

Science for Environment Policy

Reducing avian collisions with wind turbines

Wind is an important renewable energy source for Europe. The wind power capacity installed in 2014 could produce enough electricity to meet over 10% of the EU's electricity consumption. However, wind power structures can also be harmful to birds, which can collide with turbines. This study assessed methods of reducing avian collisions with wind turbines and makes several practical recommendations.

Wind energy is an important means of mitigating [climate change](#). However, it can also present a danger to birds, which can fatally collide with wind turbines. This conflict with biodiversity can also delay consent processes for wind energy infrastructure. There is therefore a need for practical measures that can effectively reduce bird deaths related to wind energy.

This study reviewed the literature on post-construction measures to reduce bird mortality from collisions with wind turbines. Assessments were based on prior reviews of the topic, keyword searches of internet resources and direct contact with international experts, including researchers, industry representatives and government agencies.

In total, 77 references to 26 different mitigation measures were collected. The measures were categorised as turbine- or bird-based. Turbine-based measures involve changes to the design of wind power plants, the location of turbines and their operation. Bird-based approaches directly alter bird behaviour and can include additions to wind turbines, such as flashing lights or loud noises, and changes to habitats, such as increasing the attractiveness of areas outside wind power plants or decreasing the attractiveness of the turbine area.

In order to compare the efficacy of these different measures, the researchers used a set of six qualitative criteria, which included risk reduction and implementation costs. For each mitigation measure, the six criteria were scored from one to three (three being the most preferable).

Of the turbine-based mitigation measures, altering turbine speed and temporary shutdown were the most effective, receiving an average total score of 2.83 and 2.67, respectively. Reducing the speed of the rotating turbine blades and temporarily shutting down turbines reduce the frequency of birds colliding with the rotor blades, although not with the structure itself.

Of the bird-based measures, reflectors, visual scare deterrence and lasers were the most effective visual cues, all receiving a score of 2.50 or above. Reflectors, most often in the form of mirrors, can scare birds away from turbines in the sunlight, while active visual cues like lasers are effective in low levels of light and therefore may be most relevant to nocturnal birds.

Sounds are socially important to birds and therefore audible deterrence was also effective, receiving a score of 2.67. The authors recommend use of sounds with a biological meaning, such as predation or warning calls, and at short distances.

Continued on next page.



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The researchers also assessed habitat changes. They say increasing the attractiveness of areas surrounding a wind power plant, for example creating novel habitats or breeding sites for birds, may be the preferred option of drawing bird species away from turbines compared to decreasing the attractiveness of the turbine area. This is because the latter may force birds to sub-optimal habitats, thereby affecting the entire population.

To reduce wildlife impact the authors also recommend the development of wind energy on 'disturbed land' (land that has been previously used for human activity), such as brownfield sites, and say that construction activity should not be carried out near to breeding territories or during the breeding season.

Finally, the authors make two key recommendations for future turbine design and construction. They recommend lighting regimes that combine passive visual cues, such as UV coatings, with active measures, like flashing lights, which will reduce risk at both high and low light levels. They also recommend bird-friendly siting of turbines, involving identifying locations with a high risk of collision (such as agricultural areas and migration corridors) and removing or relocating these turbines.

