

Home

- [Advisory Group](#)
- [Values](#)
- [Disclaimer](#)
- [Privacy Policy](#)

About Adverse Health Effects

- [Annoyance and Wind Turbines](#)
- [Sleep Disturbance and Wind Turbines](#)
- [Stress and Wind Turbines](#)
- [Mental Health and Wind Turbines](#)
- [Physiological Health and Wind Turbines](#)
- [Low Frequency Noise, Infrasound and Wind Turbines](#)
- [Visual Health Effects and Wind Turbines](#)
- [Proposed Case Definition: Adverse Health Effects And Industrial Wind Turbines](#)
- [A Primer on Adverse Health Effects](#)
- [Wind Turbine Noise Sleep and Health by Dr Hanning](#)
- [Resource Centre](#)

Contact Us

International Symposium

- [PROCEEDINGS: First International Symposium](#)
- [Wind Turbines Linked To "Sick Building Syndrome"](#)

News

- [Wind Turbines Linked To "Sick Building Syndrome"](#)
- [Dr. Hazel Lynn - we should have longer setbacks](#)
- [International Symposium](#)
- [Analysis of the NHMRC Rapid Review](#)
- [The Society for Wind Vigilance Announces First International Symposium](#)
- [Analysis of Chief Medical Officer of Health of Ontario Literature Review](#)
- [Research Chair Choice Misses the Mark](#)
- [Government of Ontario requests 'Expert Advice'](#)
- [Analysis of A/CanWEA Panel Review](#)
- [Preliminary Findings - Controlled Study Mars Hill](#)

[Untitled]

WindVOiCe Health Survey

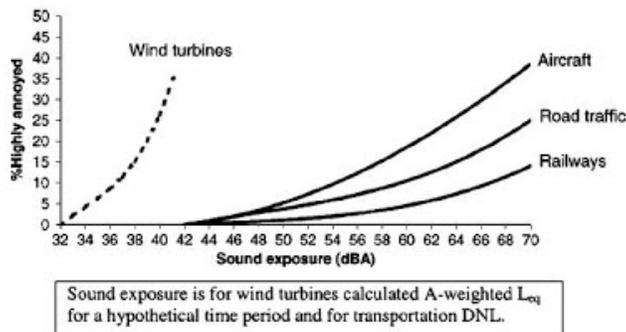
- [Download a copy of WindVOiCe](#)

[About Adverse Health Effects](#) >

Annoyance and Wind Turbines

"Annoyance with wind turbine noise was associated with psychological distress, stress, difficulties to fall asleep and sleep interruption." [1]

Peer reviewed scientific articles based on studies of European wind turbine facilities have concluded that wind turbine noise is more annoying than equally loud noise sources such as airport and traffic noise. [2], [3], [4], [5] Annoyance is predominately attributed to the unique sound characteristics of wind turbine noise. Plausible causes include wind turbine amplitude modulation, audible low frequency noise, temporal variability, and lack of night time abatement. Shadow flicker and other visual impacts may also contribute to high annoyance levels.



Sound exposure is for wind turbines calculated A-weighted L_{eq} for a hypothetical time period and for transportation DNL.

Source Pedersen, E. and K. Persson Waye. 2004. Perception and annoyance due to wind turbine noise: A dose-response relationship, Journal of the Acoustical Society of America 116: 3460-3470.

"The sound level associated with wind turbines at common residential setbacks ... may lead to annoyance and sleep disturbance." [6] and evidence demonstrates "Annoyance and sleep disruption are common when sound levels are 30 to 45 dBA." [7]

The American Wind Energy Association and Canadian Wind Energy Association sponsored literature review entitled "Wind Turbine Sound and Health Effects" acknowledges wind turbine noise, including low frequency noise, may cause annoyance, stress and sleep disturbance and as a result people may experience adverse physiological and psychological symptoms.

