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Birds and Wind Farms within the Rift Valley/Red Sea Flyway

Wind energy can make a valuable contribution to reducing greenhouse gas emissions and developing a green economy. BirdLife welcomes the development of wind energy within the region and supports to the shift to renewables.

However, wind farms are likely to pose a significant risk to birds if they are inappropriately located. Any adverse impacts are likely to be associated with collision, disturbance/displacement, and barrier effects. Developers and consultants can play an important role in reducing the impacts on birds and biodiversity.

Developers should:

- Consult a **Strategic Environmental Assessment** (**SEA**) and bird sensitivity maps as guides to areas where developments are appropriate
- Where no SEA has taken place, consult experts and request guidance on high risk areas
- Carry out a site-specific **Environmental Impact Assessment** (**EIA**) which includes appropriate ornithological surveys, including a one year pre-construction baseline survey, and three years' post-construction surveys
- Ensure stakeholder participation as part of an EIA, and publish an Environmental Management Plan and non-technical summary in the local language
- Consult ornithological and conservation experts regarding proper assessment methodologies
- Commit to adaptive management of wind farm operations
- Utilise ongoing monitoring data to inform mitigation activities, such as shutdown-on-demand, and relocation and removal of high-impact individual turbines
- Ensure that mitigation measures are implemented according to expert opinion
- Encourage the development of local capacity in bird-risk management to facilitate sustainable long-term solutions
- Work with other developers in the region to reduce cumulative impacts
- Commit to making ecological and bird data freely and publicly available from a centralised source
- Engage with governments, utility companies, consultants, and conservation organisations and other civil society groups, to ensure best available solutions are utilised
- Use environmentally-friendly construction techniques.

BirdLife International supports the transition to more renewable sources of energy. However this transition must avoid harm to ecosystems and biodiversity. Wind farms can make a valuable contribution to tackling climate change, by providing energy with substantially lower emissions than fossil fuels, and at a significant viable scale.

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Innovations within the wind energy sector happen quickly, and the sector is at the cutting edge of delivering a low carbon economy. It has been growing globally and is expected to increase substantially over the coming years. The wind energy sector can have a positive impact on a country's economy, by creating jobs and also providing a secure, low carbon energy supply. However, poorly designed and sited wind farms have been shown to have detrimental effects on birds. Special attention needs to be given to the development of wind farms and the associated power lines along migration flyways.

This is especially true in the Rift Valley/Red Sea area, where millions of birds pass through on migration routes between Europe, Central Asia and Africa. The Rift Valley/Red Sea flyway is the second most important flyway in the world for migratory soaring birds. Over 1.5 million migratory soaring birds of 37 species use the flyway, including raptors, storks, pelicans and cranes, of which five are globally threatened. Any negative impacts on migratory birds within this area have the potential for far-reaching consequences, both local and global.

The potential for renewables within the Rift Valley/Red Sea area is very high, with significant developments planned across the flyway. For example, the Red Sea coast could potentially produce 20GW of electricity. But inappropriately situated and designed developments along the flyway could have significant impacts. Wind farm developments in this region will have to take account of the movement of vast numbers of soaring birds, especially during the peaks of the Spring and Autumn migrations.

BirdLife is committed to working with developers and construction companies so that they receive guidance and expert advice, enabling projects to be delivered in ways which minimise the impact on birds and the environment, while delivering lasting sustainable development.

Whilst the majority of wind farms have little negative environmental impact, inappropriately positioned or poorly designed developments can lead to serious environmental impacts, including significant bird mortality and risks to rare or protected species.

This could potentially lead to international scrutiny of projects and adverse coverage for the renewable industry. Publicity surrounding negative impacts from a development can impact on a company's profile and ability to secure future contracts, while positive publicity and the support of civil society and other groups can deliver a range of benefits. It is in the developers' interest to ensure bird safety, and to publicise their efforts to reduce the impacts, in order to generate support for their operations. The proactive engagement of local groups can also reduce opposition to projects.

