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INFORMATION RESOURCES

Sustainable deployment of renewable energy technologies and power lines: avoiding and mitigating negative impacts on biodiversity

(Prepared by Birdlife International for the Energy Task Force)

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Summary

This document has been prepared for governments, investors, developers and civil society to help them to avoid and mitigate negative impacts of renewable energy technologies and power lines on biodiversity. It comprises an introduction to the necessary considerations for reducing the impact of renewable energy and powerlines, followed by guidelines, decision support tools, and general information resources on the following issues:

- strategic planning;
- environmental assessments;
- mitigation measures;
- monitoring.

The document is intended to direct stakeholders to relevant resources. Whilst every attempt has been made to ensure the latest information on these topics is captured in this document, it should not be considered an exhaustive record. New resources continue to become available as the knowledge base continues to develop and these will be incorporated in future updates at regular intervals.

Contents

How to use this document

This document provides an overview of the considerations needed throughout the development and planning process relevant to all stakeholders. This is followed by provision of details about, and links (text in **blue**) to resources that address each opportunity for integrating biodiversity protection into energy development. Critical information is highlighted with this symbol ⚠.

For ease of identifying links that may be useful to you, resources are labeled with the following icons:

 **Guidance**

 **Decision Support Tools**

 **Information**

1 INTRODUCTION

1.1 RECONCILING ENERGY DEVELOPMENT WITH CONSERVATION OF BIODIVERSITY

Scaling up of renewable energy infrastructure is critical for sustaining global economic growth and ensuring universal access to modern energy services, while at the same time holding global temperature rise well below 2 degrees Celsius to prevent the worst effects of climate change on socio-economic and ecological systems.

Poorly planned energy developments pose a threat to biodiversity, including migratory species, but if the correct approach is taken, renewable energy and the powerlines needed to support the distribution of this energy can be deployed sustainably. To ensure the conservation of species and ecosystems in the energy transition, all actors in energy development should collaborate from the outset to identify risks and take actions to manage these.

This document outlines the **tools and approaches that governments, investors, and developers can employ across the full planning cycle** to reconcile energy development with species conservation.

1.2 BENEFITS OF EARLY STRATEGIC CONSIDERATION OF BIODIVERSITY IMPACTS

Ensuring that biodiversity impacts are properly considered, and steps are taken to avoid or minimise these throughout the planning process, can provide a multitude of wider benefits beyond the obvious advantage of wildlife protection:

- ✓ Ensure **coordinated efforts to deliver on Sustainable Development Goals** 7 & 13 (affordable and clean energy; climate action) and 14 & 15 (protect and conserve marine and terrestrial biodiversity).
- ✓ Demonstrate and promote more **open and transparent governance** of the energy transition.
- ✓ Help to **avoid costly and time-consuming conflicts** with civil society, **reducing capital costs** of investment.
- ✓ **Provide stability** in the renewable energy industry and give greater **confidence to energy industry and investors** of project success.
- ✓ Provide **signal to wider industry, mobilising investment** in appropriately located infrastructure and energy system innovation.
- ✓ **Reduce the need for mitigation,** restoration and compensation measures by focusing on minimal impact sites.
- ✓ Help **identify opportunities for biodiversity enhancement**, allowing for multi-benefit projects.
- ✓ **Improve societal acceptance** of energy and powerline development.

1.3 THE MITIGATION HIERARCHY: INTEGRATING BIODIVERSITY CONSERVATION INTO ENERGY PLANNING AND DELIVERY

The **mitigation hierarchy** is widely accepted as the best approach for framing action to limit impacts of development projects on biodiversity. It can be **employed throughout the energy planning and development process**. The following diagram provides a broad and widely-applicable framework:

