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Comments Re New Polish Government rules for siting wind turbines

I commend the Polish Government on their attempts to ensure improved regulation of noise pollution emissions from industrial scale wind turbines, **however I am concerned that the proposed initiatives, whilst an improvement, will not adequately protect the Polish people living in the acoustic impact zone of impact of industrial wind turbines, especially as they increase in size and power generating capacity.**

I therefore wish to make the following comments.

1. There is a growing body of evidence over the last thirty years, both anecdotal and clinical, in field studies by clinicians and acousticians, and in peer reviewed published literature that regular sleep disturbance resulting in chronic sleep deprivation, together with other characteristic symptoms called “annoyance” (by acoustic engineers and non medical researchers) is occurring at locations in quiet rural areas where there is pulsing infrasound and low frequency noise. These locations include but are not limited to industrial wind power developments, and the complaints are widespread globally and growing, despite the use of non-disclosure clauses (eg in turbine host contracts “good neighbour” agreements, and property buyouts) which are designed to silence sick people.
2. Sleep disturbance is the most common complaint, and is one of the many symptoms which have been referred to as “annoyance” symptoms, which UK Low Frequency Noise Expert Acoustician Dr Geoff Leventhall has agreed are the same as “Wind Turbine Syndrome” as described by American Paediatrician and scientist Dr Nina Pierpont, MD PhD (eg see Leventhall’s presentation at the NHMRC Workshop in Australia in June 2011 <http://waubrafoundation.org.au/resources/leventhall-g-comments-nhmrc-june-2011-wind-turbine-syndrome-symptoms-same-as-noise-annoyance/>).
3. Both Dr Leventhall and Dr Pierpont agree that industrial noise sources which cause these symptoms are not confined to wind turbines, and both agree that there are risk factors such as motion sickness, migraines and inner ear pathology which will make individuals more susceptible to developing these symptoms. We can therefore predict population subgroups who, in addition to children and the elderly, will be at increased risk of developing these symptoms acutely.
4. Dr Leventhall’s frequently expressed opinion has been that the audible noise causes a stress response, but that this is not a “direct” effect.
5. However, research led by Dr Kelley (and known to Dr Leventhall) established a direct causal link between annoyance symptoms and pulsing infrasound and low frequency noise from a variety of sources, including wind turbines. In particular, Kelley et al reported that the symptoms could be perceived by people who were “conditioned” (sensitized) to the noise, at levels which were not audible, but which were nevertheless perceived by them – ie below the threshold of hearing.

<http://cdn.knightlab.com/libs/timeline/latest/embed/index.html?source=0Ak2bgr7C0nhPdGR3S1EeKU3T3p4ZDhUNDdRV2Y2ZkE&font=Bevan-PotanoSans&maptype=toner&lang=en&height=650>

6. Furthermore, careful clinical histories collected by trained physicians providing professional care to these severely noise impacted people such as Dr Sandy Reider (family physician from Vermont, USA <http://waubrafoundation.org.au/resources/dr-sandy-reider-testimony-calls-for-moratorium-wind-farms/>) **suggest that the stress response is a *direct, involuntary, neurophysiological response, and that it forms part of the explanation for the repetitive sleep disturbance where people describe waking up suddenly in an anxious frightened panicked state, sometimes repeatedly through the night.***

7. This scientific observation is consistent with existing animal laboratory research conducted by Professor Alec Salt and his team (for a summary please see <http://waubrafoundation.org.au/resources/salt-n-lichtenhan-j-t-how-does-wind-turbine-noise-affect-people/> and animal field research, (see for example the study of polish geese <http://waubrafoundation.org.au/resources/mikolajczak-j-et-al-preliminary-studies-growing-geese-proximity-wind-turbines/>) The existence of this animal research showing physiological stress impacts (also reported in humans) suggests the nocebo hypothesis is a useful smokescreen to protect the commercial interests of the global wind industry. Those health, planning, and noise pollution regulatory authorities who fail to acknowledge the obvious noise nuisance problems let alone investigate or prevent them, show evidence of regulatory capture (https://en.wikipedia.org/wiki/Regulatory_capture).

8. Further multidisciplinary field and laboratory research will clarify what the precise acoustic triggers for these episodic neurophysiological stress responses in humans and animals living near industrial wind turbines are.

9. Stress is well known to clinical medicine, and well established via clinical research, to be very damaging to both mental and physical health in a variety of ways if it is prolonged.

