Scientific references – noise from wind turbines and impact on humans and animals

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Infrasound and ear

Salt & Hullar (2010): Responses of the ear to low frequency sounds, infrasound and wind turbines
Notes: Certain cells and structures in the inner ear are sensitive to infrasound and can be stimulated by low frequency sounds at levels below hearing threshold. The concept that an infrasonic sound that cannot be heard can have no influence on inner ear physiology is incorrect. A-weighting wind turbine sounds underestimates the likely influence of the sound on the ear. A greater effort should be made to document the infrasound component of wind turbine sounds under different conditions.

Weichenberger et al. (2017): Altered cortical and subcortical connectivity due to infrasound administered near the hearing threshold – Evidence from fMRI
Notes: Brain responses towards near- and supra-threshold infrasound stimulation (sound frequency < 20 Hz) was investigated in 14 persons under resting-state fMRI conditions. Prolonged infrasound exposure near the participants' individual hearing threshold led to higher local connectivity in three distinct brain areas – right superior temporal gyrus, anterior cingulate cortex and right amygdala. Infrasound near the hearing threshold may induce changes of neural activity across several brain regions, some of which are known to

be involved in auditory processing, while others are regarded as key players in emotional and autonomic control.

Koch (2017): Hearing beyond the limit: Measurement, perception and impact of infrasound and ultrasonic noise
Notes: Conference paper

Infrasound and brain

Xia et al. (2025): Advancements in Elucidating the Mechanisms of Central Nervous System Damage Induced by Infrasound Exposure
Notes: Describing molecular mechanisms of CNS damage caused by infrasound

Forlim et al. (2024): Resting state network changes induced by experimental inaudible infrasound exposure and associations with self-reported noise sensitivity and annoyance
Notes: 38 participants were exposed to inaudible airborne infrasound (6 Hz, 80–90 dB) or sham devices for four weeks (8 h/night). Brain functional connectivity (FC) changes were assessed in resting-state networks (auditory, default mode (DMN), sensorimotor (SMN), and executive control (ECN)). Infrasound 'sensitivity' as a predictor of identified significant FC changes was explored, and correlations between somatic symptoms and FC were examined. Infrasound exposure led to decreased FC in the right precuneus (DMN) and increased FC in the Vermis IV and V (SMN). In the ECN, an increased FC in the right frontal middle gyrus (BA8) and the right inferior parietal lobe, and decreased FC in another region of the right frontal middle gyrus was observed. Changes in the ECN (right inferior parietal lobe) were negatively associated with self-reported annoyance from infrasound/low-frequency noise. A significant negative association was found between FC changes in the DMN (right precuneus) and somatic symptoms. The study is the first to investigate prolonged infrasound exposure effects on brain FC, revealing changes in the vDMN, SMN, and ECN related to cognitive and sensory processing, but not in the auditory network.

Koch (2022): A basic identification of late auditory evoked potentials at infrasound frequencies: Support via neural network–based signal processing
Notes: Neural-network methods applied for the analysis of electroencephalography (EEG) data recorded in response to infrasound stimuli presented - late auditory evoked potentials (LAEPs) were detected. Useful for objectively identify perception events by infrasound in humans.

Zhang et al. (2023): Inhibition of astroglial hemichannels ameliorates infrasonic noise induced short-term learning and memory impairment
Notes: Rats were exposed to 16 Hz and 130 dB infrasound for 2 h every day for 14 days. This exposure resulted in impaired learning and memory.

Liang et al. (2024): Effect of low-frequency noise exposure on cognitive function: a systematic review and meta-analysis
Notes: Meta-analysis suggests that low-frequency noise can negatively impact higher-order cognitive functions, such as logical reasoning, mathematical calculation, and data processing.