[8]

[results](#)

[WindVOiCe Confidentiality Policy](#)

[WindVOiCe Privacy Policy](#)

[Sitemap](#)

This wind industry sponsored literature review acknowledges the reported symptoms can be caused by wind turbine noise and states these "...symptoms are not new and have been published previously in the context of "annoyance" to environmental sounds The following symptoms are based on the experience of noise sufferers extending over a number of years: distraction, dizziness, eye strain, fatigue, feeling vibration, headache, insomnia, muscle spasm, nausea, nose bleeds, palpitations, pressure in the ears or head, skin burns, stress, and tension...." [\[9\]](#)

The symptoms listed in the wind industry literature review are consistent with international research and media reports documenting subjects exposed to wind turbines who are reporting adverse health effects. [\[10\]](#), [\[11\]](#), [\[12\]](#), [\[13\]](#), [\[14\]](#)

The health impact of annoyance must not be underestimated.

A coauthor of the wind industry sponsored "Wind Turbine Sound and Health Effects", W. David Colby, M.D., reinforced this position regarding wind turbine induced annoyance by stating

"We're not denying that there are people annoyed and that maybe some of them are getting stressed out enough about being annoyed that they're getting sick." [\[15\]](#)

Geoff Leventhall, another coauthor of the wind industry sponsored "Wind Turbine Sound and Health Effects", reportedly elaborated:

"... there was no doubt people living near the turbines suffered a range of symptoms, including abnormal heart beats, sleep disturbance, headaches, tinnitus, nausea, visual blurring, panic attacks and general irritability....it's ruining their lives – and it's genuine..." [\[16\]](#)

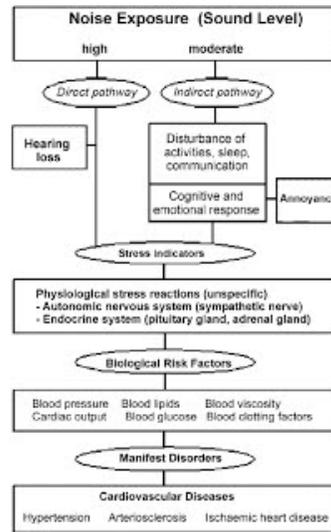
The word annoyance may mean different things to different people however in clinical terms annoyance is acknowledged to be a risk to human health.

Peer reviewed articles and other references acknowledge annoyance to be an adverse health effect.[\[17\]](#),[\[18\]](#), [\[19\]](#), [\[20\]](#)

Regarding noise induced annoyance the US Environmental Protection Agency states "... "annoyance" can have major consequences, primarily to one's overall health." [\[21\]](#)

A World Health Organization study "...confirmed, on an epidemiological level, an increased health risk from chronic noise annoyance." [\[22\]](#)

Noise induced annoyance contributes to stress, [\[23\]](#) sleep disturbance [\[24\]](#) and an increased risk of regulation diseases. [\[25\]](#)



Noise effects reaction scheme Source: Babisch, 2002. from World Health Organization, Night Noise Guidelines for Europe, 2009

Annoyance may adversely affect physiological health. Research indicates that for “chronically strong annoyance a causal chain exists between the three steps health – strong annoyance – increased morbidity.” [26]

The subjective experience of noise stress can, through central nervous processes, lead to an inadequate neuro-endocrine reaction and finally to regulation diseases. [27]

“Adults who indicated chronically severe annoyance by neighbourhood noise were found to have an increased health risk for the cardiovascular system and the movement apparatus, as well as an increased risk of depression and migraine...With children the effects of noise-induced annoyance from traffic, as well as neighbourhood noise, are evident in the respiratory system.” [28] Peer reviewed studies have consistently concluded that wind turbine noise is more annoying than equally loud traffic noise. [29], [30], [31], [32]

To protect against adverse health effects noise level limits “...should be based on annoyance responses to noise.” [33]

“Dose-response relations for different types of traffic noise (air, road and railway) clearly demonstrate that these noises can cause different annoyance effects at equal LAeq,24h values.” [34] Currently there is no health based generalized dose-response relationship developed to avoid possible adverse health effects from wind turbine noise exposure. [35]

“The need for guidelines for maximum exposure to wind turbine noise is urgent.” [36]

Wind turbine visual effects such as shadow flicker may also cause visually induced adverse health effects such as annoyance and/or stress. [37], [38], [39], [40], [41], [42], [43], [44]