10. Sufficient good quality sleep is also well known to clinical medicine and health authorities to be vital for the attainment and maintenance of physical and mental health. In the USA, the Centre for Disease Control has recently stated that insufficient sleep is a public health problem. <http://www.cdc.gov/features/dssleep/> The World Health Organisation's 2009 publication Night Noise Guidelines for Europe lists the many known adverse health consequences from chronic sleep deprivation – excessive night time noise being a well known and established cause: <http://waubrafoundation.org.au/resources/who-night-noise-guidelines-for-europe/> .

11. So, regardless of which precise sound frequencies are inducing the neurophysiological stress symptoms, or directly causing the sleep disturbance, the combination of both sleep deprivation and stress symptoms can be severely damaging for health, especially with longterm exposure.

12. There is clinical and animal experimental evidence that progressive sensitization is induced by chronic exposure to **pulsing** sound in the lower frequencies, **and that once sensitized, health will continue to deteriorate until or unless the exposure to pulsing lower frequency noise can be ceased – either by removal of the person or cessation of the sound source.**

13. The research into wild seals in Scotland by Gotz and Janik provides the physiological mechanism for the progressive sensitization also observed and reported in residents living near wind turbines, (which emit a pulsing dynamically amplitude modulated sound).

<http://waubrafoundation.org.au/resources/bmc-neuroscience-repeated-elicitation-acoustic-startle-reflex/>

14. People around the world consistently report improvement in their health and cessation of symptoms when their exposure to operating wind turbines and other sources of pulsing lower frequency noise ceases – for example either when the turbines stop operating, or when they are away from their homes. The longer the exposure, the longer the recovery period required. This is entirely consistent with what we know about the cumulative impacts of chronic sleep deprivation and chronic stress. It takes time for the body to repair itself.

15. The consistently reported differences between exposed vs non exposed experiences of residents is what is called a case crossover design in epidemiological terms. It is ideal for assessing the different physiological responses to varying exposures over time, and in particular is ideal for assessing transient exposures such as peaks of sound with rapid acceleration (<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2831419/>)

“The case-crossover study design is a relatively new analytical epidemiological approach, and is unique in that the case serves as his/her own control and is used to investigate the transient effects of an intermittent exposure on the onset of acute outcomes”

16. Where this case cross over design has been used (Dr Nina Pierpont’s study <http://waubrafoundation.org.au/resources/dr-nina-pierpont-submission-australian-senate-inquiry/> and Mary Morris’s case series at Waterloo, when the wind turbines were off for a week immediately after the South Australian EPA survey in 2013 <http://waubrafoundation.org.au/resources/morris-m-waterloo-case-series-preliminary-report/> the data is strongly suggestive of a direct causal relationship between exposure to operating wind turbines and sleep disturbance and the characteristic other symptoms labeled as “wind turbine syndrome” by Dr Nina Pierpont.

17. Again, further research to investigate this issue will clarify what the precise acoustic triggers are. Steven Cooper’s acoustic investigation at Cape Bridgewater in Victoria, Australia, for wind power operator Pacific Hydro is one example of such an investigation, which has received worldwide acclaim from his acoustic peers (<http://waubrafoundation.org.au/resources/cooper-s-acoustic-group-results-cape-bridgewater-acoustic-investigation/>). Such acoustic investigation together with physiological monitoring in the field is vital in order for regulatory authorities to be able to determine the regulatory framework required to protect the population from the progressive sensitization mentioned above, in addition to the noise nuisance.

18. There are no comprehensive long term studies of large populations exposed to wind turbines, however those individuals who report adverse impacts consistently report as individuals that their health worsens, and their sleep becomes progressively more disturbed, with ongoing exposure. This effect is captured in the follow up study in wind turbine noise exposed neighbours vs a control group by McBride et al, who found that

“compared to the 2012 control group, the turbine group had lower physical domain scores, and rated their overall health as being poorer”

<https://www.wind-watch.org/documents/longitudinal-study-of-the-impact-of-wind-turbine-proximity-on-health-related-quality-of-life/>

19. The only longitudinal population data comes from localized population noise impact studies conducted at a number of individual wind power developments in Australia. The study by Patina

Schneider at Cullerin wind power development in New South Wales in August 2013 has important data after four years of exposure. It should be noted that the wind turbines are only 2 MW each. Schneider found that: (bold my emphasis)