Inagaki et al. (2014): Analysis of aerodynamic sound noise generated by a large-scaled wind turbine and its physiological evaluation
Notes: Aerodynamic noise generated from a modern large-scale wind turbine was measured and analyzed from an engineering point of view. The measurement items were the sound, the sound pressure level (including the infra sound with extremely low-frequency band) and the corresponding physiological evaluation. Fifteen test subjects received various sound stimuli, including the recorded aerodynamic noise and a synthetic periodical sound, were examined with an electroencephalogram as a physiological evaluation. It was observed from the mapping patterns of brain waves that alpha1 rhythm, which indicates a relaxed and concentrated state, after the sound stimulus with the frequency band of 20 Hz, showed the lowest value among the other cases. That is, the test subjects cannot keep relaxed and their concentration after hearing the sound stimulus at the frequency band of 20 Hz. The induced rate of alpha1 rhythm almost decreased when the test subjects listened to all the sound stimuli, and further decreased with decreased frequency. Meanwhile, beta1 rhythm, which shows a strain state, after the sound stimulus with the frequency band of 20 Hz, showed the highest value among the other cases.

Therefore, the infrasound (e.g., low frequency and inaudible for human hearing) was considered to be an annoyance to the technicians who work in close proximity to a modern large-scale wind turbine.

Infrasound and cardiovascular system

Ryan et al. (2021): Negative Effect of High-Level Infrasound on Human Myocardial Contractility In-Vitro Controlled experiment

Notes: Exposure to high levels of infrasound (more than 100 dBz) interferes with cardiac muscle contractile ability, as early as one hour after exposure. There are numerous additional studies which support this conclusion. These results should be taken into account when considering environmental regulations.

Noise and psychological health, including sleep and pain

Chen et al. (2025): Effect of Chronic Exposure to Low-Frequency Noise on Musculoskeletal Pain, Psychological Distress, and Quality of Life in Employees

Notes: This study focused on 256 employees from a local automobile manufacturing company who experienced shoulder, neck, lower back, and leg pains from August 2022 to August 2023. Participants were categorized into two groups according to their chronic exposure to low-frequency noise: the noise-exposed group (n = 119), who were exposed to noise levels **of 0-200 Hz > 80 dB for more than 8 hour per day**, and the non-noise group (n = 137), with less than 8 h/day during the same period. Chronic exposure to low-frequency noise was associated with heightened pain perception and psychological distress (anxiety, depression) among workers, which influenced certain quality of life parameters.

Hahad et al. (2024): Noise and mental health: evidence, mechanisms, and consequences

Notes: Easy read. Noise in general, not specifically wind turbine noise or infrasound

Environmental psychology, editorial team (2024): Low Frequency Sound: Psychological Impact on Humans.
Notes: Easy read for non-scientists

Reviews on human health

Li et al. (2025): Injury of sonic weapons to human body: A narrative review
Notes: A review of sonic weapons (including infrasound), mechanisms and characteristics of injury and biological effects. Explanation of basic acoustic concepts.

Alves et al. (2020): Low-Frequency Noise and Its Main Effects on Human Health—A Review of the Literature between 2016 and 2019
Notes: Table 1 gives a good overview. Main effects on human health: sleep disorders (11.7%), discomfort, sensitivity and irritability to noise (10%), annoyance (13.3%), stress (6.7%), hearing loss (8.3%), reduced performance/fatigue (5%), heart rate/cardiovascular diseases (10%), tension and blood pressure (6.7%), anxiety (1.7%), depression (3.3%), imbalance (3.3%), and mental performance (6.7%). There were also other effects on human health but with an incidence in very specific aspects (13.3%), such as the frequency of chromosomal aberrations in bone marrow cells, excess bilirubin, peptic ulcers (gastric and duodenal), effects on the cerebral blood barrier, haemodynamic events, irreversible imbalance with structural damage to the otoconial membrane, tinnitus and sound reconversion therapy, and vocal disorders and effort.

Baliatsas et al. (2016): Health effects from low-frequency noise and infrasound in the general population: Is it time to listen? A systematic review of observational studies
Notes: Old review, annoyance, concludes that more research is needed

Piermont (2009): Wind-Turbine-Syndrome (book)
Notes: Executive summary of the book: Wind Turbine Syndrome: Executive Summary | Wind Energy Impacts and Issues

Jeffery et al. (2013): Adverse health effects of industrial wind turbines
Notes: Industrial wind turbines can harm human health if sited too close to residents. Physicians should be aware of patients reporting adverse effects.

