



Birds and Solar Energy within the Rift Valley/Red Sea Flyway

Solar Energy has great potential in the region, and is thought to be the renewable energy technology with the least environmental risk. As with all infrastructure projects, appropriate site location and the right choice of technology are key to minimising adverse impacts. These impacts are likely to be related to collisions with associated infrastructure and possibly with panels; habitat loss, disturbance and fragmentation; and water use.

Developers should:

- Consult a **Strategic Environmental Assessment (SEA)** and bird sensitivity maps to guide areas where developments are appropriate
- Recognise that appropriate site selection is key to minimising impacts
- Carry out a site-specific **Environmental Impact Assessment (EIA)** which includes appropriate ornithological surveys, including a one year pre-construction baseline survey and a year's post-construction monitoring
- Employ mitigation measures where adverse impacts are occurring
- Investigate whether habitat management at the site level could provide benefits for birds and biodiversity
- Commit to making ecological and bird data freely and publicly available from a centralised source
- Use environmentally-friendly construction techniques and minimise environmental impacts
- Engage with governments, utility companies, consultants and conservation organisations and other civil society groups to ensure best available solutions are utilised.

BirdLife International supports the transition to more renewable sources of energy. Renewable energy will deliver a number of long-term benefits, which can help in reducing greenhouse gas emissions and delivering lasting economic and social benefits to countries and communities, by reducing reliance on fossil fuels and contributing to energy self-sufficiency. This transition must avoid harm to ecosystems and biodiversity. BirdLife is committed to working with developers and consultants to ensure bird and biodiversity concerns are integrated into any developments and operations.

The high solar potential of the region has been noted, with extensive developments being planned in a number of

countries. Solar development globally is growing at a rate of 40% per year, but still only contributes about 0.6% of electricity generation. Concentrated Solar Power technology has the capacity to provide for about 7% of the total electricity needs projected for the world by 2030, and 25% by 2050¹. Substantial capital is expected to be invested by the private sector to drive this growth and meet targets.

The technologies used in solar energy developments can be broken down into four categories:

1. **Photovoltaic/Concentrated Photovoltaic:** which converts the Sun's energy directly into electricity to be exported to the grid;

¹ Estrela, Greenpeace International, Solar PACES (2009) The Global CSP Outlook 2009 www.greenpeace.org/international/Global/international/planet-2/report/2009/5/concentrating-solar-power-2009.pdf

2. **Concentrated Solar Power (CSP):** which uses mirrors to concentrate the Sun's rays, and a fluid-based system to drive steam generators which deliver electricity to the grid;
3. **Solar thermal heating** panels use the direct heat of the Sun to raise the temperature of water. Panels are usually mounted on the roofs of buildings, with a simple arrangement of dark-coloured water pipes beneath glass. This is used to heat water for buildings, swimming pools, and for various industries;
4. **Passive solar:** which generally refers to the use of glazing, building design and building orientation to contribute to space heating.

The Rift Valley/Red Sea flyway is the second most important flyway in the world for migratory soaring birds. More than 1.5 million migratory soaring birds of 37 species use the flyway, including raptors, storks, pelicans and cranes, of which five are globally threatened.

The potential for renewables within the region is very high, with significant developments across the flyway. Many countries have made commitments to the generation of renewables as part of their energy mix. For example, Egypt has a domestic energy target of 20% from renewables by 2020, and Jordan has made a commitment of 10% by 2020. Further international and national investments are anticipated across the region, and represent a significant opportunity for the private sector.

An impact in one section of the flyway or in a particular country has the potential to become a significant impact along the flyway route. The whole flyway is connected, with different habitats and resting and stopping-off areas spread throughout, so that each country provides a valuable link in the flyway chain. The flyway and the migratory soaring birds which use it are of global importance. The private sector and other developers can help ensure their protection and continued survival, by integrating bird and biodiversity concerns early on into any development plans, so as to reduce any risks.

The solar energy sector is developing quickly, with constant innovation. It has the greatest potential for global energy generation of all renewable energy resources. Although solar energy is believed to be relatively benign for bird and biodiversity, inappropriate site location or operations have the potential to have a negative impact. To be truly sustainable, these potential impacts must be minimised. Substantial growth in solar energy developments, especially industrial projects, could potentially cover a substantial land area. For example, the Shams 1 project in the United Arab Emirates, a partnership between Masdar, Total and Abengoa consisting of 768 parabolic troughs, which has the capacity to generate 100MW, extends over an area of 2.5 square kilometres. Where consideration is not given to the cumulative risks associated with successive developments along a flyway, the risks to birds and biodiversity could be significant.

