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Birds and Power Lines within the Rift Valley/Red Sea Flyway

Power lines can have a significant impact on birds and bird populations, through electrocution and collision, disturbance and displacement. BirdLife Partners and Civil Society Organisations should seek to minimise this risk by engaging with national governments to implement legislation, and working with utility companies and developers to ensure bird-friendly designs and routing.

Partners can ensure bird and biodiversity concerns are addressed by:

- Reviewing existing national legislation and planning procedures to identify opportunities for engagement, and working with governments to ensure bird and biodiversity issues are considered in grid developments and power line operations
- Providing guidance and input into any strategic development plans
- Advocating for strong legislation and regulations in regard to **Strategic Environmental Assessment** (**SEA**) and **Environmental Impact Assessments** (**EIA**)
- Ensuring that these assessments include ornithological considerations and are carried out to a high standard, and reviewing the outcomes through stakeholder consultation
- Providing input into the appropriate routing of power lines by identifying high risk hotspots, to minimise the risk to birds and biodiversity
- Ensuring an EIA takes place for each project and includes appropriate ornithological assessment
- Working with governments and utility companies to ensure bird-sensitive pole and power line design, and that regulations or standards are developed to ensure their implementation
- Engaging with donor banks to ensure that funded projects have adequate safeguards for birds and biodiversity, and that energy projects consider the impacts of associated power line infrastructure
- Calling for assessment of the existing power line infrastructure, to identify high risk sections or poles
- Using expert knowledge to identify high risk hotspots and advocate for retrofitting activities
- Developing relationships with a wide range of groups, including the private sector, to ensure bird risks are minimised. Risks can be reduced by co-operation between conservationists, ornithologists, electrical power companies and politicians
- Sharing best practice examples and guidance materials with other civil society organisations within countries and across the region
- Calling for ecological information to be freely available and stored in a central database.

Once energy is generated it must be transmitted to the end user. This infrastructure will take up space within the landscape and can pose a significant risk to birds and biodiversity. The Middle East/North Africa region including the Rift Valley/Red Sea flyway has ambitious plans for the development of energy, both renewable and conventional. These new and additional energy developments will also require the construction of power lines, the cumulative length of which could reach

thousands of kilometres. The total length of transmission and distribution lines worldwide is expected to increase by five million kilometres from 2010-2015.

Such energy infrastructure may pose a high risk to birds and bird populations, potentially leading to the deaths of thousands of birds across the region annually. The impact of these power lines on bird populations will vary between species and locations, but for some, mortality rates are high enough to have a considerable impact at the population level, and may be a significant factor driving population decline. Special attention needs to be given to the development of power lines along migration flyways. 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 a range of raptors, storks, pelicans, ibises and cranes, of which five are globally threatened. Existing power line infrastructure throughout the region may also be having an on-going impact, due to its inappropriate placement and high risk pole and line design.

Potential Impacts

The power lines needed to deliver power from where it is generated to the end user can occupy a substantial amount of horizontal and vertical space across a landscape and are likely to be one of the main sources of impacts on bird populations along the flyway. A 2010 Sudanese study found 17 electrocuted corpses of the globally threatened Egyptian Vulture (Neophron percnopterus) over a two month period[1]. Like other large soaring bird species, these long-lived birds have low reproductive rates and are likely to be significantly impacted by such mortality rates.

Significant effects of **power lines** on birds are likely to include:

- **Collision**: With power lines or associated masts leading to death or injury;
- **Electrocution**: Owing to contact with live energised components;
- **Displacement/Barriers**: Along migration routes or to suitable habitats/feeding grounds;
- **Habitat impacts**: Including fragmentation of habitats at landscape level.

The exact numbers of birds killed through electrocution or collisions are difficult to estimate, although up to 10,000 electrocutions and many hundreds of thousands of collisions are estimated to occur per country in the African-Eurasian region each year[2].

The potential impacts are likely to vary depending on the site location and also the species migrating through an area. For instance, raptors are more likely to suffer electrocution from power lines than collision incidents. The birds most commonly associated with electrocution are Ciconiformes, Falconiformes, Strigiformes and Passeriformes.

Birds which are vulnerable to collision are relatively fast-flying, heavy-bodied birds with limited manoeuvrability during flight. Particularly high impacts are likely to occur where placement of power lines coincide with migratory bottlenecks. Many collisions happen at night or dawn and dusk, and at times of low visibility. The birds most commonly associated with collision are Anseriformes, Ciconiformes, Gruiformes and Charadriiformes.

