



Effects of sound immissions from onshore wind turbines on fauna

Presentation of
Dr. Irene Hochrathner, COO





ORCHIS Environmental planning

Specialised in wind and solar energy

- 30 years of environmental planning in Austria and Germany 30
- 10 years specialised in wind and solar energy
- Current company formation in France
- First projects in France

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Target in France:

- Company structure as in Germany
- field work, preparation of expert opinions / EIAs
- whole Germany / France (regional employees)
- Team: exclusively permanent employees, 50 employees in Germany, currently being built up in France
- free capacities at any time
- 24 / 7
- On- and Offshore

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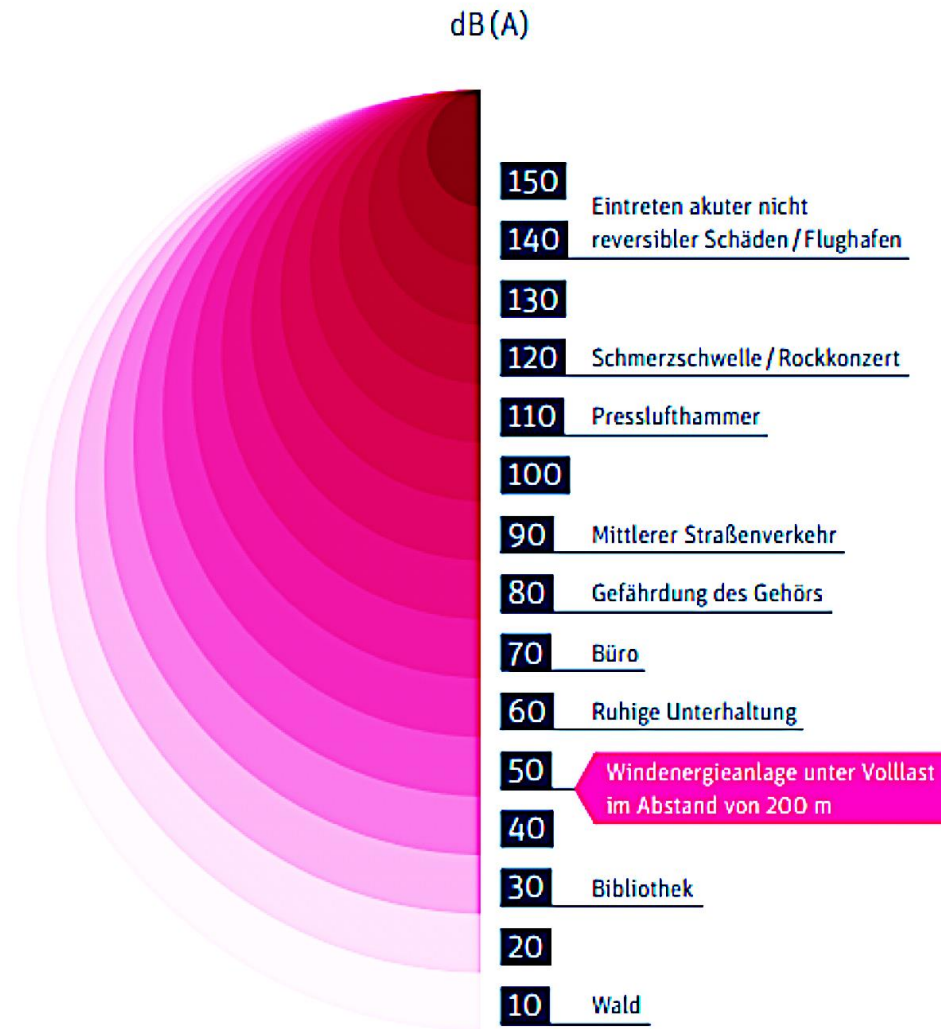
Sound →

First

There are no regulation regarding measures There are currently no guidelines that derive measures for animals due to noise pollution from onshore wind energy.

Why is that?

Auf 200 Meter Entfernung leiser als ruhige Unterhaltung



Quelle: www.wind-energie.de

Disturbance of the fauna by acoustic stimuli

1) Anatomical-physiological effects

- Mammals physical damage to inner ear irreversible hearing damage
- birds hearing recoverable after physical damage
- increased blood pressure, heart rate
- weight reduction
- weakening of immune system, fitness
- alteration of cell structure and signal transmission, DNA integrity and genes

2) Masking of information

- Impairment of communication and perception (territorial and courtship songs, warning calls, hearing of prey,...)
- Nocturnal animals strongly dependent on sense of hearing during prey search

3) Trigger more negative reaction patterns

- Association of sound events with sources of danger
- Triggering of escape response
- Escape: Consumption of energy negative for condition
- Behavioral change Stress Habituation or adaptation pattern

Disturbance of the fauna by acoustic stimuli

Avoidance of sound sources

Habitat loss or fragmentation

Increased predation and intraspecies competition

Consequences → Inhibition of reproduction, growth and survival

Stress: chronic exposure has a negative effect on the health of the animal

Altered species composition within an ecosystem

Decline in biodiversity

Effects sound from onshore wind power

Small mammals and ground dwellers

Little researched

Effects of sound from onshore wind power on fauna

mechanical noise and aerodynamic noise of rotor blades audible to small mammals

low frequency noise (despite being inaudible) can be biologically significant (but not researched!)

