigns to reduce this threat.
- Target species: Black Kite, Common Crane, Egyptian Vulture, Eurasian Buzzard, European Honey-buzzard, Great White Pelican, Lesser Spotted Egle, Pallid Harrier, White Stork.
- Overlap with other offset programs: no overlap.
- Estimated budget: 250,000 USD over 5 years.

6. Management of Kafue flats

- Responsible stakeholder: International Crane Foundation.

- Implementation countries: Zambia.
- Summary description: supporting actions to address main threats to migratory soaring birds in the area (poaching, unsustainable land use, invasive species and low management capacity).
- Target species: Steppe Eagle, White Stork.
- Overlap with other offset programs: no overlap.
- Estimated budget: 167,376 USD over 5 years.

7. Protected Area expansion in South Africa

- Responsible stakeholder: BirdLife South Africa.
- Implementation countries: South Africa.
- Summary description: support to BirdLife South Africa's Landscape Conservation, aiming at increasing the national Protected Areas network, with likely improvements in the habitat and survival of some of the Project target species.
- Target species: White Stork.
- Overlap with other offset programs: no overlap with other offset programs Nonetheless, further evaluation is needed to evaluate if funding from the Project would deliver potential additionality to the ongoing national program for expanding the Protected Areas network.
- Estimated budget: 360,000 USD over 5 years.

8. Habitat restoration, installation of nest platforms and nest surveillance in Georgia

- Responsible stakeholder: SABUKO / BirdLife Georgia.
- Implementation countries: Georgia.
- Summary description: support additional actions of nest protection and surveillance, installation of artificial nesting platforms and habitat restoration for Eastern Imperial Eagles, following a successful project by SABUKO.
- Target species: Eastern Imperial Eagle.
- Overlap with other offset programs: no overlap.

- Estimated budget: 12,420 USD over 5 years.

9. Protecting forest habitat and avoiding disturbance for breeding forest raptors in Portugal

- Responsible stakeholder: SPEA / BirdLife Portugal.
- Implementation countries: Portugal.
- Summary description: support nest surveillance and habitat management actions in forest areas used for different purposes (wood and cork production, paper production), increasing breeding success and survival of forest soaring birds.
- Target species: European Honey-buzzard.
- Overlap with other offset programs: no overlap.
- Estimated budget: 63,400 USD over 5 years.

10. Habitat enhancement and prey reinforcement in Spain

- Responsible stakeholder: Fundación Naturaleza y Hombre.
- Implementation countries: Spain.
- Summary description: support additional actions of habitat and prey enhancement and management for forest soaring birds, following a successful project by Fundación Naturaleza y Hombre.
- Target species: European Honey-buzzard.
- Overlap with other offset programs: no overlap.
- Estimated budget: 16,907 USD over 5 years.

11. Protection of breeding habitats in Turkey

Responsible stakeholder: Doğa Derneği (Doğa) and Magyar Madártani és Természetvédelmi Egyesület (MME / BirdLife Hungary)

Implementation countries: Turkey.

Summary description: support additional actions of breeding habitat protection and awareness campaigns to decrease threats to breeding Steppe Eagles and increase their breeding success.

Target species: Steppe Eagle.

Overlap with other offset programs: no overlap.

Estimated budget: 12,420 USD over 5 years.

5.4 Coverage by offset actions

The initial set of 11 potential offset options was considered for its potential to deliver gains for one or more target species and deliver a NNL/NG outcome for all species (See Section 5.2 and Table 4). This list provides multiple options for each species to allow for redundancy, as not all actions will have the same level of benefit for all species, while also providing the greatest benefits for the greatest number of species.

The relative importance of the different options to generate gains vary between species: while most species can benefit significantly from different offset and conservation projects, only the support to raptor monitoring and capacity development to counter illegal killing in Georgia, Turkey and Lebanon (option 1 above; Table 4) is more likely to generate measurable gains to the Booted Eagle, Egyptian Vulture, Lesser Spotted Eagle and Pallid Harrier. Similarly, Great White Pelicans are more likely to benefit from the retrofitting of power lines in Egypt (option 2 above; Table 4).

Importantly, a larger combination of offset options may be needed to compensate for the higher residual impacts of White Stork, European Honey-buzzard and Black Kite (see Section 4.2 and Table 3). This should likely involve at least the two conservation projects mentioned above (options 1 and 2), as well as additional actions against illegal killing and trading in Malta and Lebanon (options 4 and 5 above), habitat enhancement and nest protection in Portugal and Spain (options 9 and 10 above), and the management of Kafue flats in Zambia and support to the expansion and management of protected areas in South Africa (options 6 and 7 above) (Table 4).