Danish health investigation (6 articles)

The Danish health investigation (6 published papers in total) is build on data from 1982-2013, where the majority of the wind turbines were well below 75 m and therefore much smaller than modern on shore wind turbines >150m. Taller wind turbines generates more infrasound and low frequency sound compared to smaller wind turbines. Noise was simulated from wind data, not measured. A-weighted dB is used also for low frequency sound (10-160 Hz in this investigation).

People living up to 40 times (!) the total height of the nearest wind turbine were included. That study design will obviously impact the possibility of finding any causalities. In Denmark the minimum distance to houses is 4 times the total height of the wind turbine.

The 6 articles are listed below.

Poulsen et al. (2018): Long-term exposure to wind turbine noise and redemption of antihypertensive medication: A nationwide cohort study
Notes: Non-conclusive study

Poulsen et al. (2019): Impact of Long-Term Exposure to Wind Turbine Noise on Redemption of Sleep Medication and Antidepressants: A Nationwide Cohort Study
Notes: High levels of outdoor WTN was associated with redemption of sleep medication and antidepressants among the elderly, suggesting that WTN may potentially be associated with sleep and mental health.

Poulsen et al. (2019): Long-Term Exposure to Wind Turbine Noise and Risk for Myocardial Infarction and Stroke: A Nationwide Cohort Study
Notes: Non-conclusive study

Poulsen et al. (2018): Short-term nighttime wind turbine noise and cardiovascular events: A nationwide case-crossover study from Denmark
Notes: Non-conclusive study. Suggests that indoor LF WTN at night may trigger cardiovascular events (stroke, myocardial infarction), whereas these events seemed largely unaffected by nighttime outdoor WTN.

Poulsen et al. (2018): Pregnancy exposure to wind turbine noise and adverse birth outcomes: a nationwide cohort study
Notes: Non-conclusive study

Poulsen et al. (2018): Long-term exposure to wind turbine noise at night and risk for diabetes: A nationwide cohort study
Notes: Non-conclusive study

Technical articles, including infrasound propagation

Mattsson et al. (2025): Efficient finite difference modeling of infrasound propagation in realistic 3D domains: Validation with wind turbine measurements
Notes: The article describes the differences between the current simplified standard calculation models used by the wind turbine industry and permitted by the authorities, and an advanced calculation model, SoundSim360, which has been validated using measurements taken at operating wind farms.

The simplified standard calculation models systematically underestimate low-frequency noise.

With SoundSim360, low-frequency noise and infrasound can be predicted accurately in realistic three-dimensional environments that account for varying atmospheric conditions and the underlying terrain.

The simplified calculation methods rely on ray tracing, where sound is described as rays and where the user can adjust various parameters and thereby influence the result. The farther from the sound source, the more inaccurate the calculated values become—particularly at distances over 500 metres. Ray tracing is especially problematic for calculating low-frequency noise and infrasound (below 200 Hz) and for predicting how sound propagates through and around structures such as buildings. Low-frequency noise attenuates more slowly in air and building materials and propagates over much greater distances compared with higher-frequency sound.

SoundSim360 does not describe sound as rays but as three-dimensional waves.

The main objective of the study is to validate SoundSim360 against accurate infrasound measurements from modern wind turbines that emit significant amounts of infrasound. Another objective is to map the infrasound from various modern wind turbines and to examine how atmospheric conditions affect sound propagation. The infrasound measurements were conducted at the wind farms at Målarberget and Lervik.

During these measurements, two of the researchers experienced sleep disturbances and migraines after being exposed to 95 dB infrasound (1 Hz) for just four hours. It is well known that infrasound can trigger migraine attacks, especially in particularly sensitive individuals, who make up roughly one-third of the population.