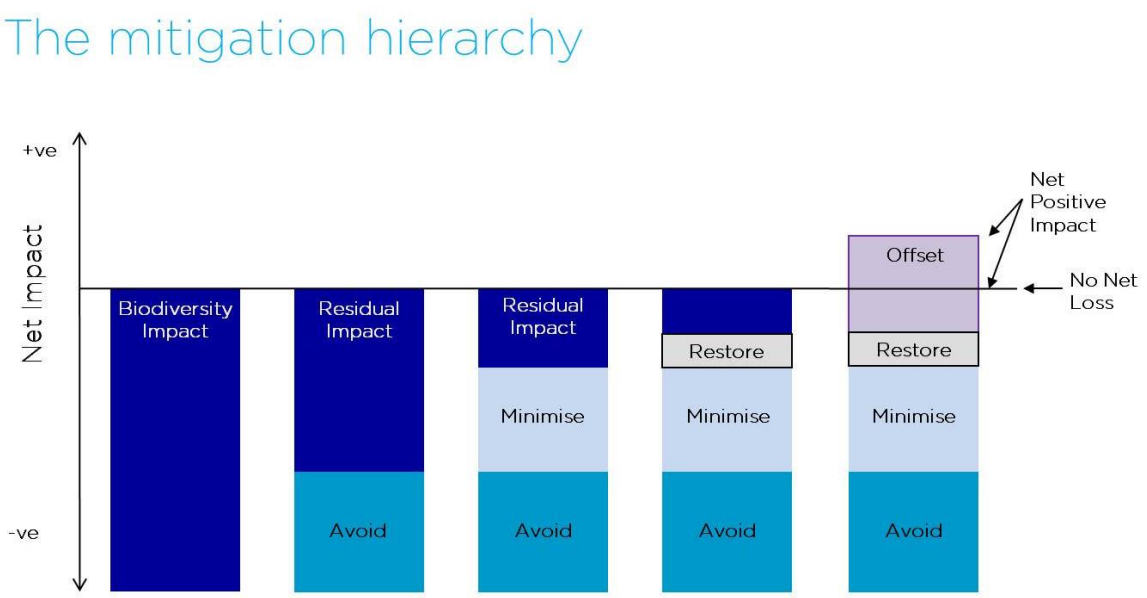

Image courtesy of The Biodiversity Consultancy

Most importantly, ***all options to avoid impact should first be fully exhausted*** before actions to minimise residual impact are then implemented.

This is then followed sequentially by restoration/rehabilitation efforts, then offsetting/ compensation actions. This document focuses on avoidance and mitigation.

Where residual impact is extremely high, and/or will involve detrimental impacts on critically threatened species, a **project should not go ahead** unless relocated to a less damaging location.

Mitigation Hierarchy explanation: The Biodiversity Consultancy provides an explanation of the Mitigation Hierarchy on their website, including the important difference between mitigation/minimising actions and compensation.

1.4 OPPORTUNITIES TO AVOID OR MINIMISE IMPACTS ACROSS THE PLANNING CYCLE

There are opportunities across the full planning cycle to avoid and minimize impacts. These are summarized below:

STEP 1: Before energy development is progressed by governments and developers, **assessment of ecological risks of energy development** across a region/country is needed, with consideration given to cumulative/'in combination' impacts.

STEP 2: This information should then be used to inform **strategic environmental assessment** and **strategic national and regional energy planning**. Spatial planning can be employed to make sure that ecological constraints are respected and impacts avoided where possible.

STEP 3: Where specific projects are then identified as potentially feasible, a **site-specific environmental impact assessment,** informed in part by step 1, is needed to ensure the potential impacts are fully understood and detailed options, including mitigation measures can be identified.

STEP 4: On the basis of the EIA, if a project is to go ahead, appropriate **mitigation measures** should be implemented to minimise impact. In addition, restoration and compensation actions should be taken, as required.

STEP 5: **Monitoring and evaluation** of impacts and sharing of this information is essential to ensure mitigation measures are working, to inform adaptive management of a project, and to inform future SEA/EIA and decision making for renewable energy and grid development.

2 STRATEGIC SPATIAL PLANNING

A very important step in the planning process, and the **key opportunity for avoiding impact,** is the decision on the **location of renewable energy and power line developments**.

The location of a project will determine the level of threat to surrounding migratory species and their habitats. Certain locations will be more sensitive to renewable energy development, such as migration bottlenecks or breeding sites. Identifying the lowest impact locations available for energy development will reduce the need for mitigation, restoration and compensation measures.