The impacts on birds differ depending on the type of power line used. There are three different types of power lines which carry differing phases of electrical current:

- High (>60kV usually 110 kV and above, Extra High > 250kV)
- Medium (1-59 kV) and
- Low (<1000 V).

High voltage lines conduct the electricity from the generation plant to a substation, which reduces the voltage. The electricity is then transported along medium voltage distribution lines, which can supply some end users, before the power is delivered by low voltage lines in residential and urban areas.

This fact sheet focusses on high and medium power lines, which are believed to have the largest direct impact on birds and bird populations, mainly from collision and electrocution risk.

High voltage power or transmission lines form the backbone of many national grids. The design of power lines along a vertical plane (or upward plane), and with lines having low visibility, is associated with collision risk, especially in poor weather conditions. Greater collision risk is associated with the thin earth (shield) wire, which can be found above the thicker high voltage wires. As they are typically connected to pylons with long suspended insulators, electrocution risk is low.

Medium and low voltage power lines, or distribution lines, are more likely to result in electrocution due to birds making a connection between two live components. This electrocution risk is most commonly associated with poles and perching areas.

Birds can a negative impact on power lines and the delivery of power to the end user by causing power outages. These power outages can often result in significant economic costs, both in repair of the line and loss of economic output[3].

All power lines that are inappropriately placed across a landscape can lead to displacement of bird populations, and can have habitat impacts, including isolation of populations and also genetic isolation. The effect on the flyway could be significant. The flyway is internationally important and a global asset and each country along the flyway, and every organisation carrying out activities within the flyway, has a responsibility to maintain its integrity, and should recognise and be reminded that an impact in one area could have a significant effect elsewhere along the flyway.

Partners and other Civil Society Organisations with knowledge of areas significant for birds are well placed to influence the decisions surrounding the routing of power lines, and to advocate for the appropriate location of electrical power lines. Routes should be planned to avoid protected areas, Important Bird Areas and migratory bottlenecks where risks may be higher.

Strategic planning and assessment

The potential negative impacts and the risks associated with routing of power lines will be significantly reduced by the use of a positive planning framework, and taking a strategic approach to routing and power line development. The development of a Smart Grid which utilises the most up to date and current technology should be advocated for as part of a national development plan. BirdLife Partners and Civil Society can play an important role in advocating for power line infrastructure and a grid which reduces environmental impacts.

At the pre-planning stage a **Strategic Environmental Assessment** (**SEA**) should be carried out to identify areas where significant impacts may occur. Where there is a high probability of a significant impact, this area should be excluded from development. Areas of high bird flight frequency with associated low height use, such as coasts and wetlands, topographical straights or areas with concentrations of breeding colonies, should be avoided in this advanced planning stage.

[1] Angelov, I., Hashim, I., & Oppel, S. (2011) Persistent electrocution mortality of Egyptian Vultures Neophron percnopterus over 28 years in East Africa. Bird Conservation International, Available on CJO 2012 doi:10.1017/S0959270912000123
[2] CMS 2011 Review of the Conflict between Migratory Birds and the Electricity Power Grids in the African-Eurasian Region
[3] Bahat O., (2008) Wintering Black Storks (cinonia nigra) cause severe damage to transmission lines in Israel- A Study of the risk and mitigation possibilities www.birdsvision-solutions.com/image/users/142826/ftp/my_files/downloads/WinteringBlackStorks.pdf

The use of an SEA will enable governments to identify potential long-term, large-scale (regional or national scale) and cumulative risks and impacts of multiple power transmission projects, not only for birds but from other environmental and socio-economic perspectives. The results will help identify recommended routes for power lines while also identifying zones or areas of high risk. The SEA process should also optimise land use, reduce the overall environment and social footprint of power line projects, and cut down on potential impact costs into the future.

An SEA should be carried out by trained professionals. It should also incorporate planned and existing development projects across a number of sectors, so that cumulative risks can be assessed. 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. Partners should engage with the SEA processes and provide inputs into its development, underscoring the need to integrate ornithological considerations.

