Why wind turbines annoy residents and how to reduce the problem

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When falling asleep, relaxing or undertaking recreational activities, nearly a third of residents living near a wind farm report that they are not at all annoyed, or only slightly annoyed by the noise of wind turbines. One in 10 people experience symptoms of stress, such as irritability or difficulty falling asleep. However, noise is not the only problem for those affected, according to psychologists at Martin Luther University Halle-Wittenberg (MLU) in the current issue of the journal *Energy Policy*. According to the study, a better information policy during the planning phase could help alleviate problems for residents.

In their study, environmental psychologists working with Prof Gundula Hübner and Dr Johannes Pohl from MLU investigated a wind farm in northern Germany from 2012 to 2014. They conducted surveys of residents, and their project partner, UL International GmbH (UL DEWI), analysed sound recordings of wind turbines. The psychologists even took weather into account. This allowed the researchers to discover that the noise from wind turbines is perceived more when humidity is high and when there is frost.

Another result: Symptoms of stress were reported at least once a month by the nearly 10 percent of participants surveyed who said they felt annoyed by the wind turbines. "Symptoms include problems falling asleep, disturbed sleep in general, a negative mood, and high irritability," explains Pohl. By comparison, 16 percent of the participants surveyed said that they suffer from such symptoms at least once a month as a result of traffic noise.

When the psychologists re-surveyed the residents two years later, the proportion of people suffering from at least one concrete symptom had fallen to 6.8 percent. "Many residents get used to the noise from the wind farm or they have resigned themselves to it. A good one-fourth of those affected close their windows at night so that they are no longer disturbed by the noise," says Pohl.

It is notable that the people who continued to have the biggest problem with wind turbines were those who were already very critical of the wind farm. This group showed little interest in learning ways to cope with the stress, says the researcher. This shows how difficult it is to change established attitudes. The environmental psychologists at the University of Halle therefore recommend proactively addressing the residents' problems and concerns during the planning phase. "The way the residents experience the planning and construction phase is a decisive indicator of how strongly or weakly they will be impaired in the long run by the wind farm." Pohl concludes. Therefore, it is important to create the most positive experience possible. This could happen, for example, through early information campaigns and community meetings. Furthermore, residents should be included in the planning wherever possible.

Several residents had also prepared recordings of annoying noise at night. These were analysed by the researchers at DEWI. "The wind and the movement of the rotor blades can cause amplitude modulation, in other words, an irregular pulsating of the volume. These irregularities are what annoy some of the residents, something which they perceive to be irregular humming or swooshing," says Dr. Johannes Pohl from the Institute of Psychology at MLU. A quiet, steady background noise is easier to ignore, says the researcher. Most of the complaints occurred in the night or in the early morning hours when there are fewer other noises. According to the study, however, the proximity of the resident's home to the wind farm had little significant influence on their

annoyance.

The psychologists from Halle will incorporate their study's findings into the project "TremAc," which is being funded by the Federal Ministry for Economic Affairs and Energy. As part of the project, 10 university and commercial research institutes are working on a new concept for predicting noise and vibrations caused by wind farms. This model should allow the interplay between these two factors to be understood and predicted better, with the aim of making the noise emitted by wind turbines more pleasant for those affected. To this end, acoustic and seismic measurements, as well as surveys covering aspects of environmental psychology and medicine are being conducted at two wind farms.

More information: Johannes Pohl et al, Understanding stress effects of wind turbine noise – The integrated approach, *Energy Policy* (2017). DOI: 10.1016/j.enpol.2017.10.007

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