Table 4. Relative importance of offset options to generate the necessary gains for each priority VEC in the Project. ***X*** *– main offset option; x – secondary offset option. BK – Black Kite; BS – Black Stork; BE – Booted Eagle; CC – Common Crane; EIE – Eastern Imperial Eagle; EV – Egyptian Vulture; EB – Eurasian Buzzard; EHB – European Honey-buzzard; GWP – Great White Pelican; GSE – Greater Spotted Eagle: LSE – Lesser Spotted Eagle; LS – Levant Sparrowhawk; PH – Pallid Harrier; SE – Steppe Eagle; WS – White Stork.*

	Species														
Offset option	**BK**	**BS**	**BE**	**CC**	**EIE**	**EV**	**EB**	**EHB**	**GWP**	**GSE**	**LSE**	**LS**	**PH**	**SE**	**WS**
1 Counter illegal killing Rift Valley/Red Sea Flyway	**X**	**X**	**X**		**X**	**X**	**X**	**X**		**X**	**X**	**X**	**X**	**X**	
2 Retrofitting power lines in Egypt	**X**	**X**		**X**			**X**	**X**	**X**		**X**				**X**
3. Nest protection and habitat restoration in Polesia		x		**X**						**X**					
4. Actions against illegal killing in Malta	**X**					x	x	**X**			x		x		
5. Control of illegal hunting and trade in Eastern Mediterranean	**X**			x		x	x	**X**	x		x		x		x
6. Management of Kafue flats									x				x	**X**	**X**
7. Protected Area expansion in South Africa													x		**X**
8. Habitat restoration and installation of nest surveillance in Georgia					**X**										
9. Protection of forest habitat and raptor nests in Portugal	x	x	x				x	**X**							
10. Habitat enhancement and prey reinforcement in Spain	x	x	x				x	**X**							
11. Protection of breeding habitats in Turkey														**X**	

5.5 Next steps

The long list of potential offset options presented as a preliminary Offset Feasibility Study in this draft BAP, and potentially additional options, will be evaluated comprehensively through an Offset Feasibility Analysis (OFA) in the next phase of the BAP. This will involve a stakeholder engagement process with all relevant stakeholders and managers for each of the identified projects. The goal of this engagement is to obtain a deeper understanding of the project, including likely gains and costs, as well as the practicalities of the projects supporting implementation of a conservation action. The OFA will also comprehend a quantification of gains as accurate as possible, and the evaluation of the set of actions and level of effort necessary to deliver the NNL/NG commitment for the different species.

Actis should then agree with Lenders the final options and level of contribution for implementation. This should also include an intermediate step of agreeing on the final list of species that qualify as CH (and therefore require a NG goal) and on the setting of acceptable fatality thresholds that will be used to further refine the likely residual impacts needing compensation for each species.

The next step is for additional details to be collected for all offset actions, including detailed plans of work, the level of support, likely gains and the practicalities of engagement. The Project may also wish to visit the identified options to provide further assurance that they meet the Project's requirements. For any final suite of options, the Project and implementing agency should agree on:

- The scope of support – i.e., level of funding, time period, responsibilities; and,
- A set of financial and management indicators to demonstrate that the action is functioning as intended and likely to deliver the assumed gain.

This information, along with the approach taken and likely resultant gains, would need to be included in the final Project BAP.

5.5.1 Biodiversity monitoring and evaluation

The development of a Biodiversity Monitoring and Evaluation Program (BMEP) is also recommended to demonstrate compliance with paragraphs 7 and 17 of PS6. While the BMEP may be referenced in an updated BAP at a later timeframe, some general guidance for biodiversity monitoring and evaluation in the Project is addressed below.

This BAP assumes a standardized PCFM continues to be implemented in the wind farms comprising the Project and is further expanded to the associated OHTLs, which should also be systematically searched for carcasses according to GIIP (including bias correction and estimates using GenEst) throughout all their extension. The PCFM results will allow for monitoring of the effectiveness of mitigation and adaptive management if carcasses are detected.

For the agreed set of offset actions, the Project, in consultation with lenders and implementing partners, would need to:

- Agree on the level of quantification for any predicted gain, and define an agreed set of biological monitoring indicators to demonstrate gains to the level required; and
- Agree on process indicators to show that the action is proceeding in a manner to deliver the assumed gain (i.e. process indicators).

