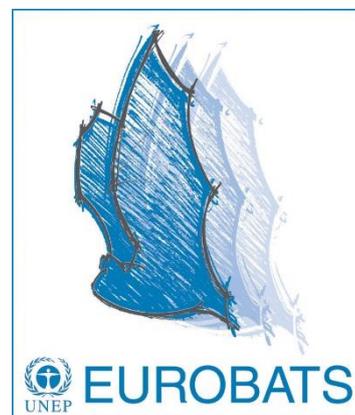


24th Meeting of the Advisory Committee

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Information on Bats and Infrasound



Compiled by Primož Presetnik

Wind turbines are known to harm bats both by direct killings and habitat destruction (e.g. Rodrigues et al. 2015). Direct killings occur when bats come into contact with turbine blades or through barotrauma to bat internal organs. Different bat species have different collision risks levels because of constraints within their ecological morphology. In means that higher flying species (*Nyctalus* spp., *Pipistrellus* spp.), which are usually also aerial hawkers, typically tend to have a higher risk for collisions.

However, a growing body of evidence has been substantiating the negative biological effects on organisms caused by exposure to infrasound and low frequency noise (ILFN) (< 100 Hz). Therefore, low-flying bat species (*Rhinolophus* spp., *Myotis* spp.) could, potentially, also be threatened by wind turbines. Longer living bat species (e.g. *R. ferrumequinum* or *M. myotis*) would be predominantly affected and their populations would be particularly harmed since they are a highly gregarious species and form relatively few maternity or hibernaculum colonies.

Here I present some references to studies on the biological effects of long-term exposure to ILFN in mammals (including humans).

In 1999, vibroacoustic disease (VAD) was defined as whole body, systemic pathology, characterized by the abnormal proliferation of extra-cellular matrices due to excessive exposure to ILFN (Castelo Branco 1999). This pathology was initially defined within occupational environments. The clinical stages presented below refer to the time required for 50% of the study population to develop the corresponding sign or symptom (Castelo Branco 1999):

- | | |
|---|---|
| - Mild
(1-4 years of ILFN exposure): | Slight mood swings, indigestion & heartburn,
repeated mouth & throat infections, bronchitis. |
| - Moderate
(4-10 years of ILFN) | Chest pain, back pain, fatigue, fungal & viral skin
infections, allergies, blood in urine, inflammation of |

exposure): stomach lining.

- Severe
(> 10 years of ILFN
exposure): Psychiatric disturbances, headaches, hemorrhages
of nasal & digestive mucosa, duodenal ulcers, spastic
colitis, varicose veins & hemorrhoids, decreased
vision, severe joint pain, severe muscular pain,
neurological disturbances.

Some of the morphological changes observed in ILFN-exposed human populations and laboratory animals were documented in a 2007 review paper (Alves-Pereira et al. 2007), and included:

- Abnormal thickening of cardiovascular structures (pericardium and blood vessel walls),
- Pulmonary fibrosis (alveolar wall thickening, trachea brush cell degradation),
- Deterioration of cochlear cilia (cilia fused together and with upper tectorial membrane).

Limb deformation and reproductive problems have also been documented in ILFN-exposed laboratory rats exposed (Castelo Branco et al. 2003), in horses living in the vicinity of a wind power station composed of 4 wind turbines (Castelo Branco et al. 2010), and in poultry living in a ILFN-contaminated home due to coal mining activities and a coal-powered electrical plant (Rapley et al. 2017).

However there are some voices of concern about real effect of ILFN and wind turbines (Chapman & St George 2013), but I think precautionary principle should also apply in this possible threat to bat conservation.

To conclude: bats may be at high risk for developing ILFN-induced disease and, therefore, I recommend that the Advisory Committee of EUROBATS take ILFN as a possible serious risk to bats, promote awareness of this threat within expert communities, encourage scientific research on the subject and take this hazard into the account during the possible renewal of "Guidelines for consideration of bats in wind farm projects".

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