This document will concentrate on the technologies of Photovoltaic (PV) and Concentrated Solar Power (CSP). Solar thermal and passive solar heating are not believed to pose any direct threat to birds and biodiversity, and are in the majority of cases confined to urban environments. The differing technologies can have different impacts depending on the site characteristics and species present. BirdLife Partners can provide valuable knowledge in relation to sites which may be inappropriate due to the risks and vulnerabilities.

Any adverse negative impacts could lead to international scrutiny of projects, and adverse coverage for the renewable energy 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 different groups can deliver a range of benefits. It is in a developer's interest to ensure bird safety and safeguard biodiversity, and also to publicise their efforts in reducing the impacts, to generate support for their operations. The proactive engagement of local groups can also reduce opposition to projects.

This guidance document is designed to inform solar farm developers, and the construction companies involved in delivering projects, of the potential impacts of developments upon birds. It recommends specific practices that can reduce these impacts. Implementing these recommendations will minimise impacts now and into the future, and potentially save money by reducing the amount of capital locked into inappropriate developments.

Potential Impacts

Industrial-scale solar technologies are relatively new, with a limited number of significant developments worldwide, and as yet little is known about their impact on bird populations and biodiversity in general. Studies that have taken place have shown that the environmental effects are relatively benign, but no studies have been completed in the Rift Valley/Red Sea region. Private companies and developers have a responsibility to ensure that their activities do not lead to environmental harm, and can aid national governments in achieving their international commitments.

Solar energy technology offers a huge range of benefits, but may have some adverse impacts if developments do not integrate bird and biodiversity concerns. As the technology is new it is vital to analyse its impact, and this can then inform future developments plans.

- **Water use:** the volume of water used for cleaning purposes can be significant². For Concentrated Solar Panel technologies, water may be used in the cooling process, or to generate steam to drive a turbine. The potential extraction rate can be very high³, and may have a significant impact on local and regional hydrology and associated avifauna, especially in water-constrained areas;
- **Habitat loss/fragmentation:** potentially this is the largest impact, as large areas of habitat may be removed, replaced or degraded. The actual ecological significance of the impact will be site and scale-specific; many developments are likely to have limited impacts. An assessment of the ecological value of the development's footprint will show the significance of the impact. The assessment of cumulative impacts is also vital;
- **Risk of collision:** with associated infrastructure, including fencing and towers, but particularly with associated power lines. Some species of birds may collide with panels because they are attracted to shaded areas, particularly if panels are located in previously undisturbed areas;
- **Pollution:** activities during construction and ongoing maintenance, as well as chemicals which may be used in CSP energy generation, could lead to the release of pollutants into the environment. Contaminated liquids in hyper-arid regions could be detrimental to large numbers of migrants.

A number of other scenarios have been put forward as potentially having an adverse impact, but there is limited data on these, and they require further study:

- **Disturbance:** Disruption of a bird's natural patterns of behaviour may lead to disorientation and increased energy use. Large arrays of panels may resemble water bodies, attracting some bird species. One study indicated that insects were attracted to laying eggs on panels as

² Guardian (2012) www.guardian.co.uk/environment/2011/dec/11/sahara-solar-panels-green-electricity

³ Damerou K, Williges K, Patt A, Gauche P (2011) Costs of reducing water use of concentrating solar power to sustainable levels: Scenarios for North Africa Energy Policy, 39(7):4391-4398

they confused them with water⁴. The shade cast by panels can also attract birds. Disturbance during construction and maintenance may also be an issue. Other possible issues relate to increased human access to otherwise inaccessible areas;

- **Change of habitat function:** the increase in shading and the changing water regime within a solar power plant change the micro-climate, and may change vegetation patterns. This means potential indirect impact on breeding and resting birds by changing food sources (e.g. seeds, insects, plants and animals), and also the use of structures for nesting;
- **Barrier effect:** Linkages within the flyway could be disrupted if very large areas are used without assessment of the cumulative impacts on migratory soaring bird populations, or if solar arrays occupy habitat at known resting sites, forcing the birds to abandon the area;
- **Potential heat damage:** a theoretical risk from heliostat technology, which concentrates solar energy on a central collector, generating temperatures in excess of 1000°C, is that birds flying within its beam may be injured or killed. One study at the now decommissioned Solar One facility in California indicated that, while some birds were affected, the overall outcome was not significant⁵.