In many cases, developers have an obligation to meet financial institutions' standards and criteria, such as the International Finance Corporations' Performance Standards, or the Equator Principles. This includes the requirement to carry out due diligence of financed projects. There could, therefore, be significant financial risks associated with negative environmental impacts, particularly if a project is seen to negatively impact important habitats or rare/threatened species. By ensuring any impacts are minimised and mitigated for, developers may secure long-term funding, and demonstrate their commitment to best practices.

This guidance document is designed to inform wind farm developers and construction companies of the potential impacts of wind farms upon soaring birds and other migratory species, recommending specific practices that can reduce these impacts. Implementing these recommendations will minimise these impacts, now and into the future. By reducing the amount of capital locked into inappropriate developments now, the sector and individual developers can save money in the long term.

Potential Impacts

Wind energy developments can potentially have serious negative impact on birds, owing to the risks associated with the scale of the land area they cover, their prominence across a landscape, and the above-ground infrastructure needed, such as power lines. For example, the installation of 68 wind turbines on the Smöla archipelago in Norway is believed to have caused the local breeding population of White-tailed Eagles *Haliaeetus albicilla* within the wind farm to decline. From 2005-2009 there were 28 casualties, 16 being adult birds potentially holding a territory[1]. Impacts are not restricted to birds; other fauna including bats are potentially vulnerable, and these impacts should also be minimised.

Some bird species are more vulnerable to the negative impacts of wind turbines. Species likely to have a high risk to vulnerability are soaring birds, raptors, seabirds, migratory species and birds with aerial flight displays. Many of the high-risk species are also long-lived, with low natural mortality and reproductive rates, meaning that they are particularly vulnerable at a population level, and that the additional stress of mortality from wind turbines may be significant. Many of these vulnerable birds are charismatic species and are well known to the public locally, regionally and internationally.

Significant effects of wind farms on birds are likely to include:

- **Collision**: with turbines and blades leading to death or injury. At Altamont Pass in California, it is estimated that over a 20 year period 25,000-100,000 birds were killed on a wind farm consisting of 7,300 turbines[2];
- **Displacement/Barrier**: can occur from habitats that are used by birds or along preferred migratory routes. A slight change in flight direction, height or speed may result in fitness costs to the bird, or reduced numbers of birds using areas beyond a wind farm. The barrier effect can mean that use of habitats adjacent to the developments may be impacted, meaning the effect of the development is greater than the area itself; therefore a buffer zone may also be required. Studies have shown that this displacement could occur at least 800m from turbines for certain species[3];
- **Habitat impacts**: fragmentation of landscape, or site-specific damage which can reduce the ability of an area to support bird populations.

The potential impacts and effects a development may have on birds are dependent on the specific location, and the species associated with this site. The cumulative impacts of successive developments could be significant; the first wind farm along a flight path may result in a small but acceptable level of bird mortality or loss of condition (weight etc.), which has little impact on the overall bird population. However, if successive wind farms have impacts, the cumulative effect may exceed the capacity of the population to regenerate, in which case the bird population will go into decline.

In a migratory flyway such as exists within the Rift Valley/Red Sea area, the potential impacts, particularly the cumulative impacts produced by successive wind energy developments, can lead to serious disruption of linkages between distant feeding, roosting, moulting and breeding areas. The important message in relation to developments therefore is location, location, location! This is especially critical at the macro-level across a landscape, but is also important at the micro-level, where changing a turbine's position within a development footprint can lead to significant reductions in mortality.

