Report 2022

Task 34

A White-Tailed Eagle soaring over the water. *Source: iStock 1078410696.*

Working Together to Resolve the Environmental Effects of Wind Energy (WREN)

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In September 2022, WREN proudly launched its Wind Energy Monitoring and Mitigation Technologies Tool. At its launch, the Tool encompassed 60 catalogued technologies which are used to assess and reduce the environmental impacts from land-based and offshore wind energy development.

To reduce the impact of wind energy development on wildlife, it is essential to employ scientifically robust, cost-effective solutions that inform sustainable decisions concerning wind siting, construction, operations, and decommissioning. The understanding that affected species dwell across jurisdictional boundaries, as well as the global reach of the wind energy industry, highlights a necessity to collaborate on an international scale.

Task 34, commonly known as WREN, facilitates international cooperation that advances the global understanding of the environmental effects of land-based and offshore wind energy development and creates a shared knowledge base of recommended practices for monitoring and mitigation strategies that meet both conservation and wind power generation goals.

2022 marked an eventful year for the goals of Task 34. WREN published a journal article titled 'International assessment of priority issues for land-based and offshore wind energy development' in Global Sustainability, which emphasised high priority issues that need to be addressed within the next 5 to 10 years. Additionally, WREN launched a Wind Energy Monitoring and Mitigation Technologies Tool that currently utilises 76 technologies (https://tethys.pnnl.gov/wind-energy-monitoring-mitigation-technologies-tool). The Task organised 3 public webinars and produced two research briefs. One concerned bats and barotrauma, while the other addressed raptor collision risk. The briefs were developed from input gathered from international subject matter experts from industry, non-governmental organisations, academia, government agencies, and research institutions. WREN actively supports the management of the Tethys knowledge base, which can be accessed here https://tethys.pnnl.gov. In the year of 2022, Tethys registered 260,000 annual visits and 600,000 page views. The platform is a valuable resource base for researchers and enthusiasts, which includes over 5,900 documents regarding wind energy and wildlife.

Introduction

Environmental impacts associated with commercial land-based and offshore wind energy can delay construction or curtail operations. In response to these ongoing concerns, the International Energy Agency (IEA) and Wind Technology Collaboration Programme joined WREN in October 2012. WREN serves as an international forum that provides crucial scientific data for government agencies, private industry, conservation organisations, and academia to inform siting and operational decisions. To fulfil these objectives, WREN conducts engagement and outreach activities targeting key stakeholder groups. Additionally, the organisation develops updated science materials including webinars, research briefs, and publications.

Specifically, WREN's goals are to:

1. Identify key stressors, such as noise or collision and receptors like marine mammals or birds. This involves assessing relevant methodologies and technologies used in species impact assessment studies, and developing best practices that mitigate these.
2. Collect and analyse data on high-priority issues concerning wind energy and to coordinate international collaborators to disseminate information to critical stakeholders across sectors.
3. Ensure the global community has access to the latest information on the research and development status of existing monitoring and mitigation technologies.

Table 1. Countries Participating in Task 34

	COUNTRY/SPONSOR	INSTITUTION(S)
1	**Belgium**	Royal Belgian Institute of Natural Sciences
2	**Canada**	Environment and Climate Change Canada
3	**France**	France Energies Marines
4	**Ireland**	N/A
5	**Italy**	Italian National Agency for New Technologies, Energy and Sustainable Economic Development
6	**The Netherlands**	Rijkswaterstaat
7	**Norway**	Norwegian Institute for Nature Research
8	**Portugal**	STRIX; Bioinsight
9	**Spain**	Spanish Council for Scientific Research
10	**Sweden**	Vindval; Swedish Energy Agency
11	**Switzerland**	Nateco AG
12	**United Kingdom**	Marine Scotland Science
13	**United States**	U.S. Department of Energy; Pacific Northwest National Laboratory; National Renewable Energy Laboratory