The potential impacts are likely to vary depending on the site location, and also the particular species migrating through, or resident in, an area. Grassland, steppe and desert bird species vulnerable to disturbance, such as bustards, may be vulnerable to habitat loss and fragmentation of the landscape. Particularly high impacts are likely to occur where these developments coincide with migratory staging or stopping-off spots, or areas of undisturbed habitat.

In a migratory flyway such as exists within the Rift Valley/Red Sea, the potential cumulative impacts produced by successive developments can lead to serious disruption of linkages between distant feeding, roosting, moulting and breeding areas. Cumulative impacts need to be assessed at an appropriate scale.

Another potential effect which requires further investigation is the ability of large industrial-scale projects to affect the thermal updraft of an area, which could impact on soaring birds, positively or negatively, depending on the site. This requires further development-related research to identify the extent and range of impacts, if any. Developers can play a proactive role in developing this research by facilitating monitoring at their sites.

A precautionary approach should be used in the selection and development of sites, but this need not deter developments in all cases, as mitigation actions and habitat manipulation may be possible, when informed by an appropriate EIA carried out by a qualified professional. Habitat manipulation at the site level could potentially attract birds and biodiversity and enhance the environment. BirdLife Partners have the knowledge and expertise to comment on, and help develop, appropriate management plans in this regard.

Strategic planning and assessment

At the pre-planning stage a **Strategic Environmental Assessment (SEA)** should be consulted, to inform the choice of sites which are appropriate for development. Sites located near or within protected areas, and other sites important for biodiversity such as Important Bird Areas, will require in-depth investigation, and a precautionary avoidance approach should be used. Consideration must be given to the appropriate technology to use. Given site characteristics, some areas may be unsuitable for CSP technologies due to water resource constraints, or sites next to water bodies may require mitigation

measures to prevent collision. Where no SEA exists, developers should look to governments, designated national authorities and conservation organisations and experts for guidance on appropriate areas for development, or potentially sensitive areas. For each development a site specific **Environmental Impact Assessment (EIA)** must be carried out.

A range of stakeholders should be included in the consultation processes at an early stage, including local communities, indigenous peoples, planners, researchers, and specific interest groups including conservation groups. Stakeholder consultation enables expert and local knowledge to be incorporated, and it should take place throughout the lifecycle of the project. BirdLife International is developing specific guidance on appropriate methodologies in relation to EIA for the region, and this material will be available in the coming months.

Appropriate site selection can also be informed by the use of **sensitivity mapping**. The sensitivity map presents a strategic view of the sensitivities of bird species to infrastructural developments. BirdLife International has developed and is continuing to refine a sensitivity mapping tool for the Rift Valley/Red Sea Area relating to wind farm developments and migratory soaring birds. Although the sensitivity layer is specifically for wind farms, it shows congregations of migratory soaring birds and Important Bird Areas, which can help inform site selection for solar developments.

Other support tools such as the **'IBAT – for business'** can also help guide the decision making processes, by identifying important sites, and also species which could be present in an area, which can guide assessments.

A site-specific EIA is an essential component of any development. This must appropriately assess the ornithological value, and the biodiversity of the site, such as the flora, reptiles and mammals, including nocturnal species like bats. For solar projects, a detailed hydrological impact study may be necessary, depending on the technology used.

It is essential that any survey identifying the ecological value of the development's footprint includes the additional area required for construction, and a buffer zone, to allow for any changes in the proposed development, and assessment of possible edge effects. The techniques and methods used in undertaking these surveys should be capable of replication as part of a post-construction monitoring programme.

The EIA should also consider the ecological needs of the species occurring within the site, and provide recommendations regarding possible mitigation measures, such as leaving or creating habitat corridors, creating complementary habitat, or ecosystem restoration. One option that should be considered once the mitigation hierarchy has been exhausted is contiguous/compensatory habitat development, to compensate for loss of habitat due to the development. This compensatory land requires an appropriate management plan to maximise its biodiversity potential.

The EIA ecological data generated should be stored in a publicly accessible centralised information system, which enables strategic analysis and also the generation of greater knowledge. It is essential the EIA processes and Environmental Management Plan are open to stakeholder consultation, and that a non-technical summary report is produced in the local language. If, as part of a financier's safeguard policy, a Biodiversity Action Plan is also required, (as in the International Finance Corporation's Performance Standard 6), then this should also be open for stakeholder consultation. Mechanisms should be in place to ensure participation throughout the EIA processes.