[1] Dahl E. L., Bevanger K., Nygard T, Roskaft E, & Stokker B.G., (2012) Reduced breeding success in white-tailed eagles at Smola windfarm, western Norway, is caused by mortality and displacement Biological Conservation 145 79-85

[2] Thelander C.G., & Smallwood K.S. (2007) The altamont pass wind resource areas effect on birds: a case history pp 25-46 In : de Lucas M Janss G.F.E. & Ferrer (eds) Birds and Wind Farms Quercus, Madrid

[3] Hotker (2006) the impact of repowering of wind farms on Birds and bats Michael-Otto-Instiut imNABU Bergenhusen

Strategic planning and assessment

When appropriate areas have been identified by the national or regional authorities, it is vital that a site-specific **Environmental Impact Assessment** (**EIA**) is carried out, to inform site and development operation. Appropriate sites should have been identified by a national authority completing a **Strategic Environmental Assessment** (**SEA**), which will show areas which are appropriate for development. This SEA should have taken into consideration birds and bird populations' present, especially migratory bottlenecks sites and high risk areas and ecosystems. Developers should seek advice from the designated national authority on the outcomes of an SEA. Where no SEA has been conducted, they should refer to a national development plan or national planning framework for guidance on appropriate areas for development. BirdLife Partners and regional experts can provide advice on areas and sites that are likely to be particularly risky for impacts on birds.

A number of tools are available to developers which can aid in minimising the impact on birds. One such tool is **Sensitivity mapping**. Sensitivity maps record the locations and movements of species that are vulnerable to the impacts of infrastructural development. This allows for the risks associated with the impacts of wind turbine developments to be identified at an early stage, and avoided or substantially reduced through selection of appropriate locations. Other decision support tools, such as IBAT for business, can help inform the EIA processes on site sensitivity and species presence.

BirdLife International is currently developing a sensitivity mapping tool for the Rift Valley/Red Sea Flyway, which provides valuable information on the potential impact on birds of wind energy development along the flyway. The relevance of the sensitivity mapping tool will be enhanced through the input of new and additional data as it arises. Data gathered during any assessment should be a freely available public resource, and can be used to deliver robust sensitivity maps, which can inform future developments.

An in-depth site-specific EIA must be carried out for all developments. It should take into account socio-economic, cultural and human health impacts, and investigate the positive benefits of the project alongside the negative impacts. Stakeholder participation is a necessary component of an EIA processes. Developers must ensure that the consultation process is as open and transparent as possible, and promote the active engagement of a range of stakeholders.

An appropriate EIA must include a range of ornithological surveys in addition to appropriately assessing the biodiversity value of the site. Pre-construction baseline surveys are an essential component of an EIA, and should take place for a minimum of a year and cover all four seasons.

This should include as an absolute minimum:

1. **Migratory bird surveys**, which should take place for minimum of a year, with up to three years in key locations along the flyway. This is to cover the migration seasons. The baseline survey should include **vantage point surveys** undertaken during migration periods to assess the potential risks to migratory soaring birds, particularly at or near bottlenecks. Within key areas of the flyway, the use of **radar** to aid assessment of migration movements is strongly recommended.
2. **Breeding bird surveys** to assess the potential footprint and buffer zone impact of a development on resident species, and baseline conditions in the area.
3. **Vulnerable and protected species-specific surveys**, for species that need individual assessment, e.g. owls, nightjars *caprimulgus* sp, locally breeding raptors, colonial breeding species etc., which may be present in the area.
4. **Wintering ornithological surveys** may also be required, which could include non-breeding surveys of resident species, and of over-wintering migrants.

Three years of surveys may be necessary due to the seasonal and temporal nature of bird migration. By covering all seasons over a number of years, developers can more accurately assess the presence or absence of migratory species at the site level.

The assessment methods for the ornithological appraisal require expert review prior to commencement, to ensure that the appraisal is to a high standard and generates accurate results, and key species are appropriately assessed. This is critical to ensure that the surveys consider all aspects of potential ornithological impact, and that planning is not held back by the need to return to an appraisal and survey situation. An appropriate assessment can reduce the potential for delays.

The ecological data generated by the EIA should be stored in a centralised information system which is publicly available. This enables strategic analysis, and also the generation of greater knowledge of the species present in an area and potential impacts on birds. This information can then be inputted into the sensitivity mapping tool, which will increase its robustness. The more information is available, the greater the reliability of future recommendations regarding location and mitigation actions will be. This is of value to developers, as it generates accurate data informed by broad scientific analysis on the true impacts of wind energy upon birds, and will aid in the future development of projects.