Conclusions

Based on the best available science the following conclusions can be made

- The main conclusion of peer reviewed scientific studies state noise from wind turbines is more annoying than noise from most other sources at comparable sound levels. This annoyance is predominately attributed to the unique sound characteristics of wind turbine noise.
- Noise induced annoyance is an adverse health effect which can result in stress, sleep disturbance and an increased risk of regulation diseases.
- Possible symptoms of wind turbine noise induced annoyance include distraction, dizziness, eye strain, fatigue, feeling vibration, headache, insomnia, muscle spasm, nausea, nose bleeds, palpitations, pressure in the ears or head, skin burns, stress, and tension. These symptoms are consistent with international research and media reports documenting subjects exposed to wind turbines who are reporting adverse health effects.
- The audible sound from wind turbines, at the levels experienced at typical receptor distances is expected to result in an unacceptable percentage of persons being highly annoyed.
- Exposure to wind turbines may also visually induce adverse health effects. It is acknowledged wind turbine shadow flicker may cause annoyance and/or stress.
- Wind turbines must be sited to protect humans from the adverse health effect of visually induced annoyance as well as noise induced annoyance.

[1] Pedersen et al., 2008, Project WINDFARM perception Visual and acoustic impact of wind turbine farms on residents

[2] Pedersen, E. and K. Persson Waye. 2004. Perception and annoyance due to wind turbine noise: A dose-response relationship, *Journal of the Acoustical Society of America* 116: 3460–3470.

[3] Pedersen, E. and K. Persson Waye. 2007. Wind turbine noise, annoyance and self-reported health and well being in different living environments

[4] Pedersen et al., 2008, Project WINDFARM perception Visual and acoustic impact of wind turbine farms on residents

[5] Pedersen, E., R. Bakker, J. Bouma and F van den Berg 2009. Response To Noise From Modern Wind Farms in The Netherlands. *Journal of the Acoustical Society of America*

[6] Rideout K, Copes R, Bos C. Wind turbines and health. Vancouver: National Collaborating Centre for Environmental Health; 2010 Jan [cited 2010 June 3]. Available from: http://www.nccch.ca/files/Wind_Turbines_January_2010.pdf.

[7] Rideout K, Copes R, Bos C. Wind turbines and health. Vancouver: National Collaborating Centre for Environmental Health; 2010 Jan [cited 2010 June 3]. Available from: http://www.nccch.ca/files/Wind_Turbines_January_2010.pdf.