For many actions, the cost of quantifying gains may be disproportionately high compared with the cost of implementing the action. A pragmatic solution would be for a collective agreement between the Project, lenders and implementing parties on likely gains from any effort or intervention so that the majority of funding can be allocated to implementation.

6 BAP implementation

Actions outlined in this BAP:

- Implement the recommended improvement actions for mitigation regarding both wind farms and OHTLs (Table 2);

- Agree on a suite of offset actions that the Project will support, the level of such support, and update the BAP once these have been confirmed.
- Ongoing monitoring of the effectiveness of selected offset actions on a regular basis; and,
- Evaluation of the Project's status for each species compared to their NNL/NG commitment on an annual basis. If this commitment is not being met for any species, additional support to conservation actions would be required.

The BAP must be updated annually to incorporate:

- Estimated fatalities for each species at wind farms and OHTLs, as derived from the PCFM;
- Gains from offset actions;
- The current, and predicted outcome for each species covered by the BAP (i.e., is the Project likely to meet its Net Gain / No Net Loss requirement or not); and,
- Any other relevant information.

6.1 Roles and responsibilities

The principal roles and responsibilities for the implementation of this plan are outlined below (Table 5). As the Project moves towards operation, a suite of Environmental and Social Management Plans (ESMP) will also be needed that operationalise the commitments made in this BAP.

Table 5. Roles and responsibilities for implementation of this Biodiversity Action Plan.

Role	Responsibilities
Operations Manager	Ensure that all parties comply with the requirements set out in this BAP. Approve sufficient resources for the implementation of this BAP.
Manager of Environment, Health and Safety / sub-contracted biodiversity specialist company	Leads reporting requirements, as well as subsequent revisions of this BAP. Communicate the requirements of this plan to all relevant personnel and contractors. Coordinate the completion of the programs outlined in this BAP.
All staff and contractors	Undertake all activities in accordance with the requirements of this plan.

7 References

Actis (2023) Responsible Investment & Sustainability Policy Values drive Value 2023.

Al Amar Consulting Group (No date) Gulf of El Zayt 220 MWe Wind Power Plant Project. Environmental and Social Impact Assessment. Executive Summary.

Allinson, T. (2017) Introducing a new avian sensitivity mapping tool to support the siting of wind farms and power lines in the Middle East and Northeast Africa in: *Wind Energy and Wildlife Interactions*. Springer, Cham.

BBOP (2012) Principles for Biodiversity Offsets. Business and Biodiversity Offsets Programme, Washington D.C., USA.

CSBI & TBC (2015) A cross-sector guide to implementing the Mitigation Hierarchy. Cross-Sector Biodiversity Initiative, Cambridge, UK. http://www.csbi.org.uk/our-work/mitigation-hierarchy-guide/

EcoConsult (2022) Amunet Wind Power Company 500 MW at Gulf of Suez Critical Habitat Assessment (CHA) (Report for RCREEE, the Regional Centre for Renewable Energy and Energy Efficiency). ECO Consult, Amman, Jordan.

Ehab Ameen (No date) NREA Wind Farm Projects & Birds conservation in Egypt.

Environics (2019) Shutdown on Demand and bird monitoring at KFW 240 MW Wind Farm in Gebel El Zeit Autumn 2019 Final Report.

GreenPlus (2017) Soaring birds carcass search project in KFW wind farm at Gebel El Zeit, autumn 2017. GreenPlus Environmental Solutions, Maadi, Egypt.

GreenPlus (2021) Shutdown on demand and bird monitoring. NREA wind farm complex. Final collective report autumn 2021 (Report for the New and Renewable Energy Agency). GreenPlus Environmental Solutions, Maadi, Egypt.

GreenPlus (2022) Shutdown on demand and bird monitoring. NREA wind farm complex. Final collective report spring 2022 (Report for the New and Renewable Energy Agency). GreenPlus Environmental Solutions, Maadi, Egypt.

Hilgerloh, G., Michalik, A. & Raddatz, B. (2011) Autumn migration of soaring birds through the Gebel El Zeit Important Bird Area (IBA), Egypt, threatened by wind farm projects. *Bird Conservation International* 21: 365–375.

ICMM & IUCN (2013) Independent report on biodiversity offsets. Prepared by The Biodiversity Consultancy, available at: www.icmm.com/biodiversity-offsets.

IFC (2012) Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources. International Finance Corporation (IFC), Washington DC, USA.