Governments and designated national authorities have been approached to act as repositories of such data. Other innovative approaches have been used, such as the 'Scottish Windfarm Bird Steering Group' (SWBSG) which includes government, industry and conservation representatives, and is developing a meta-data catalogue.

The EIA will aid in identifying the extent of risks to birds and other biodiversity at the site/project level. Stakeholder consultation and participation is an essential component of any development. By engaging with a range of stakeholders, conflicts and objections to a project can be minimised. Developments should not start until the pre-construction surveys are finished. By waiting till the pre-construction surveys are completed, the layout of the turbines can be adequately informed.

If the risk levels posed by a project are deemed acceptable, then the mitigation hierarchy to be adhered to is **avoidance, minimisation (mitigation), rehabilitation/restoration, offset**.

The mitigation hierarchy is defined as[4]:

a. Avoidance: measures taken from the outset, such as careful spatial or temporal placement of elements of infrastructure, in order to completely avoid impacts on certain components of biodiversity.
b. Minimisation: measures taken to reduce the duration, intensity and/or extent of impacts (including direct, indirect and cumulative impacts, as appropriate) that cannot be completely avoided, as far as is practically feasible.
c. Rehabilitation/restoration: measures taken to rehabilitate degraded ecosystems or restore cleared ecosystems following exposure to impacts that cannot be completely avoided and/or minimised.
d. Offset: measures taken to compensate for any residual significant, adverse impacts that cannot be avoided, minimised and/or rehabilitated or restored, in order to achieve no net loss, or a net gain, of biodiversity. Offsets can take the form of positive management interventions, such as restoration of degraded habitat, arrested

[4] Business and Biodiversity Offsets Programme (BBOP) (2012) Standard on Biodiversity Offsets. www.forest-trends.org/documents/files/doc_3078.pdf

degradation or averted risk, or protecting areas where there is imminent or projected loss of biodiversity.

The primary objective must be to avoid any adverse impact, which can be done through appropriate site selection. Offsets as part of the mitigation hierarchy should be the option of last resort, and if required, should be directed towards conservation efforts and habitat restoration, targeting those species and habitats affected by the development.

The steps in carrying out a robust EIA are:

- **Screening stage** to determine whether a full or partial assessment is required. As there is little ornithological and ecological data available for the flyway, it is recommended that a full assessment is carried out. However as more information is generated it may become appropriate for full assessments to be restricted to identified high-impact areas.
- **Scoping** determines the content and extent of what needs to be investigated to generate the ecological information to be submitted by the developer to a designated national authority. The scoping stage is an important feature of an adequate EIA regime, and improves the quality and output of the EIA. It should determine the range of ornithological issues likely to be encountered, and decide upon an expert-reviewed suite of surveys to ensure that all ornithological aspects are appropriately assessed. It should take into account international, national, regional and local considerations and priorities. The scoping stage provides a good opportunity for developers to identify and engage with a wide range of stakeholders. It sets out the terms of reference for the impact assessment stage.
- **Preparation and assessment**, which states the description of the project, describes the likely impacts and the probability of these impacts occurring, the data required to identify and assess the main effects on the environment, the main alternatives studied, and the reasons for the preferred choice of operations. It should also consider the magnitude, extent, duration and reversibility of impacts alongside their probability of occurrence. The ecological significance of any impact should be quantified, and the assessment should also include the cumulative impacts of similar existing and proposed developments in the area. The information and data gathered should be publicly available.
- **Reporting**: the Environmental Impact Assessment should be published, including an Environmental Management Plan. A non-technical summary in the local language should also be published and distributed.
- **Consultation and review**: the public, local communities and interested groups such as conservation organisations, as well as the national environment authorities, must be informed and consulted before a developer proceeds to make a request for consent for the development. The results of this consultation, and the information accumulated, must be taken into consideration and integrated. The ornithological and biological data should be freely available in a centralised information facility, to allow interested groups to formulate their positions.
- **Decision**: the national decision authority that refuses or grants consent for development must make the information available to the public, including the reasons and considerations on which the decision is based.
- **Monitoring** should then take place, to make sure the predicted impacts and the mitigation actions are occurring as set out in the Environmental Management Plan. Monitoring will also ensure unpredicted impacts are addressed. The data generated should be freely available in the same centralised information facility, and be accessible.

