Tafila Region Wind Power Projects
Cumulative Effects Assessment

Executive Summary

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WORLD BANK GROUP

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Executive Summary [1]

In the Middle East, wind power is a rapidly growing renewable energy source because of its minimal carbon emissions and increasing cost competitiveness. In an initiative to reduce Jordan's high energy import costs, estimated at 13.5 percent of GDP, the government has set a target of obtaining 1,800 megawatts—10 percent of the country's energy supply—from renewable sources by 2020.

Although the renewable energy sector, including wind energy, is considered "green," adverse environmental and social (E&S) impacts of renewables also need to be considered and managed. Jordan sits on the Rift Valley/Red Sea flyway, the second largest flyway for migratory birds in the world. It also has a suite of protected areas of national and international significance. Jordan's largest nature reserve—the Dana Biosphere Reserve (BR) and the surrounding Dana Important Bird and Biodiversity Area (IBA)—is one of the few large areas in Jordan designated as important for its flora and fauna.

The IFC (International Finance Corporation) commissioned the Tafila Region Wind Power Project (TRWPP) Cumulative Effects Assessment (CEA) to help promote more sustainable wind energy investments in Jordan. Focusing on biodiversity, this innovative initiative is the first of its kind in the Eastern Europe, Middle East, and North Africa region. The overall management and technical direction of the CEA was undertaken by IFC, supported by a team of multidisciplinary international and Jordanian experts and advisors who were contracted to develop the CEA. The work was made possible through a partnership with developers, conservation bodies, finance institutions and government, along with the knowledge of in-country experts facilitated through an Advisory Committee and an Expert Review Panel (ERP).

Five wind farm developers agreed to share and pool their pre-construction environmental survey data, representing a remarkable resource. This collaborative approach, a key component of the CEA process, allows a consistent method for identifying and managing E&S risks when developers are working in close proximity. For energy companies operating in middle-income and developing countries, the CEA approach is especially pertinent in that it is risk-based and relies on survey data but can also be applied where regional data on biodiversity are limited. This is particularly relevant when assessing the effects of external stressors on biodiversity, as data on these effects are almost always either limited or nonexistent in the countries where IFC and other multilateral development banks operate.

The CEA study area, located approximately 200 km south of Amman, principally within the Tafila Governorate, covers the Dana BR/IBA and the Wind Power Project (WPP) sites. The temporal scope of the assessment was defined as three years from the start of operations at each WPP, following which an evaluation would be conducted to determine an appropriate ongoing level of biodiversity monitoring and adaptive management.

[1] For a copy of the full report please visit www.ifc.org/sustainabilitypublications

OBJECTIVES

The overall objective of the CEA was to identify the potential cumulative effects of the WPPs on biodiversity in the study area and propose mitigation, monitoring, and other management measures to address the highest risks. Risks were identified with respect to Valued Social and Environmental Components (VECs). Cumulative effects also considered non-TRWPP-sources of mortality (external stressor effects) on VECs, although data on these aspects were severely limited. The CEA recommends both site-specific and joint mitigation and monitoring measures for developers, authorities, and other entities to consider as well as the management and institutional arrangements necessary to implement those measures.

CEA PROCESS

PHASE 1. SCOPING:

The scoping phase included an initial review of existing data, preliminary engagement with stakeholders, determining spatial and temporal boundaries of the CEA, and conducting a screening process to select VECs. Birds, bats and "habitats and other species" were identified as the three VEC categories potentially at risk, with the risk to birds from fatal collisions with wind turbines identified as the likely highest risk. Data gaps and inconsistencies were identified as a major challenge in conducting the CEA. Defining standardized bird survey methods and conducting surveys over a season at WPP sites in the study area was identified as a way to ameliorate these inconsistencies. Collision fatality thresholds for birds were identified as essential for informing the assessment of risks and identifying adaptive management solutions. The use of baseline flight activity monitoring data was considered a key requirement for specifying these thresholds. Post-construction monitoring of bird and bat mortality was determined to be essential for informing the adaptive management approach.

