

# *Wind Turbine Syndrome: A Report on a Natural Experiment*

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## *Executive Summary*

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The core of the book is a scientific report presenting original, primary research on symptomatic people living near large industrial wind turbines (1.5-3 MW) erected since 2004.

These are the findings:

- 1) Wind turbines cause Wind Turbine Syndrome. We know this because people have symptoms when they are close to turbines and the symptoms go away when they are away from turbines. The study families themselves figured out that they had to move away from turbines to be rid of their symptoms, and nine out of ten have moved. Some sold and some abandoned their homes.
- 2) People do not abandon their homes out of “annoyance.” Reported symptoms, such as sleep deprivation, dizziness, and nausea, cannot be dismissed as “annoiances.”
- 3) The symptom cluster is consistent from person to person, hence the term “syndrome.”
- 4) The symptoms are sleep disturbance and deprivation, headache, tinnitus (ringing in ears), ear pressure, dizziness, vertigo (spinning dizziness), nausea, visual blurring, tachycardia (fast heart rate), irritability, problems with concentration and memory, and panic episodes associated with sensations of movement or quivering inside the body that arise while awake or asleep.
- 5) Children are affected as well as adults, especially older adults.
- 6) People with pre-existing migraine disorder, motion sensitivity, or damage to inner ear structures (such as hearing loss from industrial noise exposure) are more susceptible than other people to Wind Turbine Syndrome. These results are statistically significant ( $p < 0.01$ ).
- 7) Wind Turbine Syndrome symptoms are not statistically associated with pre-existing anxiety or other mental health disorders.
- 8) The sample size of 10 families/38 people was large enough for statistical significance with regard to susceptibility or risk factors.
- 9) The susceptibility factors are clues to the pathophysiology of Wind Turbine Syndrome. The symptom complex resembles syndromes caused by vestibular (inner ear balance organ)

dysfunction. The proposed mechanism is disturbance to balance and position sense by noise and/or vibration, especially low frequency components of the noise and vibration.

- 10) An extensive review of recent medical literature reveals how balance-related neural signals affect a variety of brain areas and functions, including spatial awareness, spatial memory, spatial problem-solving, fear, anxiety, autonomic functions (like nausea and heart rate), and aversive learning. These known neural relationships provide a robust anatomic and physiologic framework for Wind Turbine Syndrome.
- 11) Medical and technical literature on the resonance of sound or vibration within body cavities (chest, skull, eyes, throat, ears) is reviewed, since study subjects experience these effects.
- 12) Published studies of documented low frequency noise exposure (both experimental and environmental) are reviewed. These demonstrate effects on people similar or identical to Wind Turbine Syndrome. Indeed, one study from Germany in 1996 may indeed be Wind Turbine Syndrome.
- 13) Recent mail-in survey studies of people who live near wind turbines in Sweden and the Netherlands are reviewed. These show that people are severely annoyed at noise from wind turbines at much lower A-weighted noise levels than for traffic, train, or aircraft noise.
- 14) Published literature documenting the effects of environmental noise on cardiovascular health and children's learning are reviewed. For health reasons, the World Health Organization recommends lower thresholds for nighttime noise than are currently observed in most countries—especially when the noise has low-frequency components.
- 15) Wind Turbine Syndrome gives a name and medical description to a set of symptoms severe enough to drive people from their homes and establishes medical risk factors for such symptoms. This study and other studies reviewed in the report indicate that safe setbacks will be at least 2 km (1.24 miles) and even longer for larger turbines and in more varied topography. Further research is needed to clarify physical causes and physiologic mechanisms, explore other health effects of living near wind turbines, determine how many people are affected, and investigate effects in special populations, including children. Government funding and moratoria are appropriate.

The book further includes:

- A) Full case histories—the words and experiences of all the study subjects (including children), presented in an organized tabular format.
- B) The report presented again in non-scientific, layman's language, explaining the medical, technical, and statistical aspects of the study. This section is illustrated.
- C) Peer reviews and commentary by scientists and university physicians.
- D) Introduction, complete list of scientific and medical references, glossary, and list of abbreviations.