Stakeholder consultation with local communities, indigenous groups, planners, researchers, and specific interest groups such as conservation groups, is vital. It is especially important in the earliest stages of development so that expert and local knowledge may feed in to the development and routing process. BirdLife Partners and Civil Society Organisation can use this opportunity to work with and distribute guidance on power lines to relevant groups. They should also seek strong regulation with regard to guaranteeing stakeholder consultation and the publication of SEA materials. Consultation throughout the processes will enhance the outcome of the assessment.

An SEA will be reinforced and enhanced when it is conducted in conjunction with **sensitivity mapping**. Sensitivity maps, although separate from the SEA and Environmental Impact Assessment, are complementary and can provide valuable input into both; they are tools which record the locations and movements of species that are vulnerable to the impacts of infrastructural development. These tools allow for the risks associated with a particular activity to be quantified and combined with additional data that relates to species and sites. By using sensitivity mapping tools at an early strategic planning stage, high-risk areas can be identified and the risks avoided or substantially reduced. Among other decision support tools, the IBAT should also be consulted, as it can show protected and important areas, and species or habitats which may be present along a route.

BirdLife International has developed and is continuing to refine a sensitivity mapping tool for the Rift Valley/Red Sea Flyway, which will provide valuable information on the potential impact on bird populations from wind energy development at different locations along the flyway. It also shows specific areas which are important to birds, which will be useful in identifying areas for routing. This tool will be enhanced by provision of additional data. Appendix A of the 'Guidelines for mitigating conflict between the migratory birds and electricity power grids[4]' gives a country case study example of selecting appropriate routing.

When the appropriate routes have been identified and proposed as a result of the SEA, it is essential that an **Environmental Impact Assessment** (**EIA**) of the proposed routes is undertaken. This must appropriately assess the ornithological value and biodiversity along the route. Several routes should be investigated in parallel, with the risks associated with each route considered and appropriately addressed. The route associated with the lowest risk should be the preferred option.

Ideally ecological data generated by the EIA should be stored in a centralised and accessible information system, which enables strategic analysis and also the generation of greater knowledge on the birds present within an area, and the impact of any lines. Partners and CSOs should advocate strongly for a central repository of ecological data, which is free and accessible. It is essential that the Environmental Management Plan is open to stakeholder consultation, and a non-technical summary report is published. Partners and other CSOs should actively engage with the EIA processes and provide expert input into it, providing comments on the appropriateness of the routes and mitigation actions proposed.

The EIA will aid in identifying the extent of risks to birds and other biodiversity at the site/project level. It enables specific risks to be addressed and outlines **specific avoidance and mitigation** actions, which will reduce the impact on birds and biodiversity. A robust pre-construction **baseline survey** is an essential component of the EIA. This baseline survey should take place for a minimum of a year.

The fragmentation of habitat and displacement of birds, and resulting exclusion from particular areas, could have effects similar to actual habitat loss. This should underline the importance of the need to carry out an appropriate SEA, and provide a compelling argument for Partners and CSOs to use with governments and designated national authorities.

Pre-Construction surveys

The EIA, the pre-construction baseline surveys and also the post-construction monitoring must include an accurate assessment of the species present, and the significance of the area impacted by a project. The method should be reviewed by a trained ornithological expert to ensure the methods are appropriate, and the survey itself should be carried out by trained and qualified investigators, and follow standardised techniques which allow replication and comparisons.

These methods include:

1. Assessment of birds breeding along the proposed route, and within an appropriate buffer zone including the construction site itself;
2. Vantage point surveys throughout the year, with intense monitoring during peak migration periods;
3. Species-specific assessments for rare or threatened and breeding bird species for collision risks and/or electrocutions;
4. Winter ornithological surveys may also be required.

Assessing the impact of disturbance displacement is a vital component of impact assessment. Given the length of power lines across a landscape, Partners should use their knowledge to identify potential hotspots, and where the power line crosses multiple habitat types, a stratified random sample approach could be used along the rest of the line.

This baseline survey should describe habitats and species across the entire length of the route and its impact area, and identify high risk hotspots along the route. More intensive multi-seasonal ornithological surveys will be required at high risk areas.

Construction activities

The construction of the power lines has the potential to have a significant impact on biodiversity, in particular resident bird species with territories close to the construction site. These impacts can be reduced by utilising environmentally sensitive construction practices and techniques, including habitat restoration at the site level. Best practice standards and designs for mitigating impacts on birds in relation to power line cables and mast structure should be adhered to.

