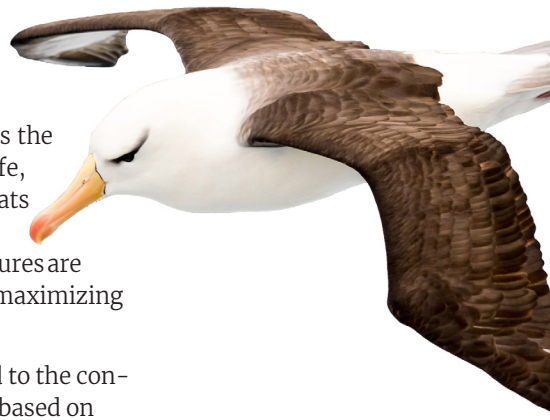
A Risk-Based Approach for Addressing Wind and Wildlife Interactions using Ecosystem-Based Management Values



RISK AND RISK-BASED MANAGEMENT

Risk is defined as the potential for a negative outcome to occur and is the product of the likelihood and the severity of that negative outcome.

Risk-Based Management is a system for the identification, assessment, and setting of priorities among risks, so that the appropriate level of resources can be applied to minimize, monitor, and control deleterious outcomes given the uncertainties in the system.

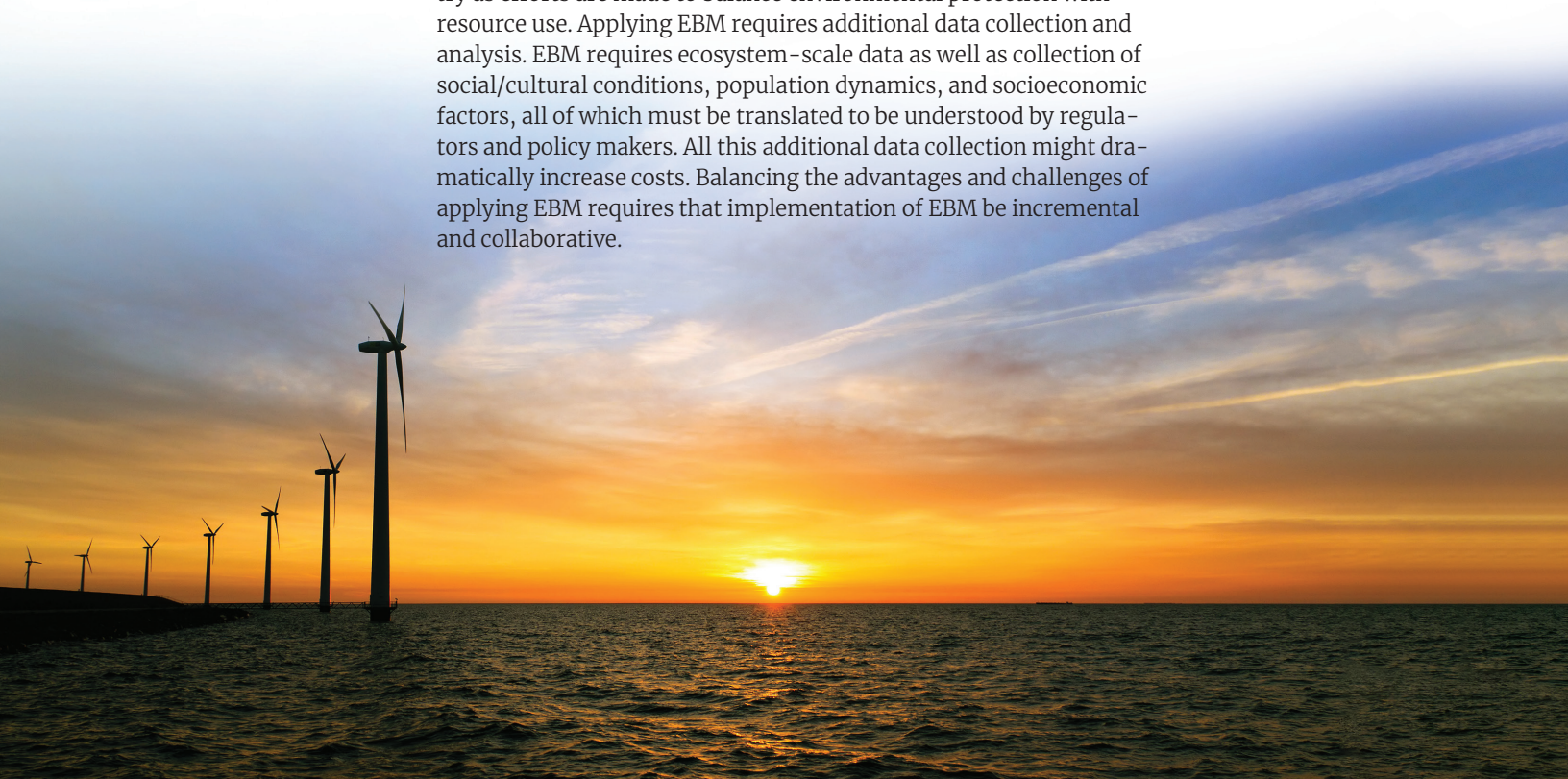
In the context of land-based and offshore wind energy development, Risk Based Management (RBM) examines the potential negative effects on birds, bats, terrestrial wildlife, marine mammals, other marine organisms and the habitats or migratory pathways that support them. RBM has the potential to ensure that wildlife protection measures are focused on the factors that pose the highest risks, while maximizing the production of energy.