The infrasound is generated by the pressure difference produced each time a blade passes the tower. The larger the blades, the more infrasound is emitted. Its pulsating nature with regular spikes distinguishes wind turbine infrasound from natural infrasound sources and makes it particularly disturbing. The authors explain that existing studies of infrasound effects on humans and animals are insufficient because their duration is too short and they do not replicate pulsating infrasound; instead, they rely on broader-spectrum infrasound without the characteristic spikes. The authors call for long-term studies using pulsating infrasound and involving sensitive individuals and relevant medical experts, such as otoneurologists.

Measuring infrasound differs significantly from ordinary sound measurements and requires specially calibrated and carefully placed equipment that must be shielded from wind, for example with a special metal windscreen. The measurements were made using Lidström microphones, developed specifically for measuring low-frequency noise down to 1 Hz from sources such as helicopters. The Lidström microphones were calibrated at NORSAR, a CTBTO-certified infrasound station. The CTBTO is the nuclear test-ban treaty organisation’s monitoring system for nuclear explosions, and these stations host extremely precise equipment used to verify the accuracy of other microphones.

The measurements show that large modern wind turbines generate significantly more infrasound than older, smaller turbines. The studies also show that atmospheric conditions (temperature, humidity, wind, etc.) play an important role in the propagation of infrasound from wind turbines, and that such parameters must be included to achieve a realistic prediction of infrasound propagation. Atmospheric conditions cannot be described as constant. There are large atmospheric differences between day and night, especially in forested areas, and also throughout the year.

The studies show that SoundSim360 can reliably and accurately predict the propagation of infrasound from wind turbines under realistic and complex 3D conditions.

The research group's work is financially supported by the Swedish Research Council.

Cailloce (2024): Infrasound, sound waves that nothing can stop
Notes: Easy read for non-scientists about infrasound, propagation, atmosphere, impact on humans, A-weighting that is not suitable for infrasound.

Crozier (2025): Infrasound with large peak to trough blade pass harmonics in two houses between three large wind turbine farms - wtfs on the northwest coast of Norway and two single health cases and a health survey near the wtf in Tysvær, Norway.pdf
Notes: Case reports from Norway. Infrasound levels measured inside and outside houses approx. 10 km from large wind turbine farms. Despite the considerable distance distinct blade-pass harmonics (repetitive low-frequency pressure pulses synchronized with turbine blade rotation) were recorded also inside homes. Wind turbine-generated infrasound propagated over long distances with little attenuation.

Takefuji (2025): Understanding environmental noise: Transmission, attenuation, resonance and health implications
Notes: Comprehensive analysis of noise attenuation, covering point, line, and plane sources, frequency-dependent attenuation, and environmental factors. It specifically addresses the often-overlooked attenuation of infrasound and explores the unique characteristics of both natural resonance noises. The paper discusses the limitations of FFT frequency resolution and its impact on acoustic signal measurement, suggesting potential advancements in acoustic measurement technologies to address these limitations. Additionally, it highlights the potential health implications of infrasound, including its ability to cause resonance and amplify sound levels. By offering a detailed overview and addressing specific gaps in knowledge, this paper contributes to a better understanding of environmental noise and its implications for human health and the environment.

Ziaran et al. (2025): Low frequency sound generated by industrial equipment and its negative impact on human health

Notes: This article includes a comparison between dBA and dBZ field measurements of infrasound from wind turbines – and clearly shows how dBA is inappropriate for infrasound.

Wind turbine noise and wildlife / nature / domestic animals

Velilla et al. (2021): Vibrational noise from wind energy-turbines negatively impacts earthworm abundance

Notes: Larger soil animals, such as earthworms (macrofauna, > 1 cm in size), are particularly likely to be impacted by the low-frequency turbine waves that can travel through soils over large distances. This study examined the effect of wind turbine-induced vibrational noise on the abundance of soil animals. Vibratory noise levels dropped by an average of 23 ± 7 dB over a distance of 200 m away from the wind turbines. Earthworm abundance showed a strong decrease with increasing vibratory noise.