PHASE 2. SUPPLEMENTARY DATA AND CAPACITY BUILDING:

Field survey data on all WPPs were pre-existing, and Phase 2 focused on supplementary data collection and capacity building efforts in response to the Scoping Phase. Analyses of data were also conducted during this phase. Activities included a three-week ornithological training program and workshop to train Jordanian bird surveyors in standardized methods for conducting bird flight activity surveys at wind energy developments; standardized surveys at WPP sites during the spring of 2015 to augment collision risk model (CRM) suitable data, comparable across all WPP sites; a CRM analysis to obtain species-specific annual fatality rate estimates for at-risk bird populations; compiling of a common database of bird flight activity records from the various WPPs; a trends analysis using the common database to complement the CRM and allow better understanding of the flight behavior of Migratory Soaring Birds (MSBs) in the study area; and a reconnaissance site visit and rapid effects assessment for bats and for habitats and other species.

PHASE 3. CEA FRAMEWORK

A six-step CEA framework using a risk-based approach was developed for birds. The objective was to identify priority VECs at highest risk of cumulative effects from the WPP in the study area so that mitigation, monitoring, and management measures could be put in place to safeguard these populations. The identification of priority

VECs applied commonly accepted concepts within risk assessment practice and aligned with IFC's Performance Standards on Environmental and Social Sustainability (the Performance Standards). The process identified those species populations potentially at risk (step 1), evaluated their sensitivity (relative importance and vulnerability) (step 2), and assessed the likelihood of cumulative effect (LoE) of WPPs on each species population (step 3). Those species with the highest risk ratings were determined to be priority VECs.

Fatality thresholds were then determined for each priority bird VEC using species-specific demographic information, CRM results, and ERP external stressor fatality estimates (step 4). A site-specific and joint Mitigation and Monitoring Plan (MMP) was then created (step 5), and institutional and information management arrangements were proposed (step 6).

For bats, and for "habitats and other species," an initial 3-step process equivalent to that for birds was used to identify priority VECs. Fatality threshold targets were not determined for priority bat VECs due to a lack of information on the regional size and status of these populations. Similarly, limited data on habitats and other species meant that threshold setting would not have been possible. Mitigation and management measures were also proposed.

RESULTS

BIRDS

For birds, the initial list of 171 populations identified as potentially at risk was reduced to 13 priority bird VECs assessed to be at highest risk through a process that included data analysis, literature review, expert review, and reasoned evaluation of population sensitivity and likelihood of collision risk. Eleven were raptors comprising four MSB populations (Steppe Eagle – *Aquila nipalensis*, Egyptian Vulture – *Neophron percnopterus*, Eastern Imperial Eagle – *Aquila heliaca*, and Booted Eagle – *Hieraaetus pennatus*) that use the Rift Valley/Red Sea flyway and are present in the study area during their spring and autumn migration periods. Seven species were resident or summer breeding raptor populations (Short-toed Snake-eagle - *Circaetus gallicus*, Griffon Vulture – *Gyps fulvus*, Golden Eagle – *Aquila chrysaetos*, Verreaux's Eagle – *Aquila verreauxii*, Bonelli's Eagle – *Aquila fasciata*, Long-legged Buzzard – *Buteo rufinus*, and Lesser Kestrel – *Falco naumanni*) that may use the study area during, and outside, their respective breeding periods. In addition, two passerine species, Syrian Serin – *Serinus syriacus*, and Eurasian Goldfinch – *Carduelis carduelis*, were identified as priority bird VECs.

Populations of these 13 priority bird VECs were assessed to determine an annual threshold of fatalities that each could sustain without affecting their long-term viability. For all 13, the target was determined to be *zero fatalities*. In addition, an *extreme events threshold target* was recommended to alleviate the risk of multiple-fatality events to a small number of non-priority MSB populations that may migrate in large flocks in the vicinity of the WPP sites.

As well as identifying and putting in place safeguards for bird populations at greatest risk, the CEA has provided unique and valuable insights into general and species-specific bird use of WPP sites and the wider study area. In particular, it has confirmed that, despite being reasonably close to migration bottlenecks around the Red Sea coast, the WPP sites are located within a part of the flyway where MSBs migrate across a "broad front," and so these sites do not typically experience high concentrations of these species during the spring or the autumn migration periods.

Mitigation and monitoring measures for birds as well as institutional arrangements were included in the CEA Mitigation and Monitoring Plan (MMP) as described below.