However, where risk-based approaches have been applied to the construction and operation of wind farms, they generally are based on traditional risk assessment methods that focus on cost reduction and seldom take into account environmental factors.

ECOSYSTEM BASED MANAGEMENT

The risk-based approach that most closely addresses aspects of the complex ecosystems that make up the landscapes/seascapes of wind energy development is Ecosystem Based Management (EBM). EBM includes effects of human activities as well as environmental and ecological factors, using approaches that embrace holistic methods to include human needs and effects in an integrated view for managing resources sustainably.

There are challenges to implementing EBM in the wind energy industry as efforts are made to balance environmental protection with resource use. Applying EBM requires additional data collection and analysis. EBM requires ecosystem-scale data as well as collection of social/cultural conditions, population dynamics, and socioeconomic factors, all of which must be translated to be understood by regulators and policy makers. All this additional data collection might dramatically increase costs. Balancing the advantages and challenges of applying EBM requires that implementation of EBM be incremental and collaborative.



DEVELOPING A RISK MANAGEMENT FRAMEWORK FOR WIND ENERGY

EBM approaches to land-based and offshore wind energy projects are in the early stages of implementation internationally but have not been implemented in the U.S. The purpose of the RBM framework, shown in the table below, is not to scientifically assess the range of wind energy farms that are in development or operation around the world, but rather to identify a small subset of farms where there is a clear intent to examine and maintain environmental integrity by protecting wildlife populations, habitats, and ecosystem services. EBM encompasses 11 goals, including:

- **Sustainability** – Native animals, plants, and the habitats and migratory corridors that support them must persist. Population-level effects must be taken into account.
- **Ecological health** – The health and resiliency of the overall ecosystem is maintained or enhanced through management actions.
- **Inclusion of humans in ecosystem** – A range of ecosystem services are considered in developing management actions.
- **Complexity** – Management decisions acknowledge linkages between ecosystem components. These included predator-prey relationships, critical habitat needs for vulnerable populations, linkages of migratory corridors and critical habitats, and food web linkages at sea.

Additional goals of EBM are described in the Risk Based Management white paper.

From these goals of EBM, and through an examination of land-based and offshore wind energy projects, a risk-based framework for wind energy development has been formed.

RECOMMENDATIONS AND BEST PRACTICES

Based on RBM goals for wind farms, and tested against phases of several wind farms, recommendations are made to enhance and enable RBM for improving wind and wildlife outcomes:

1. **Complexity of Ecological Interactions:** Data collection and analysis must incorporate the complexities of spatial and temporal changes in populations and habitats, as well as ecological interactions between predators/prey and competitors.
2. **Science-Based Data Collection:** Where data are collected to describe the baseline of wildlife populations and habitat quantity/quality, as well as post-installation monitoring, they should be based on questions of scientific importance (such as population-level effects, changes in critical habitat for species under stress, etc.), provide adequate data in context for interpretation, and to the greatest extent possible use standardized methods for pre- and post-installation studies.
3. **Mitigation Hierarchy:** Monitoring results should be re-evaluated, and monitoring efforts realigned to act as mitigation measures, allowing post-installation monitoring results to guide appropriate environmental mitigation measures during design, siting, construction, operation, and decommissioning.
4. **Integration of Adaptive Principles:** Implementing full Adaptive Management policies should be the goal of governments seeking to reduce scientific uncertainty and support future wind energy development over landscape or regional scales. Adaptive processes must also allow for decreases in monitoring and mitigation efforts if monitoring data indicate a lower than anticipated risk to species under special protection and the habitats that support them.
5. **Inclusion of Stakeholders:** In addition to lowering opposition to projects, stakeholders who have engaged in one successful wind farm development can be key supporters of subsequent projects, and they can provide local knowledge, and under certain circumstances, community involvement in financing and offtake of power.
6. **Focus on Social and Economic Outcomes:** Ecological risk is unavoidably linked to social acceptance of wind farm development. Understanding the potential social and economic risks and benefits of a wind farm prior to consenting and licensing has the same effect as engaging with stakeholders about ecological concerns: it decreases the chances of large organized opposition to development and increases the potential positive outcomes of support and acceptance.

You can find the full text of the risk-based management review online on *Tethys*: Risk-Based Management white paper.

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