Strategic spatial planning is:

> *"a sociospatial process through which a range of people in diverse institutional relations and positions come together to…develop contents and strategies for the management of spatial change."* [1]

Strategic spatial planning for energy needs to involve thorough consideration of the opportunities and risks of different energy development options within a given (appropriately large) geographical area, with care being given to ensure ecological impact are fully understood. Spatial planning for energy should be developed in an open, transparent and consultative process to ensure a comprehensive understanding of all potential issues.

⚠ Strategic environmental assessment, that includes **consideration of cumulative and 'in-combination' effects**, should inform a strategic spatial plan for energy.

Quality strategic spatial planning will require the availability of data and the ability to interpret data as well as partnerships between civil society, government and developers.

⚠ **Where there is a lack of data, actions to resolve this should be prioritised** (e.g. improving accessibility of existing data for all parties, funding of quality impact assessment projects, and development of collaborative partnerships).

In the absence of directly applicable data, consideration should be given to information that is available from the development of energy in similar locations, and/or from similar development types.

2.1 GUIDANCE ON STRATEGIC SPATIAL PLANNING FOR ENERGY

2.1.1 APPROACHING STRATEGIC SPATIAL PLANNING

- **Responsible Business Conduct for Institutional Investors:** key considerations for due diligence under the OECD guidelines for Multinational Enterprises
- **Principles for Responsible Investment:** guidance on integrating environmental, social and governance factors into investments
- **CMS Renewable energy technology and migratory species guidelines**: guidelines on strategic planning such as legislation, policy and SEA procedures

[1] Albrechts, L. (2015). "Ingredients for a more radical strategic spatial planning." Environment and Planning B: Urban Analytics and City Science, **42**,3, 510-525

- **AEWA Guidelines on Infrastructural Developments and Waterbirds:** guidelines on SEA as part of a system for planning and implementing sustainable development of energy.
- **Guidelines on How to Avoid or Mitigate Impact of Electricity Power Grids on Migratory Birds in the African-Eurasian Region:** guidelines include Strategic Planning, Legislation and Organisational Approaches.
- **Birdlife International Energy in Harmony with Nature Report**: guidance on the conservation risks of major technologies, and how to integrate nature considerations into energy planning.
- **Scottish National Heritage Guidance on Spatial Planning for Onshore Wind Turbines – Natural Heritage Considerations:** highlights landscape wide considerations for landscape-wide policies.

2.1.2 INTEGRATING ENVIRONMENTAL CONSIDERATION INTO SPATIAL PLANNING

- **Bern Convention Wind Farms and Birds Report**: an updated analysis of wind farms on birds including guidance on integrated planning.
- **RAMSAR Guidance for addressing wetlands in the energy sector**: a variety of relevant information for planning such as Inter-relationships between policies in energy, water, wetlands, climate change and other sectors.
- **BESTGRID 'Protecting nature in power grid planning' Handbook:** demonstrates how industry and civil society can both work to better combine power grid planning with nature protection.
- **RSPB Mapping and Locational Guidance:** GIS maps and written guidance on strategic planning for onshore and offshore wind farms in the United Kingdom.
- **RSPB 2050 Energy Vision Technical Report:** demonstrates an approach for analysing ecological risk of renewable generation technologies and spatial mapping energy deployment opportunities.
- **SEO Guidelines for Assessing the Impact of Wind Farms on Birds and Bats**: information for wind energy in Europe, including planning and SEAs.
- **UNEP/EUROBATS Guidelines for Consideration of Bats in Windfarm Projects:** guidance on how to consider bats strategically within energy planning.
- **Guidelines for Environmental Assessment of Projects likely to Affect the Natura 2000 Network**: best practices for Nature 2000 sites in Europe written by the Spanish National Power Transmission Company.
- **Working Group of German State Bird Conservancies**: recommendations for distances of wind turbines to important areas for birds as well as breeding sites.

2.1.3 ENGAGING STAKEHOLDERS EFFECTIVELY IN STRATEGIC SPATIAL PLANNING

- **BESTGRID: Public Participation and Transparency in Power Grid Planning:** recommendations drawn from case studies in Belgium, Germany and Netherlands.
- **Grid Expansion in Germany:** a short booklet that provides information on planning procedures and provides recommendations for how civil society can engage.
- **German Government Consultation**: government resources for how civil society can engage with the German government on grid infrastructure.