BATS

For bats, an initial list of 18 species potentially present within the study area was reduced to two priority bat VECs (Desert Pipistrelle - *Hypsugo ariel* and Rüppell's Pipistrelle - *Pipistrellus rueppellii*) through a process that included spatial data review, literature review, and a reasoned evaluation of population sensitivity and likelihood of collision risk.

For bats, recommendations focused on monitoring and other considerations in project-specific Environmental and Social Impact Assessments (ESIAs) and Environmental and Social Mitigation and Monitoring Plans (ESMMPs).

HABITATS AND OTHER SPECIES

Four habitat types and four other species were identified as potentially at risk within the study area. Using spatial data reviews of habitat/species distributions and existing assessments of habitat conservation priority and species conservation status, all four species and three of the four habitats were scoped out of the assessment process during step 2 of the CEA process. The likelihood of effect of WPPs on Thorny Salt Brush (*Noaea mucronata*), the one habitat remaining in the process, was assessed as minor, based on a risk of habitat loss and degradation. As a consequence, no habitats were identified as priority VECs.

For habitats and other species, recommendations are focused on considerations in project-specific ESIAs and ESMMPs.

CEA MITIGATION AND MONITORING PLAN

The CEA MMP principally aims to avoid collisions of priority VECs, quantify post-construction fatality rates at WPP sites and ensure an adaptive management approach is undertaken. Three types of measures are proposed: (i) project-specific on-site measures focusing on monitoring of post-construction flight activity coupled with turbine-specific shutdown protocols and searches for carcasses of bird fatalities; (ii) inter-site monitoring activities and adaptive management; and (iii) joint management and action plans focused on priority bird VECs. Adaptive management will respond to a variety of scenarios such as exceeded thresholds, near-miss incidents, elevated-risk situations, pastoral or livestock movements, and deficiencies found in monitoring protocols. Exceeded thresholds will trigger immediate review and adaptive management response.

An innovation of the CEA MMP is to describe and propose a mechanism that facilitates inter-site data-sharing, which allows TRWPP-wide reviewing of incident reports and routine mitigation monitoring results. This mechanism will facilitate the efficient assessment of emerging cumulative issues, allow adaptive management response recommendations, and broaden mitigation and monitoring planning to encompass the whole of the study area. A key component of inter-site data sharing and management is that developers establish an Internal Committee to oversee a central data center for sharing data from bird and bat monitoring.

The CEA recommends that data shared and reviewed by the Internal Committee also be shared with the Ministry of Environment, given its regulatory role in environmental approvals and ongoing auditing role for Environmental Impact Assessment (EIA) commitments. The ministry is encouraged to engage with the RSCN, Birdlife International,

and other conservation organizations and interested parties on the long-term implementation of the recommendations of the CEA, including adaptive management responses.

Another important recommendation within the MMP is the development of a corporate social responsibility (CSR) fund, which is the vehicle through which a proposed preemptive biodiversity offset might be undertaken, if needed. A CSR fund has already been established in Jordan for developers of photovoltaic solar energy projects clustered near Ma'an. Such a fund would be a useful way to pool resources among developers for collectively carrying out actions relevant not only to this CEA but potentially also to other environmental and social initiatives.

Future safeguarding of current and emerging high-risk populations is a key priority within the CEA. The iterative, comprehensive program of post-construction monitoring and adaptive management that was developed as part of the CEA is designed to provide the feedback necessary for a dynamic process that enables developers and authorities to respond to environmental and ecological changes that may affect the conservation status of bird VECs.

CONCLUSIONS

The process and methodology for this CEA was developed to promote more sustainable investments in the wind energy sector in Jordan through improved identification and management of the highest environmental risks. This is important work, given the multiple developments proposed near the Dana BR/IBA and the potential for more development elsewhere. Though the CEA focuses on Jordan, its process and methodology are likely to be relevant across middle-income and developing countries, many of which—like Jordan—have limited regional data on biodiversity. Likewise, the CEA Framework could be adapted to apply to other sectors.

The recommendations proposed in this CEA are in line with IFC's Performance Standards and analogous environmental and social standards of the European Bank for Reconstruction and Development (EBRD) and European Investment Bank (EIB). Their implementation would assist in the development of the ESIAs and ESMMPs, not only for the WPPs participating in the CEA, but also for other developments near the Dana BR/IBA or other important biodiversity areas in Jordan.

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