Progress and Achievements

One of the achievements WREN can announce is the publication of the paper 'International assessment of priority issues for land-based and offshore wind energy development' in Global Sustainability [1]. The publication summarises feedback from the international wind energy and wildlife community regarding high-priority environmental issues to be addressed in the next 5 to 10 years. The assessment included feedback from 294 stakeholders representing 28 countries. Regarding land-based wind energy, the most commonly expressed concern was wind turbine collision risk to, followed by collision risk to bats. Regarding offshore wind energy, seabird collision risk, underwater noise disturbing marine mammals and displacement of birds were identified as the greatest concerns amongst the participants. Additionally, the disruption of ecosystems and natural habitats remained a persistent concern regarding both land-based and offshore wind energy. This paper demonstrates an important step towards actionable solutions for combatting these urgent topics.

Additionally, WREN successfully organised two expert forums on topics surrounding wildlife interactions with wind turbines. This enabled engaging discussions between 10-15 field experts for each subject matter and resulted in the development of new research briefs for each of the two subject matters.

The first of which centres on bats and barotrauma [2]. Interestingly, it addresses a contradiction between earlier and more recent research. The former, dating back to 2008, suggested a connection between bat fatalities and rapid pressure changes encountered by the bats as they flew near wind turbine blades. Subsequent research indicates that barotrauma is unlikely to cause bat fatality, as the pressure differential needed to cause barotrauma only occurs within millimetres of the blade.

The second brief aims to investigate raptor interactions with wind turbines and the models used to predict collision risk [3] (Figure 1). Experts recognise that there is no one-size-fits-all model for collision risk. Therefore, models must consider the species, as well as individual turbine characteristics and landscape at the particular wind energy facility.

Furthermore, three public webinars were organised by the participants of Task 34. The first webinar presented the findings from the publication in *Global Sustainability*. The second launched the Wind Energy Monitoring and Mitigation Technologies Tool (see Highlights Section). The third discussed the impacts of offshore wind turbines on ecosystems and habitats.

Finally, WREN members participated in the Environmental Co-Design subgroup at the Topical Expert Meeting #109 on *Grand Challenges in Wind Energy*, where three environmental grand challenges were identified:

1. Incorporating environmental considerations throughout every phase of wind energy development, including its design, siting, construction, and operation phases.
2. Quantifying the environmental costs and benefits of wind energy development and integrating these factors throughout every decision point of the process.
3. Addressing the broader spatio-temporal environmental impacts