laboratory rats: a high infrasound level leads to stress
in physiological stress reaction release of hormones

Distribution areas often quite small

- partly complete overlap with wind farm location
- sound pressure level of about 60 dB(A) at the base of the tower
- permanently exposed to the potentially damaging effects of wind energy

→ **But: no avoidance behavior detected**



Effects sound from onshore wind power

Bats and birds

What is known →

Birds

Frequencies of wind power (between 2 and 4 kHz) can be heard by birds
No (researched) direct effects of sound from rotor blades

Bats

Can orient themselves to distant sounds
Flight and foraging in the vicinity of wind turbines
Possibility of attraction to noise generated by rotating rotor blades
No confirmed data



Effects sound by wind power on land

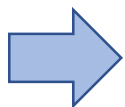
Breeding cattle

Farm animal	Frequencies between	max. sensitivity range
Pig	42 Hz and 40,5 kHz	250 Hz and 16 kHz
Coat	78 Hz and 37 kHz	2 kHz
Horse	55 Hz to 33,5 kHz	1 and 16 kHz
Cow	23 Hz and 35 kHz	8 kHz
Sheep	125 Hz to 42 kHz	10 kHz
	400 Hz to 4 kHz	1 and 2 kHz

→ Wind turbines emit between 2 and 4 kHz

→ Farm animals are able to perceive wind turbines

→ Frequencies in the range of highest sensitivity for pigs, cows, goats, horses and chickens



No scientific publications on direct harmful effect of sound from wind turbine on breeding cattle

Effects sound by wind power on land Game

Ears of mammals can process wide frequency range

roe deer, brown hare, fox, lynx, wild cat

- No fundamental avoidance of wind farms by wild animals
- Close range of the turbines is still used

Studies showed no abandonment of the area near the wind turbines (wapitis, reindeer)

→ No aversion to wind turbines

Measurements conducted for infrasound also showed

→ "no evidence of abnormal voltage that could alter animal behavior"

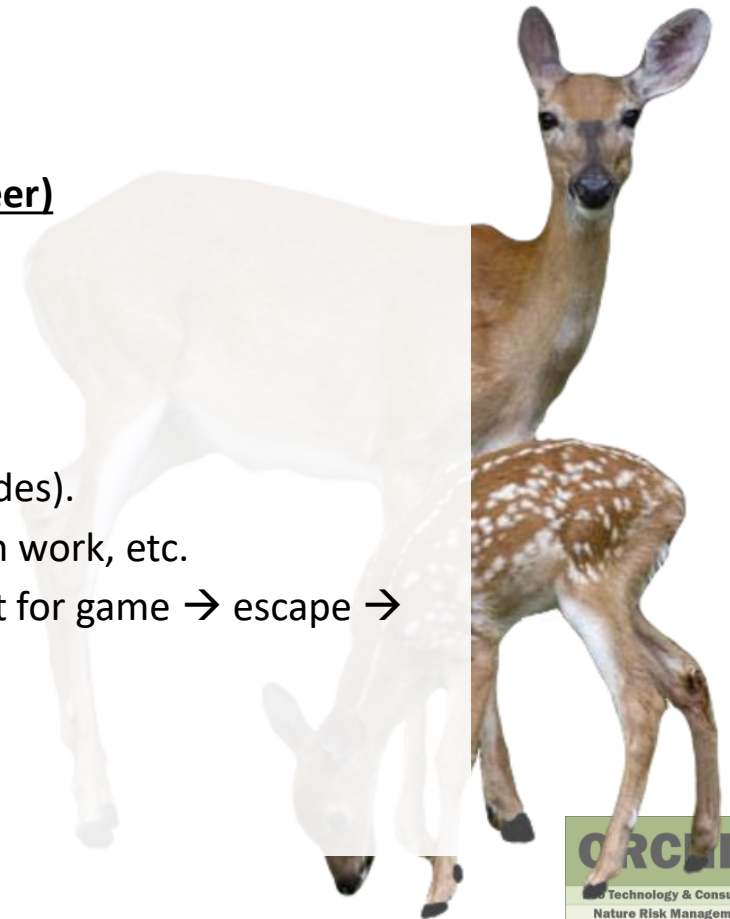
Game quickly becomes accustomed to predictable, consistent noise sources (rotor blades).

Clear disturbance of game by unpredictable noise sources such as people, construction work, etc.

Accustoming to noise sources that change spatially, temporally and in intensity difficult for game → escape →

Loss of energy

Game returns to area after disturbance source





Conclusion

Generally

little researched direct effects of sound on fauna

but indirect effects of noise, especially mechanical, unexpected noise generally known

The available studies show

- Noise spectrum generated by wind turbines is inaudible or not harmful to the species studied
- Disturbance by humans and vehicles more common than by the wind turbines themselves

Conclusion

no significant negative impact of sound from onshore wind energy on fauna

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Thank you!