Impacts should be predicted as accurately as possible, and the basis of these predictions should be made clear, and freely available. The Environmental Management Plan should specify the actions to be undertaken during project construction and operation to prevent, minimise, mitigate, or offset any adverse environmental impacts. Significant negative impacts to birds and biodiversity must be avoided; however, depending on the technologies used and the habitats and species present at a particular site, wind farms may be appropriate at sites which are located close to areas important for their biodiversity and birds. This will be informed by an appropriate EIA. A precautionary avoidance approach should be used where there is a risk of significant adverse impacts.

It is essential that the Environmental Management Plan is open to stakeholder consultation, and a non-technical summary paper is available to stakeholders including local community groups. Where project funding is conditional on the development of a Biodiversity Action Plan (such as an IFC project), this should also be open for stakeholder consultation. Stakeholder consultation should take place throughout the project, and from the beginning of the EIA process.

Power lines and associated infrastructure

The power line infrastructure which carries the power generated by wind farms to the end user can potentially have a significant impact on birds. This impact could be reduced by using appropriate mitigation measures. These measures include the appropriate routing of the lines, using bird deflectors, and pole design which minimises electrocution risks. Any development must include an impact assessment of the infrastructure needed to connect the development to the national grid. Further details can be found in the BirdLife guidance produced for the region in relation to power lines. Routing and mitigation actions should be informed by an SEA and EIA. Within a wind farm development, power line cables should be routed underground, and follow access roads where possible.

Construction activities

The construction of the renewable infrastructure has the potential to have a significant impact on biodiversity, in particular resident bird species with territories close to the construction site[5]. These impacts can be reduced by utilising environmentally-sensitive construction practices and techniques.

Good construction techniques include (1) assessment of breeding bird populations at the site, and proactive management to address the impact of turbine development; (2) minimising the area of construction to limit habitat degradation; (3) implementing adequate measures to control soil erosion and runoff; (4) ensuring proper disposal of all solid and liquid wastes; (5) ensuring that locally obtained construction materials come from environmentally sustainable sources; (6) restoring disturbed areas where feasible, using appropriate restoration techniques, embedded into the design at the commencement of construction (e.g. appropriate stockpiling of topsoil to maintain the nutrient base for restoration). Good construction techniques should also include measures to prevent the introduction of invasive non-native species, and controls on hunting by construction personnel or contractors. The timing of construction should avoid times of peak sensitivity, such as during the breeding season or periods of peak migration.

Developers should ensure they are operating in a sustainable way, and conforming to the highest possible standards.

5 Pearce Higgins et al (2012) Greater impacts of wind farms on bird populations during construction than subsequent operation: results of a multi-site and multi-species analysis Journal of Applied Ecology 49 (2) 386-394

Mitigation actions

Mitigation actions are site and location specific, and there is no prescriptive solution to particular adverse impacts. As stated above, avoiding impacts by an appropriate choice of location is always the best 'mitigation' measure.

Some mitigation measures are:

- Lattice tower structures should not be used, as they provide perching areas;
- Micro-siting of turbines within a development. Identifying sensitive positions or plots within the wind farm prior to construction, as part of the EIA processes, and siting turbines outside these areas. For example, at Foote Creek Rim, Wyoming, USA, pre-construction surveys showed that about 85% of the raptors flying at likely strike height were within 50 metres of the canyon rim edge, and no turbines were established within this zone[6];
- Configuration of turbines should run parallel to features such as valleys and rivers. If a flight path exists, the configuration and placement of turbines should also run parallel to this;
- Decommissioning by removal or relocation of high-impact individual turbines within a development;
- Shutdown-on-demand: strategic shutdown of turbines at specific locations or at specific times (i.e. peak migration movement) to minimise the impacts. This has to be combined with monitoring surveys, and ideally the use of radar. Shutdown-on-demand in Spain reduced vulture mortality by 50%, with a loss of energy production of 0.07%[7];
- Larger turbines generate electricity at lower cost and higher efficiency. Fewer but larger turbines may have a reduced impact on birds. However, this is site-specific, and should be informed by local site characteristics and bird activity;
- Experiments with contrasting colour on blades to increase visibility and reduce striking probability are ongoing. This may lower mortality risks, but is unproven at this moment;
- If aircraft warning lighting is required to identify turbines at night, the use of blinking strobe lights, with flashes interspersed with darkness at 3 second intervals, is preferred. Continuous lights can lead to an increase in fatalities by attracting birds, with an associated increase in the risk of collisions with infrastructure. The number of lit turbines should be kept to a minimum. Lights should flash synchronously over the site. The Federal Aviation Authority regulations in the USA allow for a proportion rather than all the turbines to be lighted, e.g. one in five to be marked, but lighting should comply with national aviation legislation;
- The use of guy ropes should be minimised, including on meteorological towers. Where guy ropes are used, bird deflectors should be installed;
- Good maintenance practices, such as filling of holes in nacelles so that as nesting and perching is not possible;
- Habitat management and maintenance practises at the site level, to reduce the risk of attracting collision-prone birds, e.g. avoiding establishing ponds or waste sites within the development;
- Increasing the cut in speed of turbine blades to reduce collision risks can reduce the impact on bats.

Post-construction monitoring

Once a wind farm has been constructed, the ongoing effects on birds and biodiversity need to be monitored, so that potential long-term impacts can be identified and addressed. **Continuous monitoring** should take place for at least three years post-construction, to guarantee that adequate data is gathered and that all seasons are covered.

This post-construction monitoring should build on the pre-construction survey, and include as a minimum:

1. Vantage point surveys undertaken throughout the year.
   a. To assess the collision risk of vulnerable species from the operation of developments. More intensive surveys are required during migration periods, to assess the impact upon migratory soaring birds when they pass through the region in vast numbers.
   b. To estimate disturbance and displacement of bird species. This can be done through comparison with the pre-construction baseline survey.

   The use of radar will increase the accuracy of the results when assessing large numbers of birds.
2. Ongoing vulnerable and protected species-specific surveys to investigate disturbance or mortality.
3. Assessment of collision mortality. This can help identify particular turbines or periods of high collision risk, help quantify avoidance rates for specific species, and improve understanding of factors associated with collision.
4. Carcass searches, whereby the area adjacent to the turbines is searched for carcasses, which are counted and identified and the data inputted into a standardised recording sheet. Recently, dogs have been used to aid in the searches, and should be considered in areas where local conditions are likely to reduce the detection rate. It is essential that the survey design is accurate and generates comparable results. A number of factors must be included in the estimate of mortality, including observer bias and removal of carcasses by scavengers.
5. Winter ornithological surveys may also be required.

Continuous monitoring generates information on the operational effects of wind farms, and will inform the need to adapt mitigation actions and operational procedures within the development. This monitoring should be carried out in a standardised way, by recognised professionals, following best practice guidelines.

The Before-After Control Impact (BACI)[8] approach should ideally be used. This compares the data collected in pre-construction surveys at the project site and at a control area with data obtained from post-construction monitoring, in order to assess environmental impacts caused by construction and operation, and inform ongoing operational activities.

Continuous monitoring allows for adaptive management to take place, and can provide valuable information which can inform mitigation actions such as shutdown-on-demand, and significantly reduce the impact on birds. Poor quality surveys can result in a particular development being inappropriately assessed, potentially leading to an under-estimation of bird activity and vulnerability. It can also lead to extra costs when inefficient mitigation actions are implemented, such as inappropriate shutdown-on-demand, or removal of turbines which may not have been necessary. Developers should ensure that the methodology used is adequate, and that the personnel carrying out the monitoring work are trained appropriately.