- [8] W. David Colby, M.D et al., Wind Turbine Sound and Health Effects, An Expert Panel Review 2009, Prepared for American Wind Energy Association and Canadian Wind Energy Association
- [9] W. David Colby, M.D et al., Wind Turbine Sound and Health Effects, An Expert Panel Review 2009, Prepared for American Wind Energy Association and Canadian Wind Energy Association
- [10] Pierpont, N., 2009. Wind turbine syndrome. K-selected books.
- [11] Harry, A., 2007. Wind turbines, noise and health.
www.windturbinehealthhumanrights.com/wtnoise_health_2007_a_barry.pdf
- [12] Dr Michael Nissenbaum, Wind Turbines, Health, Ridgelines, and Valleys, Montpelier, VT, May 7 2010
<http://www.windvigilance.com/news/preliminary-findings---controlled-study-mars-hill>
- [13] Wind Vigilance for Ontario Communities (WindVOiCe©) http://www.windvigilance.com/windvoice_home
- [14] Hansard Reports, proceedings from April 15th, 2009 The Green Energy Act, Bill 150, Standing Committee on General Government, Ontario http://www.ontla.on.ca/web/committee-proceedings/committee_transcripts_details.do?locale=en&Date=2009-04-15&ParlCommID=8856&BillID=2145&Business=&DocumentID=23801
- [15] W. David Colby, M.D., Sounding Board, 97.9 FM The Beach December 17, 2009
- [16] Countryside News, Wind turbines set to get bigger, January 28 2010 <http://www.walesonline.co.uk/countryside-farming-news/countryside-news/2010/01/28/wind-turbines-set-to-get-bigger-91466-25701853/>
- [17] Pedersen, E., & Persson Waye, K. (2007). Wind turbine noise, annoyance and self-reported health and well being in different living environments. Occupational and Environmental Medicine, 64, 480-486.
doi:10.1136/oem.2006.031039
- [18] Michaud DS, Keith SE, McMurchy D. (2005). Noise annoyance in Canada. Noise Health 2005;7:39-47
- [19] Health Canada. (2005). Community noise annoyance. Retrieved from <http://www.hc-sc.gc.ca/hl-vs/jyh-vsv/life-vie/community-urbain-eng.php#he>
- [20] Suter, A. H. (1991). Noise and its effects. Administrative Conference of the United States. Retrieved from <http://www.nonoise.org/library/suter/suter.htm>
- [21] US Environmental Protection Agency web site, Noise Pollution, [cited June 30, 2010]
<http://www.epa.gov/air/noise.html>
- [22] Niemann H, Bonnefoy X, Braubach M, Hecht K, Maschke C, Rodrigues C, Robbel N. Noise-induced annoyance and morbidity results from the pan-European LARES study. Noise Health 2006;8:63-79
- [23] Babisch W. Stress hormones in the research on cardiovascular effects of noise. Noise Health [serial online] 2003 [cited 2010 May 7];5:1-11. Available from: <http://www.noiseandhealth.org/text.asp?2003/5/18/1/31824>
- [24] World Health Organization, Night Noise Guidelines for Europe, 2009
- [25] Maschke, C., et al Health Effects of Annoyance Induced by Neighbour Noise, Noise Control Engineering Journal, 2007, 55(3): 348-356.
- [26] Niemann, H, et al., WHO LARES Final report Noise effects and morbidity, 2004
- [27] Maschke, C., et al Health Effects of Annoyance Induced by Neighbour Noise, Noise Control Engineering Journal, 2007, 55(3): 348-356.
- [28] Niemann H, Bonnefoy X, Braubach M, Hecht K, Maschke C, Rodrigues C, Robbel N. Noise-induced annoyance and morbidity results from the pan-European LARES study. Noise Health [serial online] 2006 [cited 2010 May 6];8:63-79. Available from: <http://www.noiseandhealth.org/text.asp?2006/8/31/63/33537>
- [29] Pedersen, E. and K. Persson Waye. 2004. Perception and annoyance due to wind turbine noise: A dose-response relationship, Journal of the Acoustical Society of America 116: 3460-3470.
- [30] Pedersen, E. and K. Persson Waye. 2007. Wind turbine noise, annoyance and self-reported health and well being in different living environments
- [31] Pedersen et al., 2008, Project WINDFARM perception Visual and acoustic impact of wind turbine farms on residents
- [32] Pederson, E., R. Bakker, J. Bouma and F van den Berg 2009. Response To Noise From Modern Wind Farms in The Netherlands. Journal of the Acoustical Society of America
- [33] World Health Organization, Guidelines for Community Noise, 1999
- [34] World Health Organization, Guidelines for Community Noise, 1999
- [35] Pederson, E., R. Bakker, J. Bouma and F van den Berg 2009. Response To Noise From Modern Wind Farms in The Netherlands. Journal of the Acoustical Society of America
- [36] Pederson, E., R. Bakker, J. Bouma and F van den Berg 2009. Response To Noise From Modern Wind Farms in The Netherlands. Journal of the Acoustical Society of America
- [37] National Research Council (NRC). Environmental Impacts of Wind-Energy Projects, 2007 NRC, Washington,

DC

[38] Minnesota Department of Health (MDH) 2009 Public Health Impacts of Wind Turbines

[39] Pedersen et al., 2008, Project WINDFARM perception Visual and acoustic impact of wind turbine farms on residents

[40] Copes et al, Wind Turbines And Environmental Assessment, National Collaborating Centre for Environmental Health, June 23, 2009

[41] Copes, R. and K. Rideout. Wind Turbines and Health: A Review of Evidence. Ontario Agency for Health Protection and Promotion, September 2009

[42] Copes, Ray MD, MSc, Wind Turbines in Ontario: Hazard or Outrage?, Ontario Agency for Health Protection and Promotion, January 2010

[43] Rideout K, Copes R, Bos C. Wind turbines and health. Vancouver: National Collaborating Centre for Environmental Health; 2010 Jan [cited 2010 June 3]. Available from:

http://www.nccch.ca/files/Wind_Turbines_January_2010.pdf.

[44] Environment Protection and Heritage Council (EPHC), National Wind Farm Development Guidelines DRAFT - JULY 2010

[Sign in](#) | [Report Abuse](#) | [Print Page](#) | Powered By [Google Sites](#)