Agnew et al. (2016): Wind turbines cause chronic stress in badgers (Meles meles) in Great Britain

Notes: Assessment whether the presence of wind turbines in Great Britain impacted the stress levels of badgers (*Meles meles*) in nearby setts. Hair cortisol levels were used to determine if the badgers were physiologically stressed. Hair of badgers living <1 km from a wind farm had a 264% higher cortisol level than badgers >10 km from a wind farm. This demonstrates that affected badgers suffer from enhanced hypothalamo-pituitary-adrenal activity and are physiologically stressed. No differences were found between the cortisol levels of badgers living near wind farms operational since 2009 and 2012, indicating that the animals do not become habituated to turbine disturbance. It is suggested that the higher cortisol levels in affected badgers is caused by the turbines' sound and that these high levels may affect badgers' immune systems, which could result in increased risk of infection and disease in the badger population.

de Oliveira et al. (2025): Wind farm noise negatively impacts the calling behavior of three frogs in Caatinga dry forests

Notes: Significant relationship between wind turbine noise and changes in acoustic parameters of three species of frogs.

Tolvanen et al. (2023): How far are birds, bats, and terrestrial mammals displaced from onshore wind power development? – A systematic review

Notes: Systematic review about how far birds, bats and terrestrial mammals are displaced from onshore wind turbines – as a common group up to 5 km.

Voigt (2021): Insect fatalities at wind turbines as biodiversity sinks

Notes: It is estimated that each wind turbine in Germany kills 40 million insects/year by directly hitting them.

Theorell & Vemdal (2024): Varför ökar äggmortaliteten i närheten av en ny vindkraftsanläggning? / Why is the egg mortality increasing near a new wind turbine park?

Notes: Article in Swedish from Swedish Veterinary Magazine. Egg mortality has increased after a wind turbine park was established 1000 m from a chicken egg farm. From 2009-2020 the hatching rate has been >95% after 21 days of brooding. In 2021 twelve 4.5 MW wind turbines were established 1000 m from the farm. From 2021-2023 the hens stop brooding after 16 days and all eggs are dead. Egg mortality can have different causes like e.g., stress, malnutrition, age, inbreeding, infections and parasites. The authors are pointing out that noise and vibrations can also be a cause and it should be investigated further. Previous studies have indicated a causality. Those studies are described in the article, see references in the Swedish article. High focus on vibrations propagated through the field. Low frequency noise can affect chromosomes. The authors suggest further interdisciplinary research.

Karwowska et al. (2014): Effect of Noise Generated by the Wind Turbine on the Quality of Goose Muscles and Abdominal fat

Notes: The study suggests that noise generated by a wind turbine, Vestas V90, affected the quality of muscles and the fatty acid profile of abdominal fat of geese. The muscles of geese reared at a distance of 50 m from the wind turbine were characterized by higher pH and TBARS values compared to those reared at a longer distance from the wind turbine. The significantly lower content of C 18:3 n-3 fatty acid in abdominal fat was observed for geese reared 50 m from the wind turbine. Further studies should be undertaken to establish the safe distance of a wind turbine from livestock buildings.

Karwowska et al. (2015): The Effect of Varying Distances from the Wind Turbine on Meat Quality of Growing-Finishing Pigs

Notes: Rearing pigs in close proximity to a 2 MW wind turbine (50 m) resulted in decreased muscle pH, total heme pigments and heme iron as well as reduced content of c18:3n-3 fatty acid in the loin muscle. Loins of pigs reared 50 m from the wind turbine were characterized by significantly lower iron content (6.7 ppm g–1) compared to the loins of pigs reared 500 and 1000 m from the wind turbine (10.0–10.5 ppm g–1). The concentration of α-linolenic acid (C18:3n-3) in loin and neck muscles decreased as the distance from the wind turbine increased. Avoiding noise-induced stress is important not only for maintaining meat quality but also for improving animal welfare.