IFC (2013) Cumulative Impact Assessment and Management: Guidance for the Private Sector in Emerging Markets. International Finance Corporation, Washington D.C., USA. https://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/sustainability-at-ifc/publications/publications_handbook_cumulativeimpactassessment

IFC (2017) Tafila Region Wind Power Projects Cumulative Effects Assessment. International Finance Corporation, Washington D.C.

IFC (2019) Guidance Note 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources. International Finance Corporation (IFC), Washington DC, USA.

Lahmeyer & Ecoda (2013) Environmental and Social Impact Assessment for an Area of 300 km^2 at the Golf of Suez.

Lahmeyer International & Ecoda (2011) Environmental and Social Impact Assessment Study. 1,000 MW Wind Farms at the Gulf of Suez (No. Report to the Egypt Ministry of Electricity and Energy, New and Renewable Energy Authority). Lahmeyer International GmbH and Ecoda, Bad Vilbel and Dortmund, Germany.

Ledec, G.C. & Johnson, S.D.R. (2016) Biodiversity offsets: a user guide (Working Paper No. 110820). World Bank Group, Washington, D.C.

Migratory Soaring Bird Project (2020) Post-construction fatality monitoring for KFW windfarm project (240 MW) at Gabel Al-Zayt - autumn 2020 (Report for the Egyptian Environmental Affairs Agency (EEAA) & BirdLife International/UNDP/GEF Migratory Soaring Birds Project).

NREA & SafeSoar (2023) Active Turbine Management Program at NREA Wind Farms.

Riad, S.A. (2021a) Post-construction fatality monitoring for KFW windfarm project (240 MW) at Gebel Al-Zait - spring 2021 (Report for the Egyptian Environmental Affairs Agency (EEAA) & BirdLife International/UNDP/GEF Migratory Soaring Birds Project). Al-Zhar University, Egypt.

Riad, S.A. (2021b) Post-construction fatality monitoring during operation of observer-led shutdown on demand system with radar for KFW (240 MW), JICA (220MW) & FIEM (120 MW) windfarms projects at Gabel Al-Zayt (Report for the Egyptian Environmental Affairs Agency (EEAA) & BirdLife International/UNDP/GEF Migratory Soaring Birds Project). Al-Zhar University, Egypt.

Riad, S.A. (2022) Post-construction fatality monitoring for FIEM windfarm project (120 MW) at Gabel Al-Zeit - autumn 2022 (Report for the Egyptian Environmental Affairs Agency (EEAA) & BirdLife International/UNDP/GEF Migratory Soaring Birds Project). Al-Zhar University, Egypt.

RINA Consulting & TBC (2019) Technical Support for Wind IPP Transaction Development Ethiopia. Task 11 – Final Site Comparison Report (Report to the World Bank and Ethiopian Electric Power). RINA Consulting S. p. A and The Biodiversity Consultancy Ltd, Genova, Italy and Cambridge, UK.

STRIX (2018) Wind turbine shutdown on demand operations and bird migration monitoring in the Gabal el Zayt Wind Farm (200 MW), Egypt. Unpublished Report, Carcavelos.

TBC (2019) Lekela North Ras Gharib 250 MW: Analysis of cumulative effects to biodiversity. The Biodiversity Consultancy Ltd, Cambridge.

TBC (2022) AMEA Power Amunet Wind Farm. Biodiversity Action Plan and Offset Feasibility Study. The Biodiversity Consultancy Ltd, Cambridge, UK.

World Bank Group (2015) Environmental, Health, and Safety Guidelines for Wind Energy. World Bank Group, Washington D.C., USA. http://www.ifc.org/ehsguidelines

Appendix 1 Identification of Priority VECs

The identification of those bird species that should be considered as VECs for the Thar Desert CIA followed a three-steps approach (e.g. following (IFC 2017)(TBC 2019).

- Step 1 - Develop the bird species population list and identify the Unit of Analysis;
- Step 2 - Identify bird species sensitivity; and,
- Step 3 – Conduct the ecological risk assessment and identify bird VECs.