⁴ Horváth, G., Blahó, M., Egri, A. *et al.* (2010) Reducing the Maladaptive Attractiveness of Solar Panels to Polarotactic Insects. *Conservation Biology*, 24(6):1644-1653

⁵ McCary M.D., McKernan R.L., Schreiber R.W., Wagner W.D. & Sciarrotta (1986) Avian mortality at a solar energy plant *Journal of Field Ornithology* 57 (2) 135-141

The EIA will aid in identifying the impacts on birds and other taxa 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 **baseline survey** is an essential component of this EIA assessment. This assessment should be carried out by a trained ornithologist, and should deliver robust scientifically accurate data. Inappropriate assessments may fail due-diligence requirements of project funders, and lead to delays or rejection of a project.

Pre-Construction Monitoring

The baseline survey should take place for a minimum of one year; three years may be necessary if an area is known to be important for migratory species.

The pre-construction surveys should include:

1. **Breeding bird surveys**, to assess the potential footprint and buffer zone impact of a development on resident species;
2. **Vulnerable and protected species-specific surveys** for species that may need individual assessment, e.g. nationally and internationally important bird, reptile and mammal species, or colonial bird species;
3. **Migratory bird surveys** may be required if the site is along a migratory route. If required, this should include **vantage point surveys** undertaken during migration periods, particularly at or near bottlenecks, and should cover seasonal variation during a year-long period;
4. **Hydrological assessments**, depending on the technology used.

By ensuring that the appraisals are carried out to a high standard, generate accurate results, and are sufficiently informed on key species and ecosystems, developers can ensure that planning is not held back by the need to return to an appraisal and survey situation. Any assessment should be undertaken by qualified individuals.

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

The mitigation hierarchy is defined as⁶:

- 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 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 ecological and ornithological information is generated within the region, it may become appropriate for full assessments to be restricted to high risk 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; it 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, 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 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 other interested groups, as well as 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 into the planning and operations of a development. The ornithological and biological data should be freely available in a centralised information facility, to allow for 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 insure unpredicted impacts are addressed. The data which is generated should be freely available in the same information facility as the EIA data, and be accessible to the public.

⁶ Business and Biodiversity Offsets Programme (BBOP) (2012) Standard on Biodiversity Offsets. www.forest-trends.org/documents/files/doc_3078.pdf

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 compensate for any adverse environmental impacts. Negative impacts to birds and biodiversity must be avoided; however, depending on the technologies used, the habitats and the species present at a particular site, developments may be appropriate at sites which are important for their biodiversity and birds. This will be informed by an appropriate EIA. As there is little knowledge in regard to the impacts of solar farm technologies on birds and biodiversity, the ongoing monitoring is key to generating greater knowledge, and will provide valuable guidance on future developments.

Power lines and associated infrastructure

The power line infrastructure which carries the power generated by solar farms to the end user can potentially have a significant impact on birds and bird populations. This impact could be reduced by using appropriate mitigation measures. These measures include the appropriate routing of the lines, use of bird deflectors at hotspot areas, and pole design which minimises electrocution risks. Further details can be found in the BirdLife guidance produced for the region in relation to power lines, which can be found on the Migratory Soaring Birds website. The infrastructure used to connect a development to the national grid, should be considered as part of any development and will require an appropriate impact assessment.

Routing and mitigation actions should be informed by an appropriate SEA and EIA. Within a solar energy development, power line infrastructure should be routed underground. As it is costly to retrofit existing lines, a precautionary approach should be adopted, and bird flight diverters should be fitted on all new lines where collisions may potentially occur. New sites should be located close to the existing grid infrastructure, to minimise the amount of additional lines needed.

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. These impacts can be reduced by utilising environmentally sensitive construction practices and techniques, including habitat restoration at the site level.

Good construction techniques include (1) minimising any clearing of natural vegetation; (2) implementing adequate measures to control soil erosion and runoff; (3) ensuring proper disposal of all solid and liquid wastes (special attention is needed when using hazardous chemicals); (4) ensuring construction materials come from local and environmentally sustainable sources; (5) restoring cleared areas where feasible. Construction should be timed to avoid times of peak sensitivity, such as during the breeding season or periods of peak migration.