Weschler & Tronstad (2024): Wind energy and insects: reviewing the state of knowledge and identifying potential interactions

Notes/abstract: In 2023 the wind industry hit a milestone of one terawatt of installed capacity globally. That amount is expected to double within the next decade as billions of dollars are invested in new wind projects annually. Wildlife mortality is a primary concern regarding the proliferation of wind power, and many studies have investigated bird and bat interactions. Little is known about the interactions between wind turbines and insects, despite these animals composing far more biomass than vertebrates. Turbine placement, coloration, shape, heat output, and lighting may attract insects to turbines. Insects attract insectivorous animals, which may be killed by the turbines. Compiling current knowledge about these interactions and identifying gaps in knowledge is critical as wind power grows rapidly. We reviewed the state of the literature investigating insects and wind energy facilities, and evaluated hypotheses regarding insect attraction to turbines. We found evidence of insect attraction due to turbine location, paint color, shape, and temperature output. We provide empirical data on insect abundance and richness near turbines and introduce a risk assessment tool for comparing wind development with suitable climate for insects of concern. This understudied topic merits further investigation as insects decline globally. Compiling information will provide a resource for mitigation and management strategies, and will inform conservation agencies on what insects may be most vulnerable to the expansion of wind technologies.

Katzner et al. (2025): Impacts of onshore wind energy production on biodiversity

Notes/abstract: Wind is increasingly used as a renewable source of energy worldwide. However, harvesting wind energy can have negative consequences for biodiversity. In this Review, we summarize the growth of onshore wind power, its impacts on species and ecosystems, and how those impacts are assessed and mitigated. Across the construction, operation and decommissioning stages, wind facilities are associated with wildlife fatality and behavioural change as well as alteration, loss and fragmentation of terrestrial and aerial habitat. These negative consequences can be mitigated by avoiding construction of wind turbines at sensitive sites, detecting and deterring wildlife, curtailing turbines to reduce fatalities, and replacing lost habitats. Uncertainty about wildlife populations and their demographic parameters, the rate and extent of build-out of onshore wind energy, and best practices for mitigation, as well as variability in regulatory requirements by country or region, all contribute to the difficulty of predicting the consequences of this technology for biodiversity. Scenario-based modelling that incorporates population- and community-level consequences to biodiversity from varying degrees of wind energy development — including the cumulative effects of multiple facilities — is key to addressing this uncertainty.

Seifert et al. (2025): The emerging need for ecosystem restoration to mitigate the impacts of onshore wind energy

Notes/abstract: This literature review synthesizes findings from 88 studies on the environmental impacts of onshore wind energy. Most concerned impacts on vegetation, followed by soil and hydrology. The nature and severity of impacts varied across ecosystems and geographic contexts, but despite the growing body of studies documenting impacts that lead to ecosystem degradation, only a few acknowledged the resulting need for mitigation (24) or restoration (23). To bridge this gap, a conceptual framework is presented that links the documented impacts to mitigation potential across all phases of onshore wind energy. This framework illustrates seven key actions to advance the mitigation of environmental impacts by reinforcing existing mitigation strategies or overcoming persistent knowledge gaps. These are: (1) Inform decision-making, (2) Standardize environmental impact assessments, (3) Plan restoration early, (4) Understand feedback-mechanisms, (5) Inform predictive models, (6) Learn from other sectors, and (7) Evaluate restoration outcomes. By synthesizing evidence on impacts, presenting mitigation solutions, outlining actionable steps for improvement, and stressing the emerging need for ecosystem restoration, this review provides a foundation for more effective mitigation of environmental impacts of onshore wind energy. Advancing this shift is essential to ensure that renewable energy expansion aligns with both climate goals and environmental sustainability.

Local Danish scientific literature about bats and the EU habitate directive, annex IV / Videnskabelige rapporter og notater fra Nationalt Center for Miljø og Energi, DCE, Aarhus Universitet.

Opdatering af: Håndbog om dyrearter på habitatsdirektivets bilag IV, Del 2 – Odder og flagermus, "Den opdaterede flagermushåndbog, DCE 2024"

Noter: Info om de forskellige flagermusarter og deres levevis, levesteder og krav til undersøgelsesmetoder og -tidspunkter samt længde.