Good construction techniques include (1) minimising any clearing of natural vegetation; (2) implementing adequate

[4] CMS 2011 Guidelines for mitigating conflict between the migratory birds and electricity power grids www.cms.int/bodies/COP/cop10/docs_and_inf_docs/doc_30_electrocution_guidlines_e.pdf

measures to control soil erosion and runoff; (3) ensuring proper disposal of all wastes; (4) ensuring construction materials come from local and environmentally sustainable sources; (5) restoring cleared areas where feasible; (6) ensuring invasive alien species are not introduced. Construction should be timed to avoid times of peak sensitivity, such as during the breeding season or during periods of peak migration, or when sensitive species are wintering in the area.

Mitigation actions and bird-sensitive design

The main mitigation actions to reduce the risk of collision, electrocution and disturbance, which should be carried out at an early stage, are:

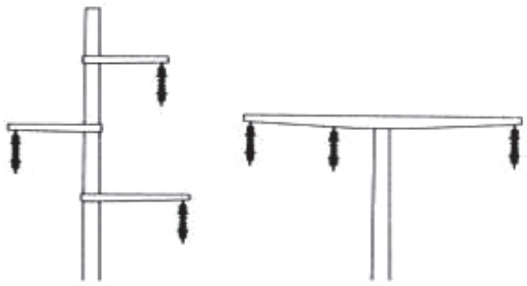
- Routing of lines to avoid key areas for birds, including migratory flyways and bottlenecks;
- Avoiding areas which are attractive to birds such as waste water treatments plans and waste dumps, especially in arid regions;
- Avoiding where possible establishing power lines close to shorelines and over wetland areas, maintaining a minimum distance of 5 km from shorelines.

To reduce collision risk, actions include:

- Placing power lines parallel to land features which could be potential bird routes, such as ridges and valleys, and not cutting across them;
- Using bird deflectors in high impact areas, specifically along migration flyways. These should increase line visibility by thickening the appearance of the line by a minimum of 20 cm over a length of 10-20cm;
- Markers should be moveable, of contrasting colours (e.g. black and white), contrast with the background, protrude above and below the line, and be placed 5-10 m apart;
- Removing the thin neutral or earth (shield) wire above the high voltage transmission lines where feasible, and where this is not possible, marking the line to make it more visible;
- Bundling high voltage wires and using spacers to increase visibility;
- Burying cabling of low and medium voltage lines may be possible. While expensive, this eliminates the majority of risks associated with bird collision and electrocution. But this depends on the local site condition, as in specific habitats it may be ecologically disruptive;
- Minimising the vertical spread of power lines. Having lines in a horizontal plane reduces collision risk;
- Depending on the location and topography, it may be suitable to have low-lying power lines which are beneath the altitude at which birds may travel;
- Habitat manipulation to influence flight activity and bird behaviour, e.g. tree lines under the high voltage lines to increase visibility;
- Clustering of lines along the same route may also be beneficial as the network will then cover a smaller area;
- Avoid establishing areas which are attractive to birds, such as waste water treatment plants and solid waste dumps, near high concentrations of power lines.

To reduce electrocution risk, design of the poles is vital:

- Designing power lines and associated masts to reduce electrocution risk;
- Hanging insulators under cross arms and poles, provided the distance between a likely perch (mainly the crossarm) and the energised parts (conductors) is at least 70 cm;
- Capping upright insulators with a nonconductive material, and using a nonconductive material to attach insulators to poles;

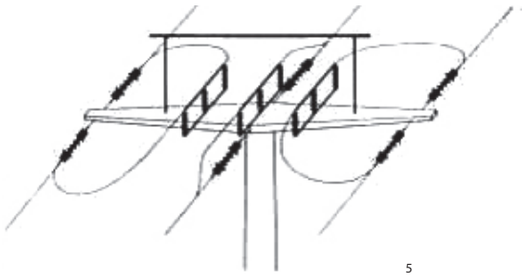


Hanging insulators beneath cross arms (taken from Haas et al. 2003)

- Insulating cables close to poles, at least 70 cm on both sides and around perching areas, and up to at least 140 cm (even 180cm if vultures are present) in areas with large soaring birds;

Insulated conductors minimum of 70 cm on each side of cross arm (taken from Haas et al. 2003)