- **Grid Expansion in Germany: Public Participation**: a brief conceptual framework for how civil society can engage with the German government on grid infrastructure.
- **Renewable Grid Initiative Best Practices:** a database of good practice in grid development, including engaging stakeholders in the planning process.

2.2 TOOLS AND INFORMATION FOR SPATIAL PLANNING

2.2.1 TOOLS TO ASSIST WITH STRATEGIC SPATIAL PLANNING

- **The Integrated Biodiversity Assessment Tool (IBAT) for Business** is a decision support tool for assessments of development project proximity to species and their habitats for the private sector.
- **Scottish National Heritage page** provides a variety of useful resources for spatial planning, including for planners and developers.
- **Soaring Bird Sensitivity Mapping Tool**: This tool can be used to inform appropriate location for wind energy and power line developments based on the collision risk to migratory birds in the Rift Valley/Red Sea Flyway and the Mediterranean.
- **RSPB Mapping and Locational Guidance**: provides GIS maps and written guidance on strategic planning for onshore and offshore wind farms in the United Kingdom**.**
- **National Sensitivity Maps**:
  - Bulgaria
  - Germany
  - Greece
  - Ireland
  - Netherlands
  - Slovenia
  - South Africa

2.3 STRATEGIC SPATIAL PLANNING FOR ENERGY DEVELOPMENT IN PRACTICE

- **Desert Renewable Energy Conservation Plan:** an example of how strategic spatial planning has been implemented in California to develop a land use plan that promotes low impact renewable energy developments.

3 ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

Whilst beneficial for providing an indication of lower impact areas to prioritise for energy development, strategic spatial planning (see above) does not remove the need for site specific environmental impact assessment (EIA). However it should help inform EIAs.

Data is key

EIAs should not view the energy project in question in isolation. They should **include consideration of cumulative/'in-combination' effects** with existing and known planned developments.

Appropriate **specialists with local ecological knowledge should be used** to ensure the EIA is well informed and identifies the most appropriate mitigation measures.

Biodiversity baselines and monitoring plans are one of the most important pieces of work in an environmental assessment process (see also section 5 for monitoring). Through the identification of threats to species the EIA process informs what mitigation measures may be needed, for instance regarding technology design or 'shut-down on demand'.

3.1 GUIDANCE ON EIA

3.1.1 BEST PRACTICE GUIDANCE

- **Responsible Business Conduct for Institutional Investors:** key considerations for due diligence under the OECD guidelines for Multinational Enterprises
- **Principles for Responsible Investment:** guidance on integrating environmental, social and governance factors into investments
- **CMS Renewable Energy Technology and Migratory Species Guidelines**: guidelines on EIA procedures
- **AEWA Guidelines on infrastructural developments and waterbirds:** guidelines on EIA as part of a system for planning and implementing sustainable development.
- **Bern Convention Wind Farms and Birds Report**: an updated analysis of wind farms on birds and guidance on integrated planning and impact assessment.
- **Energy Task Force Case Studies:** best practice case study presentations on integrating migratory species considerations in renewable energy and power line developments (see Presentations).
- **Birdlife South Africa Best Practice Guidance on Birds & Solar Energy**: provides guidelines for assessing the impact of solar power on birds and identifying the most effective means to avoid, minimize and mitigate these impacts.
- **Birdlife South Africa Wind Energy Impact Assessment Requirements:** sets out minimum requirements for impact assessment for wind energy facilities.
- **Birdlife South Africa Best Practice Guidance on Birds and Wind Energy:** provides guidance for assessing the impact of wind energy facilities on birds in southern Africa.
- **EU Guidance on Integrating Climate Change and Biodiversity into EIA:** European Commission guidance on how to integrate consideration of biodiversity (and climate change) into environmental impact assessments

- **UNEP/EUROBATS Guidelines for Consideration of Bats in Windfarm Projects:** includes detailed guidance on how to carry out impact assessments.
- **Bern Convention Wind Farms and Birds Report**: an updated analysis of wind farms on birds with guidance on impact assessment.
- **Netherlands Commission for Environmental Assessment Resources**: a range of publications on environmental impact assessment, including good practice case studies of land use and energy planning.
- **NCEA Financing EIA Guidance:** describes the resource needs of the EIA process and financing mechanisms for raising revenue, with international case studies.
- **International Association for Impact Assessment (IAIA) Guidance:** Provides guiding principles and operating principles for biodiversity impact assessments.
- **Renewable Grid Initiative Best Practices:** a database of best practices including environmental impacts of grid development projects.