Citater: "Flagermusenes brug af landskabet varierer gennem året og fra år til år. Forundersøgelser bør derfor altid dække relevante perioder over året i minimum to år i projektområdet og relevante nærområder for at få et fyldestgørende billede af variationen i aktivitetsniveauet af de forskellige flagermusarter. Dette skal gøres med passiv akustisk monitering gennem hele yngletiden, sensommeren og det tidlige efterår. Hvis projektområdet ligger i eller nær potentielle trækområder for flagermus, skal undersøgelsen dække de to trækperioder om foråret og efteråret (marts til maj og medio-august til medio-oktober) over minimum 2 år. Det gælder både ved landbaserede, kystnære og offshore projekter."

Fagligt notat fra DCE pr. 10. feb. 2025, "Flagermus, vindmøller og solceller", Uddybning af "Den opdaterede flagermushåndbog".

Citater: "Tab af levesteder er især tydelig for skovtilknyttede arter ved opstilling af vindmøller i skov (fx Ellerbrok m.fl. 2022, Gaultier m.fl. 2023, Reusch m.fl. 2023, McKay m.fl. 2024). Tab af levesteder strækker sig ind i skoven og er, for de mest skovtilknyttede arter, ikke begrænset til selve lysningen omkring vindmøllerne. Fortrængningen af skovtilknyttede arter fra vindmøller i skov er registreret op til 800 m fra vindmøllerne (fx Ellerbrok m.fl. 2022, Gaultier m.fl. 2023, Reusch m.fl. 2023, McKay m.fl. 2024). Lysninger i skov omkring vindmøller øger desuden risikoen for kollisioner for arter, der jager langs strukturer og i det åbne luftrum, fordi flagermusene fouragerer på insekter, der samles i lysningerne omkring vindmøllerne (Kirkpatrick m.fl. 2017, Ellerbrok m.fl. 2023). Fortrængningen fra levesteder er ikke begrænset til de mest skovtilknyttede arter. Selv for arter, der jager langs skovbryn og levende hegn ude i mosaiklandskabet eller højt og mellemhøjt over mere åbne områder, er aktivitetsniveauet påvirket af vindmøller i drift (fx Reusch m.fl. 2022, 2023). Der kan være nedsat flagermusaktivitet mere end en kilometer fra vindmøller (fx Leroux m.fl. 2024, Sotillo m.fl. 2024). Disse forhold er bestemt ved akustiske registreringer af aktiviteten af flagermus i forskellige afstande fra vindmøller (fx Ellerbrok m.fl. 2022, Gaultier m.fl. 2023, McKay m.fl. 2024) og vha. GPS-sporing af brunflagermus (fx Reusch m.fl. 2023)."

"Vindmøller kan påvirke flagermusbestandenes bevaringsstatus negativt direkte og indirekte. Dels kan vindmøller medføre øget dødelighed i en grad så bestandene bliver mindre, og dels kan opstilling af vindmøller medføre forringelser af kvaliteten eller direkte tab af levesteder."

"Antallet af flagermusdrab per mølle stiger med stigende højde af vindmøllerne og med stigende længde af møllevingerne, mens afstanden mellem møllevingespidsen og jorden ikke har indflydelse på antallet (Grodsky m.fl. 2011, Mathews m.fl. 2016). Dødeligheden og disse sammenhænge mellem antallet af døde flagermus, vindmøllernes højde og vingernes længde er især tydelige ved møller opstillet i og nær skov."

"Der findes især mange døde flagermus ved vindmøller opstillet i eller nær skov og ved vindmøller i trækområder. Modelleringer viser, at risikoen for vindmølledrab af flagermus er forhøjet op til 5 km fra skov og vådområder (Santos m.fl. 2013)."

"Selv produktionsskove og plantager kan være af væsentlig betydning for lokale flagermusbestande og for den økologiske funktionalitet af flagermusenes levesteder."

"Flagermusbestande er yderst sårbare overfor øget dødelighed, fordi flagermus har en lang levetid og en langsom reproduktionsrate (Altringham 2011)."