Step 1 - Develop the bird species population list and identify the Unit of Analysis

This initial step comprised three phases:

- Step 1a - Identifying the Unit of Analysis (UoA) – the UoA (i.e., the relevant population scale on which the analysis of cumulative effects is based; (IFC 2017)TBC 2019) was considered the Rift Valley / Red Sea Flyway population for migratory soaring birds. For the remaining bird species, due to the general lack of accurate information on the biogeographical distribution of populations at a smaller scale, the UoA was considered the global population of each species (data from IBAT – Integrated Biodiversity Assessment Tool[6]).
- Step 1b - Compiling the full list of bird species present within the Project boudaries - this was extracted from IBAT and previous monitoring reports from field work conducted at the Project area, particularly for migratory soaring birds. The resulting complete list of bird species in the Project area comprised 194 species; and,

Step 2 - Identify bird species sensitivity

Species sensitivity was scored as a result of the combination of the Vulnerability and Relative Importance ratings for each species (e.g. IFC 2017, TBC 2019). Therefore, this step comprised also three sequential phases:

[6] 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. Note that an IBAT subscription is mandatory to be allowed to use any of the above-mentioned dataset for commercial purposes https://www.ibat-alliance.org/.

- Step 2a – Rating species' Vulnerability. This index was assessed based on published information on each species global conservation status and vulnerability to impacts from energy infrastructures (Table 6). The used information comprised:

  o IUCN threat categories (IUCN 2022);

  o The list of species on Category 2 of Annex 3 of the 'Memorandum of Understanding on the Conservation of Migratory Birds of Prey in Africa and Eurasia' under the Convention of Migratory Species (CMS 1979) reflecting species considered to have an unfavourable conservation status at a regional level within the Range States and territories (including Egypt).

  o Species Vulnerability Index (SVI), for species, mainly soaring birds, where this has been assessed (Allinson 2017, IFC 2017, RINA Consulting & TBC 2019, TBC 2019).

Table 6. Vulnerability categories and criteria.

Vulnerability	Migratory Soaring Birds (and other species where an SVI has been designated)	Other 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; 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
Medium	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
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

- Step 2b – Assessing Relative Importance. The Relative Importance of the Project area for the different species was assessed based on the percentage of the species flyway population (for migratory soaring birds; (TBC 2019) or the species global range overlapping with the Project boundaries (Table 7).

Table 7. Relative Importance assignment to bird species.

% of overlap with global range	Relative Importance
0.5 to 5%	Negligible
5 to 10%	Low
10 to 20%	Moderate
≥ 20%	High

- Step 2c – Assigning species' Sensitivity. A species' Sensitivity score was assigned, based on a matrix that accounts for the combined Vulnerability and Relative Importance ratings for each species (Table 8) . This approach was based on previous work by TBC 2019 (as a conservative adaptation from IFC 2017).

Table 8. Sensitivity assignment to bird species.

Sensitivity		Relative Importance			
		Negligible	Low	Medium	High
Vulnerability	Negligible	Negligible	Negligible	Low	Low
	Low	Negligible	Low	Low	Moderate
	Medium	Low	Low	Moderate	High
	High	Low	Moderate	High	High

Step 3 - Conduct the ecological risk assessment and identify bird VECs

Species with a negligible Sensitivity score from Step 2 did not progress to Step 3, which therefore focused on 42 species and consisted of two phases:

- Step 3a – Qualitatively estimating a Likelihood of Effect

The Likelihood of Effect, i.e., species site-specific risk, was estimated based on qualitative information by local expert ornithologists, according to the following:

o Assignment of a qualitative category for Abundance (Negligible, Low, Moderate, High).

o Assignment of a qualitative category for Risk Behaviour (Negligible, Low, Moderate, High). This was based on e.g. flight height in relation to the height of turbine blades, if the species gather in flocks, or if the species has been observed to land in the wider area.

o Assignment of a final Likelihood of Effect score, based on the variables above (Table 9).

Table 9. Likelihood of Effect assignment to bird species.

Likelihood of Effect		**Relative Importance**			
		Negligible	Low	Medium	High
Risk Behaviour	Negligible	Negligible	Negligible	Low	Low
	Low	Negligible	Low	Low	Moderate
	Medium	Low	Low	Moderate	High
	High	Low	Moderate	High	High

- Step 3b – Assigning an Overall Risk rating

The Overall Risk rating for each species resulted from the combination of the Likelihood of Effect rating with the Sensitivity rating (Step 2) (Table 10).

Table 10. Overall Risk assignment to bird species.

Overall Risk		Likelihood of Effect			
		Negligible	Low	Medium	High
Sensitivity	Low	Negligible	Low	Low	Moderate
	Medium	Low	Low	Moderate	High
	High	Low	Moderate	High	High

The bird species identified as having an Overall Risk of High or Moderate (Table 10) were considered Priority VECs to Project BAP (15 species; Table 1).