

Wind energy and bat conservation: Scientists call for the global application of measures to reduce fatalities

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The construction of wind turbines as a cornerstone for the production of climate-friendly electricity is rapidly increasing all over the world—and everywhere this results in major challenges for bats, which die directly at the turbines or lose valuable habitats in their vicinity.

A research team from Australia, Brazil, France, Germany, Kenya, Puerto Rico, Taiwan, the United Kingdom and the U.S. now analyzed possible solutions to this green-green conflict on a global scale and identified the steps required to improve the balance between climate protection and [biodiversity conservation](#). The [paper](#) is published in the journal *BioScience*.

The team demonstrates that scientifically proven methods for reducing bat casualties need to be implemented more consistently into regulations for the operation of wind turbines worldwide and significant research gaps on the interaction of bats with turbines in countries of the Global South and in tropical ecosystems need to be closed.

Global climate change requires effective measures to reduce greenhouse gas emissions in energy production. The expansion of wind [energy production](#) is a promising path, as the yield in electric energy is relatively high in relation to the investment and the size of the area used. However, this approach often has notable detrimental effects on local biodiversity, as wind turbines significantly alter habitats in their immediate vicinity.

Bats, birds and insects in particular are affected in several ways: "Bats collide with the rotor blades if they come too close to them," says Dr. Christian Voigt, Head of the Department of Evolutionary Ecology and bat specialist at the Leibniz Institute for Zoo and Wildlife Research (Leibniz-IZW). "Additionally, there is a direct habitat loss at the construction sites for turbines as well as an indirect loss, since some [bat species](#) avoid turbines over long distances and are therefore driven away from their traditional habitats."

Estimates showed that, in Germany alone, more than 200,000 bats die at wind turbines every year—rendering this a serious conservation issue, not only in Germany but all over the world, the team concludes.

The global expansion of energy use from wind power can therefore become a problem for the protection of biodiversity. In the European Union, in Canada and parts of the U.S., measures to reduce the number of bat casualties have already been successfully implemented. Accordingly, wind turbines should, first of all, not be erected at ecologically valuable sites.

For example, structurally rich and diverse [old-growth forests](#) ("ancient woodlands") should not be made available for wind energy use. In addition, erecting turbines in the proximity of forest edges or water bodies as well as known migration corridors for birds and bats should be avoided.

Second, low-yield periods of low wind speeds at night, when bats are most active, should be excluded from operation ("curtailment"). In temperate latitudes, the estimated yield loss is low—between 1% and 4%—but the number of fatalities can thereby be reduced by more than 80%.

In addition, at low wind speeds below the "cut-in" at which turbines begin to generate electricity, the rotor blades should be set at such an angle to the wind that this allows the blades only to turn slowly ("feathering"). This additionally reduces the risk of fatalities at the [rotor blades](#).

According to the scientific team, these measures could improve the compatibility of climate and biodiversity protection—if they are well implemented. There is a lot of catching up to do here, as the corresponding requirements have so far been limited almost exclusively to the regulations of countries where bats are protected. From a global perspective, these are only a few countries.

In the U.S., protection status only applies to bat species that are

categorized as "threatened with extinction" and therefore come under the Endangered Species Act. In EU member states, all bat species are strictly protected, yet the implementation of conservation measures is still patchy.

"In Germany, for example, two-thirds of wind turbines on the mainland—that is 18,000 turbines—are operated without curtailment to protect bats," explains Voigt. "Without appropriate regulations to ensure curtailment, an average of 14 bats per year die at a single wind turbine, and at some turbines more than 100 animals per year."

Globally, challenges for bats are even larger, the team elaborates in the scientific paper. The Convention on the Conservation of Migratory Species of Wild Animals of the United Nations Environment Program (UNEP) also calls for the protection of bats. Although 131 countries worldwide have joined this UN convention, most signatories have implemented few or no protective measures for bats at wind turbines.

Furthermore, some representatives of the international wind energy industry seem not aware of the need to consider the protection of biodiversity when expanding the use of wind energy. For example, the work of the International Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) is not sufficiently taken into account and measures to protect endangered species are ignored or criticized by investors as obstructive.

"In Brazil for example, wind farms are being set up in areas with high biodiversity values," says Prof Dr. Enrico Bernard from the Universidade Federal de Pernambuco in Recife (Brazil), a co-author of the paper. "However, their environmental licensing is rather relaxed and only adopts poor standards.

"A more rigorous licensing is strongly needed in the Global South, also

by international players that are operating large multi-turbine facilities in Europe or North America. They should adopt the same high standards for their farms also in South and Central America." Bernard concludes that adopting standards known from North America and Europe in countries of the Global South would be a big step for bat conservation.

As wind energy expands globally, more research is urgently needed to understand the vulnerability and collision risk of bat species at biodiversity hotspots in the Global South. This risk, for example, also applies to flying foxes, which are regularly killed by wind turbines in Africa, Asia and Australia.

"We lack knowledge about their number of fatalities, about seasonal peaks in activity, and about whether the measures that are considered effective in central Europe and in North America are also effective in countries of the Global South and in tropical ecosystems," concludes Voigt.

Bats are globally important players in ecosystems, consuming pest insects, dispersing tree seeds in subtropical and tropical regions and pollinating numerous plants. Many scientific investigations also demonstrated the high economic benefits of bats. Protecting bats around [wind turbines](#) also benefits society, the scientists say.

More information: Christian Voigt et al, Towards solving the global green-green dilemma between wind energy production and bat conservation, *BioScience* (2024). [DOI: 10.1093/biosci/biae023](https://doi.org/10.1093/biosci/biae023). academic.oup.com/bioscience/advance-article/doi/10.1093/biosci/biae023/7639565

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