3.1.2 Assessing cumulative and in combination impacts

- **EU Guideline for Cumulative Impact Assessment:** provides guidance on assessment of indirect and cumulative impacts, as well as impact interactions.
- **RenewableUK Cumulative Impact Assessment (CIA) Guidelines:** guidance document aimed at planning and offshore wind industry professionals, focused on overcoming challenges of CIA including provision of data principles

3.2 Tools and information for EIA

3.2.1 Tools for carrying out EIA

- **The Integrated Biodiversity Assessment Tool (IBAT) for Research and Conservation Planning** is a decision support tool for Research and Conservation Planning.
- **South Africa EIA Database**: An environmental impact assessment data publishing tool for bird and bat monitoring.
- **Guidelines and tools for public participation in EIA:** Describes how to integrate public participation in EIA procedures, both in theory and in practice, including tools for organizing participation.
- **IFC Stakeholder Engagement**: a good practice handbook for companies developing projects in emerging markets, including guidance for how to integrate stakeholder engagement into the project cycle.

3.2.2 Environmental Impact Information for EIA screening

- **Synthesis by Swedish EPA:** provides examples of the effect of wind power on birds and bats and provides recommendations for pre and post construction surveys.
- **Knowledge base on wind energy and marine energy:** provides access to information about the environmental effects of marine and wind energy.
- **NABU Repowering wind farms:** This study details the impacts of repowering of wind farms on birds and bats in Germany.
- **Information sheet for Equator Principles Financial Institutions:** provides information on global datasets and tools for screening critical habitats, legally protected areas and internationally recognised areas.

- **National Sensitivity Maps:**
  - **United Kingdom**
  - **Bulgaria**
  - **Germany**
  - **Greece**
  - **Ireland**
  - **Netherlands**
  - **Slovenia**
  - **South Africa**

4 MITIGATION

Where all efforts have been taken to avoid impact on biodiversity through careful siting of energy projects, it is likely that mitigation measures will still be needed to reduce the residual impact of a renewable energy or powerline development to an acceptable level.

Mitigation measures are:

> *"Measures taken to reduce the duration, intensity, significance and/or extent of impacts (including direct, indirect and cumulative impacts, as appropriate) that cannot be completely avoided, as far as is practically feasible"*[2]

⚠ Care should be taken **not to confuse restoration and compensation measures with mitigation measures**. Mitigation must reduce impact a project has on the chosen location.

There are different wind energy and power line technologies that vary in size and design and the threats they pose. For example, low and medium voltage power lines are associated with electrocution and collision risks whereas high voltage power lines are mostly associated with collision risks, and the impact of wind farms can depend on the size and operation of the turbines. The aim is to offer tailored mitigation measures to address these specific threats, such as installing nest platforms on power lines or shut down on demand for wind turbines.

The success of mitigation measures largely depends on the adequacy of baselines and monitoring approaches and some mitigation measures may only be specific to a type of landscape feature or species.

⚠ It is important to ensure that mitigation measures are monitored (see section 5) and **adaptive management** is employed at project sites to ensure mitigation is working effectively.

4.1 GUIDELINES TO IDENTIFY APPROPRIATE MITIGATION MEASURES

4.1.1 IDENTIFYING AND IMPLEMENTING APPROPRIATE MITIGATION OPTIONS

- **MSB Wind Farm Guidelines:** provides guidelines on various mitigation actions for wind energy developments.
- **MSB Power Line Guidelines:** provides guidelines on various mitigation actions for power line developments.
- **MSB Shutdown on Demand:** provides a review and guidance on the use of "shutdown-on-demand" for wind turbines to conserve migrating soaring birds.
- **CMS Renewable Energy Technology Guidelines:** provides guidelines on wind farm configuration for lower impact on migratory species.
- **Guidelines on How to Avoid or Mitigate Impact of Electricity Power Grids on Migratory Birds in the African-Eurasian Region:** guidelines include mitigating electrocution and collision impact on birds.