*“68%(24) of the 35 households resident out to 10km from the wind turbines participated in the survey. No household participating in the survey was adversely impacted by noise and vibration beyond 8km. 91% of these households out to 8km were impacted by the wind turbine noise or vibration which was affecting the sleep and health of the residents, and all had lodged complaints with the developer or the responsible authorities. **In the 20 households this represents, there are 50 residents — 49 of whom are adversely impacted.**”*

<http://waubrafoundation.org.au/resources/schneider-p-cullerin-range-wind-farm-survey-follow-up-july-august-2013/>

20. Where wind turbines are more powerful than 2 MW, such as at Waterloo (VESTAS V 90 3 MW) and Macarthur (VESTAS V 112 3 MW) the distance of adverse effects including sleep disturbance will be even greater, particularly if the wind turbines are not separated by at least the recommended 5-8 rotor diameter distances, between wind turbines. Wind turbines at Cullerin, Waterloo and Macarthur wind turbines all have inter turbine separation distances which are less than the recommended 5 – 8 rotor diameters.

21. It was known in 1989 that when there is turbulent inflow into “modern” upwind bladed wind turbines that surprisingly high levels of infrasound and low frequency noise would be generated (<http://waubrafoundation.org.au/resources/swinbanks-m-nasa-langley-wind-turbine-noise-research/> and <http://waubrafoundation.org.au/resources/shepherd-k-hubbard-h-noise-radiation-characteristics-westinghouse-wwg-0600-wind-turbine-generator/>). Increased turbulence and therefore increased infrasound and low frequency noise is inevitable when wind turbines are located too close together. (see the appendix for the email discussion between acousticians Les Huson and Dr Malcolm Swinbanks about this issue at Macarthur wind power development: <http://waubrafoundation.org.au/resources/renewable-energy-target-review-waubra-foundation-submission-2014/>)

22. The distance of 10km over which adverse effects were being reported by credible and reliable witnesses directly to the Waubra Foundation was the basis for the 10km setback distance stipulated in the **Waubra Foundation’s Explicit Cautionary Notice**, which was widely distributed on 29th June, 2011 (<http://waubrafoundation.org.au/about/explicit-cautionary-notice/>).

23. That warning of the potential for adverse health and sleep impacts out to 10km has since been echoed by others, as the acoustic evidence of excessive lower frequency noise, and clinical evidence of harm to health and sleep disturbance out to 10 km increases internationally. Because of this mounting evidence, Professor Robert McMurtry and Ms Carmen Krogh’s “*Diagnostic Criteria for adverse health effects in the environs of wind turbines*”, published in the Journal of the Royal Society of Medicine in 2014 included reference to impacts in residents living out to 10km from industrial wind turbines. <http://shr.sagepub.com/content/5/10/2054270414554048.full>

24. The first of the population noise impact surveys in Australia was conducted by University of Adelaide Masters student Frank Wang in 2011. **Mr Wang surveyed all households within 5km of wind turbines at the Waterloo wind development, after only a year’s operation, and found that over 50% of residents who responded were moderately or very affected by the wind turbine noise, with 38% stating they had adverse health effects including sleep deprivation and headaches.** <http://waubrafoundation.org.au/resources/evaluation-wind-farm-noise-policies-south-australia/>

25. Other population noise impact surveys subsequently at Waterloo (Morris, 2012 <http://waubrafoundation.org.au/resources/waterloo-wind-farm-survey-2012/>) and at Macarthur (Schafer, 2013 <http://waubrafoundation.org.au/resources/macarthur-wind-energy-facility-preliminary-survey/>) have confirmed that adverse effects including sleep disturbance can extend out to at least 10km at wind power developments with 3 MW turbines, and there have been reports of adverse impacts from even further in sensitized people at these locations.

26. Dr Bob Thorne's data from his case series from Cape Bridgewater and Waubra found that wind turbine noise at 32 dBA and above were markers for adverse health effects. He also found amongst other things that the self reported quality of life health indicators of residents chronically exposed to wind turbine noise was **worse on every domain** (physical, psychological, social and environmental) **than even hospital inpatients** in the LIDO study (Longitudinal Investigation of Depression Outcomes), when compared to population norms. Hospital inpatients are generally known to have the worst such indicators.
<http://waubrafoundation.org.au/resources/thorne-r-victorian-wind-farm-review-updated-june-2014/> (table page 18)