Mitigation Actions

Mitigation actions for solar developments include:

- Timing of construction to minimise disturbance, e.g. avoiding the breeding season;
- Placing of white strips along the edges of the panels, to reduce the similarity of panels to water, to deter birds and insects⁷;
- Minimum clearing of native shrub and plant communities;
- Appropriate management of the space between and

beneath solar panels. Good maintenance practices (such as confining vehicular access to defined tracks) can also minimise environmental impacts;

- When developments are sited in degraded land areas, biodiversity can be improved, but in pristine ecosystems, developments will affect the local ecology;
- Some CSP use 'dry' cooling technologies. Although more expensive, these can reduce the amount of water extracted from the local environment;
- For CSP technology, reflective surfaces which are parabolic (curved) in shape reduce the likelihood of skyward reflection, whereas flat heliostats have an increased risk of being reflective;
- Trough Receivers should use evacuated glass tubes or similar technology, to reduce heat loss, which results in low receiver temperatures which will not burn birds;
- Ensure evaporation ponds are not accessible to birds and other fauna, by using fencing and wire grid. This is to reduce the possibility of a) attraction b) drowning c) poisoning;
- Use of translocation to protect terrestrial species (e.g. reptiles, amphibians) present at a development site during construction and operation. This requires an adequate complementary site with suitable habitat and viable population levels;
- Fencing should not hinder species movements at the site level, and bird diverters should be used.

Recent developments within CSP technologies, where sunlight is focussed on a receiver which is very close to the mirror, should be investigated. As a result of this design, it is less likely that a bird will fly between the receiver and mirror, reducing the likelihood of heat damage.

Once a solar development has been constructed, the ongoing effects on bird populations and biodiversity should be monitored, so that potential long-term impacts can be identified and addressed. This is especially important, as there has been little research done on the long-term effect on birds and bird populations of solar developments.

A range of surveys are required to assess the potential impact on birds. These surveys should include:

1. Assessment of resident, breeding and seasonal species compared with baseline surveys;
2. Vantage point surveys to assess any impacts on soaring birds during intense migration periods or winter movements;
3. A minimum of one year's post-construction monitoring, and a review process which provides the ability to react to results of surveys and identified impacts;
4. Mortality surveys and carcass searches should also be carried out, at intervals appropriate to scavenger removal rates, and taking searcher bias into account.

Continuous monitoring generates information on the range and extent of any operational impacts, 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 qualified individuals. It is critical for a new and developing industry that it undertakes monitoring to identify any potential impacts that may arise. The Before After Control Impact (BACI)⁸ approach should ideally be used, to allow comparison with the pre-construction and control site data, and allow impacts to be readily assessed.

The data generated should be freely available to the public, as this can greatly aid in understanding the impact, if any, of solar

⁷ Horvath G, Blaho M, Egri A, Kriska G, Seres I, Robertson B (2010) Reducing the Maladaptive Attractiveness of Solar Panels to Polarotactic Insects. *Conservation biology* 24 (6) 1644-1653

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

energy developments on birds and biodiversity. In the coming years, when data and information on birds and biodiversity has increased, it may be appropriate to amend monitoring regimes, as there will be more reliability in the information available.

Developer Commitments

BirdLife International, its Partners and its staff are committed to ensuring a lasting sustainable future for all. We welcome investment within the renewable energy sector, and the use of new technologies to deliver low carbon energy. Within the region, there is a high potential for solar energy. While this energy is believed to be one of the most environmentally friendly, a precautionary approach should be used because the technologies are new. This is especially true for technologies which require the use of water.

Developers have a responsibility to deliver projects which minimise the impact on birds and biodiversity. Birds play a vital role in the environment, and an integral role in various communities across the flyway.

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 to work with BirdLife Partners in delivering developments which have minimum impact on birds. Solar power may be relatively benign for many bird species, and particularly for migratory soaring birds. However, current uncertainties and the lack of large-scale solar power

plants means that it is vital that the ecological impacts of developments are well monitored and studied. This evidence can then refine guidance into the future.

Incorporating appropriate ornithological surveys into site-specific EIA will mean that the risks of negative impacts posed by a development will be assessed, and can be 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, with long-term benefits to the knowledge pool on which future decisions in relation to impacts and mitigation will be based.

National governments have adopted and signed a number of international agreements related to environmental concerns, many of which are driving significant investment in new and emerging technologies such as renewable energy. A range of international agreements, including the Convention on Biological Diversity, refer to the need to mainstream biodiversity concerns across all sectors of government and national strategies. Private enterprises and developers can play a leading role in helping achieve this, by integrating bird and biodiversity concerns into their operations. BirdLife International recognises that there has been limited research into the impact of solar energy generation on birds and biodiversity, and believes that given the proposed expansion of the sector, more research and in-depth analysis is needed to inform the sector and future developments.

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.