- Where the pole is made of steel, insulating all conductor lines;
- On strain structures where jumpers are used, at least two jumper wires should be suspended below the cross arm and the third insulated, or all jumpers insulated;
- Providing safe nesting and perching platforms above the pole at a minimum of 70 cm above energised components, or higher depending on the species present;
- Spacing between conductors should be not less than 140 cm and 70cm between perching sites and live components;



Safe perching area, and insulated strain poles (taken from Haas et al. 2003)

- In areas where large soaring birds occur, spacing between live components or insulation should be over 2.7 m horizontally and over 1.8 m vertically;
- Providing safe perching areas and using perch management techniques;
- Retrofitting of lines identified as high risk through the SEA and continuous monitoring.

The mitigation actions should be planned and developed at the planning stage and be implemented at the construction phase, rather than retrofitting. Partners and CSOs should work with governments or utility companies in the selection of appropriate routes and the use of bird-sensitive pole and line design.

[5] Haas D, Nipkow M, Fielder G, Schneider R, Haas W, Schürenberg B (2003) Protecting Birds from Powerlines: a guide on the risks to birds from electricity transmission facilities and how to minimise any such adverse effects Recommendation no 110 (2004) of the standing Committee on minimising adverse effects of above ground electricity transmission facilities (power lines) on birds Bern Convention

Post-Construction monitoring

Once power lines have been constructed, the ongoing effects on bird populations and biodiversity should be monitored, so that potential long-term impacts can be identified and addressed. **Continuous monitoring** generates information on the impacts of power lines, and will inform the need to adapt mitigation actions. This monitoring should be carried out in a standardised way by recognised professionals, following best practice guidelines.

In addition to continuing the surveys carried out as part of a pre-construction monitoring activity, post-construction monitoring should also include:

- Carcass searches and mortality surveys;
- Disturbance assessment.

Monitoring activities should include mortality surveys both on the new power lines being built, and also on existing lines thought to cause significant impacts. Monitoring should be designed to deliver robust, scientifically accurate and comparable information, which should be made publicly available and shared.

Strengthening national and international legislation

National legislation

A primary action for BirdLife Partners and Civil Society Organisation is to review existing regulations and planning procedures which relate to the procedures for power line development. These could include planning regulations, and national and regional development plans. By reviewing the existing planning mechanisms, some entry points may be identified which can be used for advocacy purposes. The national energy authority may be the department which is responsible for the power line infrastructure and grid, but this may require further investigation.

Partner organisations should support calls for the development of a national planning framework for infrastructure projects, including energy, which integrates biodiversity considerations, and for the strategic development of infrastructure including power line routing. National development plans and sustainable development plans should be consulted to review whether appropriate consideration has been given to birds and biodiversity.

This includes calling for the development of Smart Grid technologies and power lines which reduce the impact on bird populations, including specific legislation on power line design to ensure that bird risks are minimised. National working groups should be established to review the national situation, discuss priority areas for action, and generate broad stakeholder consensus. Partners and other specialist CSOs can use their national knowledge to prioritise high risk areas.

National legislation in relation to the use of SEA and EIA should be consulted to ensure appropriate impacts have been investigated. If no legislative framework is in place calling for the use of SEA and EIA for the development of infrastructure projects, it should be the priority of each Partner organisation to lobby for the creation of such legislation and ensure it is implemented. SEA and EIA are important mechanisms for mainstreaming biodiversity and bird concerns across governments and sectors.

Regulations which enforce the utilisation of bird-sensitive poles and lines will enable risks to be reduced. These regulations should recommend minimum technical standards. There is precedent from other countries for designing legislation and regulations which require bird-sensitive pole design, which can be referenced when advocating to governments. Budgets should also be set aside for the retrofitting of existing lines. Retrofitting may be considered as part of a mitigation offset.

The ecological and bird data which is collected should be freely available and accessible. This data can be input into a national development plan and enhance the decisions made as part of a strategic planning framework. It can provide input into future developments, and increase understanding and knowledge of birds within the national and flyway context, including the impacts on birds.

Other national legislation, such as that related to protected areas and species, should also be used as a tool to address the negative impacts of development. Partners should work to strengthen existing environmental legislation. This can be done in conjunction with other groups who may have similar interests in relation to the impacts of power lines, or environmental legislation in general.