27. Despite the best efforts of the global wind industry and their friends in government to ignore the science, the laws of physics dictate that the larger more powerful wind turbines will emit proportionately more sound energy in the lower frequencies, and this will inevitably lead to more "annoyance" symptoms ie illness and progressive sensitisation and worsening sleep disturbance for the neighbours. **Larger more powerful wind turbines must have increased setback distances and sufficient inter turbine separation distances in order to protect the neighbours from predictable adverse health effects.**
<http://waubrafoundation.org.au/resources/moller-pedersen-low-frequency-noise-from-large-wind-turbines/>

28. Another important issue is the growing number of people living near wind turbines who are being diagnosed with the features of Vibro Acoustic Disease (VAD), including damage to cardiac valvular tissue and a range of other serious adverse health effects (see <http://waubrafoundation.org.au/resources/vibroacoustic-disease-biological-effects-infrasound-alves-periera-castelo-branco/>). The risk of developing these longer term and potentially serious VAD related health problems from chronic exposure to wind turbine noise should not be ignored.

Given the severity of the adverse health effects already known to science, and the distances over which serious adverse health effects, sleep disturbance and home abandonments are occurring, I urge the Polish government to look very carefully at adopting a far more conservative approach to wind turbine siting and operational criteria, in order to protect public health, particularly the health of vulnerable citizens like children, the elderly, those with chronic mental and physical health problems, and those with risk factors for acute susceptibility.

I also urge the Polish government to consider the adopting the following measures:

- Ensure that there is complete transparency of all operational SCADA data.
- Ensure that there is full spectrum acoustic monitoring installed in homes where noise impacted residents live, with a view to working out how to prevent the noise nuisance from occurring with specific wind and weather conditions by feathering the blades or ensuring certain wind turbines are turned off during specific conditions.
- Ensure that residents have a noise control system "off switch" installed in their home so they can turn the offending wind turbines off if they are nuisanced by the noise.

- Specifically prohibit the use of any non disclosure clause in any contract relating to any wind project if the clause has the effect of stopping someone from publicly complaining and seeking and gaining immediate relief from any symptom relating to wind turbine operation, including wind turbine hosts and their families.

It is essential that the Polish Government ensures that any members of vulnerable population groups such as children, the elderly, the chronically ill, are properly protected from any adverse health impacts, recognising that these individuals will be more likely to be adversely impacted earlier and at lower exposure doses than those who are young, in good health who do not have any known risk factors for developing symptoms. ***A failure to ensure the protection of those who are most vulnerable would mean breaches of their fundamental human rights, which public officials are duty bound to protect.***

Indeed the various UN Conventions and Covenants relating to Human Rights, to which many countries are signatory, often contain a clause relating to the right of citizens to “enjoy the highest standard of physical and mental health” (see this chart for those relating to UN Conventions to which Australia is a signatory: <https://www.humanrights.gov.au/chart-related-rights-and-articles-human-rights-instruments-human-rights-your-fingertips-human-rights>) How can people attain the highest standard of physical and mental health if their governments fail to protect them from excessive night time noise pollution which is disturbing their sleep?

I further note that sleep deprivation is acknowledged as a method of torture, which is itself prohibited under the UN Convention against Torture. The UN Committee Against Torture (CAT) had this to say about sleep deprivation:

“The Committee against Torture (CAT) has noted that sleep deprivation used for prolonged periods constitutes a breach of the CAT, and is primarily used to break down the will of the detainee. Sleep deprivation can cause impaired memory and cognitive functioning, decreased short term memory, speech impairment, hallucinations, psychosis, lowered immunity, headaches, high blood pressure, cardiovascular disease, stress, anxiety and depression.”

<http://waubrafoundation.org.au/resources/un-convention-against-torture/>

I stand by the Foundation’s original advice in June 2011 in our Explicit Cautionary Notice, that a precautionary distance of ten km should be adopted for wind turbines. As the Cullerin survey data suggest, 2 MW turbines may require smaller setback distances. More powerful larger wind turbines will need greater setback distances but there is as yet no field research to help determine the acoustic zone of impact of those larger more powerful wind turbines, especially if they are sited closer together than 8 rotor diameters.

I caution, however, that even 10 km may not be enough to prevent adverse health effects, sleep disturbance, and progressive sensitisation, even with 3 MW wind turbines, over the lifetime of these wind power projects. We do not know and cannot guarantee that 10km will be safe for long term chronic exposure, especially for children.

Sarah Laurie, Waubra Foundation CEO, BMBS

For details of my professional qualifications and background as a rural General Practitioner, please see <http://waubrafoundation.org.au/about/people/>