[6] Johnson G, Wallace P. Erickson, M. Strickland D, Shepherd M F, Shepherd D and Sharon A. (2002) Collision Mortality of Local and Migrant Birds at a Large-Scale Wind-Power Development on Buffalo Ridge, Minnesota Sarappo Wildlife Society Bulletin Vol. 30, No. 3 (Autumn, 2002), pp. 879-887

[7] de Lucas, M., Ferrer, M., Bechard, M.J. & Muñoz, A.R. (2012) Griffon vulture mortality at windfarms in southern Spain: Distribution of fatalities and active mitigation measures. Biological Conservation 147: 184-189

[8] McDonald, T.L., Erickson, W.P. & McDonald, L.L. (2000) Analysis of Count Data From Before-After Control-Impact Studies. Journal of Agricultural, Biological and Environmental Statistics. 5: 262-279

The data generated should be freely available to the public, accessible and stored in a centralised database, as this can greatly aid in the scientific study of the impact of wind farms on birds, and inform future actions. Where sufficient information exists, and no impact is seen in the first year, and following consultation with experts, further monitoring may not be necessary.

Developer asks

Developers have a responsibility to deliver projects which minimise the impact on birds and biodiversity, and can play an essential role ensuring the long term sustainability of the flyway by integrating bird and biodiversity concerns into their operations. Impacts in one area of the flyway could potentially lead to considerable impacts in other areas along a migratory route.

Companies that measure, manage and communicate their environmental performance are well placed to respond to changing market conditions. They understand how to improve their processes, reduce their costs and comply with stakeholder expectations, and exploit new market opportunities.

Developers have an obligation to work within the laws and regulations of the country they operate in. Where these laws and regulations are lacking, we encourage companies to do more than the minimum, and work with BirdLife Partners to deliver developments which have minimum impact on birds.

Incorporating appropriate ornithological surveys into site-specific EIA allows the risks posed by a development to be assessed and addressed at an early stage. By ensuring the availability of this data, and the ongoing monitoring data, developers will increase the likelihood of impacts being calculated correctly, and contribute to the knowledge pool on which future decisions in relation to siting, mitigation and impacts will be based.

Adaptive management is key to minimising impacts on birds. Bird concentrations and use of an area are potentially related to certain times and seasons. By using continuous monitoring and adaptive management, operational procedures can be put in place to reduce or eliminate any adverse impacts. Such adaptive management techniques include actions such as shutdown-on-demand, which is informed by monitoring bird use of an area, and has been shown to reduce mortality with little impact on energy generated. We ask developers and operators to commit to adaptive management, and to mitigate any impacts.

An important consideration for any developer is to incorporate the cost of potential mitigation actions into their financial planning. This is particularly true in relation to shutdown-on-demand operations. Many development banks already factor this into their economic valuations where risks may be high. Over the coming months, BirdLife will be investigating shutdown-on-demand criteria for the region. In cases of shutdown on-demand operations in other countries, indicators are that actual energy losses have been low[9].

Governments across the region have signed international agreements in relation to mainstreaming biodiversity concerns into their development approaches, including national development plans, poverty reduction strategies and sustainable development plans. The private sector, and developers in particular, can help facilitate this by integrating environmental concerns into their operations.

BirdLife is committed to working with developers and wind farm operators to deliver developments which have the potential to generate clean energy while safeguarding birds and biodiversity.

More details on the Migratory Soaring Bird Project can be found on the link below. Specific guidance in relation to wind energy, power lines and solar energy is to be published, and a sensitivity mapping tool is being developed and will be available over the coming months.

[9] de Lucas, M., Ferrer, M., Bechard, M.J. & Muñoz, A.R. (2012) Griffon vulture mortality at windfarms in southern Spain: Distribution of fatalities and active mitigation measures. Biological Conservation 147: 184-189

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