International Agreements

National governments have adopted and signed a number of international agreements which provide entry points for Partner and CSO engagement. A number of these international agreements refer to the need to mainstream biodiversity concerns across all sectors of government. Partner organisations should investigate which agreements have been ratified and remind governments of their commitments. Where relevant agreements have not yet been endorsed, Partners and CSOs should lobby their national governments. Other stakeholders should be informed of government commitments, and alliances can be formed to ensure government fulfilment of pledges.

The Strategic Plan for Biodiversity 2011-2020, adopted at Convention on Biological Diversity (CBD) COP10 in 2010, provides a comprehensive global framework for achieving the vision of 'Living in Harmony with Nature', including the 20 headline Aichi Biodiversity Targets for 2015 or 2020. These targets call for the mainstreaming of biodiversity across government, so that biodiversity values are integrated across sectoral plans and policies, and adverse effects can be minimised. SEA and EIA are useful tools for mainstreaming. Governments should be reminded of their commitments to the strategic plan, and of the need to integrate ornithological concerns.

BirdLife International has endorsed the Budapest Declaration calling for electrocution from power lines to be eliminated by 2016. Governments should be made aware of this declaration which should also be shared with other civil society organisations. While intended for European countries, it does make reference to the African-Eurasian Flyway, and provides relevant calls for international country engagement.

The Convention on Migratory Species (CMS) has a number of resolutions specifically related to migratory birds and energy infrastructure. These include Resolution 7.4 'Electrocution of Migratory Birds', adopted at COP7 in 2002, which calls on the parties to the convention to curb increasing electrocution risk from medium-voltage transmission lines, and Resolution 10.11 'Power lines and Migratory Birds', adopted at COP10, which developed specific guidelines on mechanisms to reduce power lines impacts on birds, and urged countries to implement these guidelines, including 'development of specific impact criteria to be applied in selection of energy generation sites'. The use of SEA and EIA which integrate ornithological concerns, and developing specific regulations in relation to power line design, will help ensure that these asks are delivered.

The Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA) also addresses power lines and renewables. Specific Resolutions agreed at the 5th Meeting

of the Parties in 2012 include Resolution 5.11 on 'Power lines and Waterbirds', and Resolution 5.16 'Renewable Energy and Migratory Waterbirds', calling for the development and strengthening of national renewable energy planning, and for the developments to include monitoring to avoid and minimise the adverse effects of renewable energy installations.

The recent COP11 meeting of the Ramsar Convention, held in July 2012, also contained a specific resolution in relation to Energy. Resolution XI.10 on 'Wetlands and Energy Issues' provided guidance on addressing the implications of policies, plans and activities in the energy sector for wetlands, stressing the need for integrated planning. Parties should be reminded of their commitments in this respect.

Donor organisations and development banks often provide the funding and loans for large scale energy generation projects, and may be responsible for the delivery of the associated electrical power line infrastructure needed to deliver power to the end consumer. These organisations have made a number of commitments to the environment, including a commitment to help national governments reach national environmental goals, such as those committed to through the CBD, as set out in the Paris Declaration on Aid Effectiveness, while the Accra Agenda for Action highlighted the need to support country environmental planning systems and to engage with civil society. Donor organisations and development banks can be reminded of these commitments, and how through working with civil society organisations, in particular BirdLife Partners, birds and biodiversity can be integrated into planning developments.

Partners and CSOs should also seek to engage with developers and utility companies, including the transmission line operators, to provide input into any routing decisions, and also engage in dialogue in relation to the use of bird-sensitive pole and line design.

BirdLife International has produced guidance notes for specific sectors related to power lines. These guidance notes can be shared with other civil society organisations, and used in advocating activities when engaging with these differing sectors. Guidance has also been published which targets the renewable energy industries of wind and solar power. These guidance documents can be used in combination to increase their relevance to a particular sector.

This factsheet is part of a suite of guidance materials produced by BirdLife for governments, financiers such as development banks, and developers and consultants. These factsheets can be used to engage and lobby stakeholders on specific issues where there is a need to reduce the negative impacts on birds. The sharing of good practice examples and success stories with regional partners will ensure that lessons can be learned.

These factsheets can be shared with other civil society organisations, to increase the knowledge of what potential impacts developments can have on birds; and also of how, when appropriately sited, constructed and operated, developments can have little or no negative impact, and deliver lasting sustainable development.

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.