- **UNEP/EUROBATS Guidelines for Consideration of Bats in Windfarm Projects:** guidelines on various mitigation measures that can be applied to bats
- **Mitigation Hierarchy Implementation Guide:** cross-sector guide on how to implement the mitigation hierarchy, including putting into practice project mitigation/minimization measures.
- **The World Bank Group's Environmental, Health, and Safety Guidelines**: technical reference documents with general and industry-specific examples of Good International Industry Practice for impact mitigation in range of energy sectors including Wind Energy, Power Lines and Geothermal energy (scroll to bottom of page).
- **German Policy on power lines:** example of a government policy to protect birds from medium voltage power lines.
- **Synthesis by Swedish EPA:** examples of the effect of wind power on birds and bats and measures to minimize impact in Sweden.
- **Energy Task Force Case Studies:** list of best practice case study presentations on integrating migratory species considerations in renewable energy and power line developments (see Presentations).
- **Renewable Grid Initiative Best Practices**: database of best practices in grid development, including environmental impact mitigation projects.

4.1.2 IMPLEMENTING ADAPTIVE MANAGEMENT

WREN Adaptive Management White Paper: information on adaptive management by assessing environmental effects.

5 MONITORING

In order to fully understand the possible impacts of proposed energy infrastructure on species, it is essential that **objective, structured and scientific monitoring** is carried out **prior, during and post-construction**.

A positive feedback loop between monitoring and mitigation should be established for all energy projects. Monitoring can inform adaptive management, thus ensuring effective ongoing mitigation.

Monitoring should seek to **collect data direct and indirect impacts**, and on **cumulative and 'in combination' effects** of a project within the context of wider land use/marine activities..

Data collected should be made available to stakeholders and wider industry. Efforts should be made to **ensure that data collected is easy to compare or integrate** with existing data sets.

5.1 GUIDANCE ON BEST PRACTICE MONITORING OF IMPACTS

5.1.1 ESTABLISHING THE BASELINE

- **AEWA Guidelines on Infrastructural Developments and Waterbirds**: provide guidelines on how to review baselines.

- **Guidelines on How to Avoid or Mitigate Impact of Electricity Power Grids on Migratory Birds in the African-Eurasian Region:** guidelines cover impact monitoring and evaluation of mitigation.
- **MFI & CSBI Baseline Guide**: a guide for developing a biodiversity baseline study.
- **CMS Renewable Energy Technology Guidelines**: provide general guidelines on pre- and post-construction monitoring.

5.1.2 MONITORING AND SURVEY APPROACHES

- **Synthesis by Swedish EPA**: examples of the effect of wind power on birds and bats and provides recommendations for pre and post construction surveys.
- **Bat Surveys:** good practice guide for professional ecologists on conducting bat surveys.
- **MSB Shutdown on demand:** guidance on the use of "shutdown-on-demand" for wind turbines that reviews radar systems used for monitoring.
- **Bat and Bird Mortality Occurring at Wind Energy Turbines:** describes monitoring approaches for carcass searches and surveys of animals prone to collisions.
- **Birdlife South Africa Guidance on Monitoring Wind Energy Impacts on Birds:** detailed best practice guidance on how to monitor impacts of wind energy on birds.
- **The World Bank Group's Environmental, Health, and Safety Guidelines**: technical reference documents with general and industry-specific examples of Good International Industry Practice for monitoring in a range of energy sectors including Wind Energy, Power Lines and Geothermal energy (scroll to bottom of page).
- **Energy Task Force Case Studies**: list of best practice case study presentations on integrating migratory species considerations in renewable energy and power line developments (see Presentations).

5.1.3 MONITORING CUMULATIVE IMPACTS

- **EUROBATS**: guidelines on how to monitor impacts and cumulative effects on bats.
- **RenewableUK Cumulative Impact Assessment (CIA) Guidelines:** guidance document aimed at planning and offshore wind industry professionals which includes principles for effective monitoring.
- **The Cumulative Effects Assessment (CEA) publication**: based on the Tafila Region Wind Power Project in Jordan.