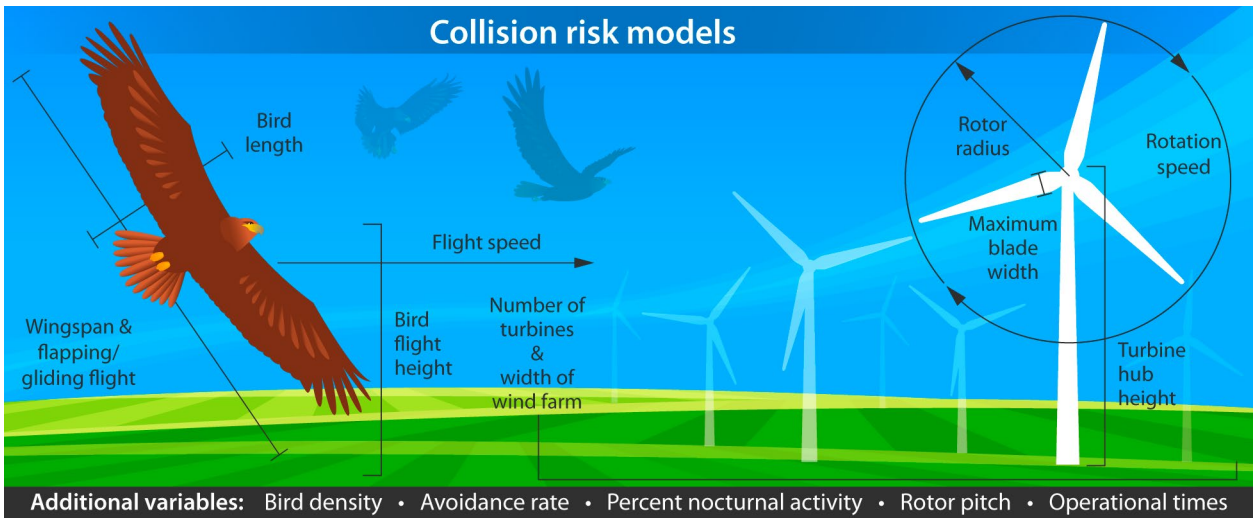

Figure 1. Variables that are often used in collision risk models for birds and wind turbines.
Source: The National Renewable Energy Laboratory.

of wind energy, assuming a goal of achieving 40% of electricity from wind energy by 2050. The subgroup has also developed several major long-term initiatives as well as short-term next steps to address the grand challenges.

Highlight(s)

In September 2022, WREN proudly launched its Wind Energy Monitoring and Mitigation Technologies Tool (https://tethys.pnnl.gov/wind-energy-monitoring-mitigation-technologies-tool). At its launch, the Tool encompassed 60 catalogued technologies which are used to assess and reduce the environmental impacts from land-based and offshore wind energy development. Examples of monitoring technologies include radar, thermal camera systems (Figure 1), and acoustic monitoring systems. Its mitigation technologies include ultrasonic bat deterrents, smart curtailment systems, and bubble curtains. The Tool provides the applicable phase of development for each technology, the stressor/receptor focus it concerns, the placement and integration of each technology with wind energy facilities, a summary of the technology development and validation, as well as links to reports and publications associated with the research and development of the technology. Since its inception, an additional 16 technologies have added and within the first six months, the tool generated close to 5,600 page views. Thus, highlighting its relevance.

Outcomes and Significance

International collaboration is essential to understand how the global deployment of wind energy affects species and habitats that cross jurisdictional boundaries. WREN's approach leverages research and incorporates diverse perspectives that enhance our global knowledge base. The outreach and engagement activities are designed to:

1. Ensure research and recommened practices are broadly disseminated to accelerate wind energy deployment while protecting species.
2. Expand international engagement among WREN and non-WREN members.
3. Create and maintain a global technology database as a reference of available monitoring and mitigating strategies.

The purpose of the knowledge transfer among WREN member and non-member nations aims to assist in advancing wind energy development by decreasing the levelised cost of energy and impacts on the environment. Within the last year, the Tethys website had 260,000 visits and 600,000 page views. A biweekly newsletter, called Tethys Blast, which includes recent news articles, upcoming webinars and conferences, and new publications, has 3,000 subscribers.

Next Steps

In the following year, the agenda includes three webinars have already been planned. One concerns compensation of bird impacts from offshore wind energy. The second discusses wind energy and wildlife issues in emerging markets. Finally, an expert forum deliberating monitoring and mitigation strategies for raptors has been organised. Task 34 will furthermore complete a report focused on the balance between wind power generation and wildlife conservation goals. To conclude, the Technologies Tool will continue to be updated by WREN on a biannual basis.

References

[1] Green et al. (2022). I*nternational assessment of priority issues for land-based and offshore wind energy developmen*t. Global Sustainability. https://doi.org/10.1017/sus.2022.14.

[2] Guest, E., and C. Hein. (2023). *The likelihood of bats experiencing barotrauma near moving wind turbine blades.* https://tethys.pnnl.gov/summaries/short-science-summary-likelihood-bats-experiencing-barotrauma-near-moving-wind-turbine

[3] Dempsey, L, and C. Hein. (2023). *Collision risk modelling-A tool for assessing risks to raptors at wind energy facilities.* https://tethys.pnnl.gov/summaries/short-science-summary-collision-risk-modeling-tool-assessing-risks-raptors-wind-energy.

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