



The Waubra Foundation.
PO Box 7112
Banyule
Victoria, 3084
Australia

Reg. No. A0054185H
ABN: 65 801 147 788

Wind Turbine Noise, Adverse Health Effects, and Professional Ethics

Written for the Human Rights Conference, Falmouth, USA

19th October, 2013

Knowing I would be following Lilli Green's footsteps with her moving stories of the people she has met around the world adversely impacted by wind turbines has helped me focus on aspects of this complex yet simple problem, which I think have not received enough public attention.

Essentially my interest and that of the Waubra Foundation is in the damage unregulated noise pollution is doing to human health, with a particular focus on the effects of infrasound and low frequency noise. Wind Turbines are one source, but there are others also doing damage. So my talk is deliberately aimed at better understanding some lessons from the past, both scientific, and ethical, which might help us move forward.

Constructively addressing the current conundrum about precisely what is causing the reported symptoms, sensations, sleep disruption and deteriorating mental and physical health of residents living near industrial wind turbines around the world, and trying to prevent such damage to health in future, has not been helped by ignoring or "burying" important research findings of the past, particularly those of Dr Neil Kelley and his co researchers, and NASA researchers from the 1980's.^{1,2,3}

For those who are not aware, Dr Kelley and his co researchers at the Solar Energy Research Institute in the US, closely connected with the US Department of Energy and NASA, identified in 1985 that the source of the annoyance for the residents living near a single downwind bladed turbine was *impulsive infrasound and low frequency noise, which resonated within the building structures*.⁴

Their research was detailed, thorough, and conducted in the best scientific fashion – curiosity about unintended consequences or "annoyance" being reported by residents. *They wanted to find out what was causing these reported problems, in order to prevent them occurring in future.* The effects were consistently reported to be worst in small rooms facing the noise source.⁵ Sensitisation or "conditioning" was also acknowledged⁶ – in simple terms people did not habituate or "get used to" the sound energy but became more and more sensitised to it with cumulative exposure. This effect has been consistently reported to me by those affected by infrasound and low frequency noise.

What was also clearly established was that *perception of the sound energy was well **below** the audibility thresholds for hearing in the infrasound range.*⁷ This is a critically important point, because all too often it is asserted particularly by those with a vested interest that it is the audibility thresholds which are the thresholds to consider, not the much lower infrasound perception thresholds. In other words, people could feel the sound pressure or vibration and were disturbed by it at levels where they could not hear it. This is precisely what people living near wind turbines describe – that they can feel the pulsations or vibrations even when they cannot hear the turbines.

Subsequent laboratory experiments using volunteers working for SERI (rather than wind turbine noise sensitised residents) reproduced the sound energy and the variable effects on those exposed.⁸ *In other words, **direct causation** of the reported “annoyance” effects from the impulsive reproduced sound energy identical to “wind turbine noise” was clearly established.* This research was certainly “noticed”, because it led to immediate changes in design from downwind bladed wind turbines to upwind bladed turbines, specifically to reduce or eliminate this problem of annoyance to the neighbours.

However the safety thresholds for infrasound and low frequency noise exposure levels, established by Kelley et al in 1985 on the basis of their detailed field study and subsequent laboratory data, were not ever adopted in the noise guidelines for wind turbine noise.

Why not?

The failure by government noise pollution regulation authorities to adopt these minimum guidelines to protect health in 1985, and the lack of reference to infrasound and low frequency noise in guidelines since, together with governments enthusiastically embracing wind energy without adequate transparent full spectrum noise pollution monitoring, have led to the current disastrous situation.

This research was presented at the American Wind Energy Association Windpower conference in 1987, sponsored by the US Department of Energy. ⁹

So, what we are now seeing with these global reports of serious and deteriorating physical and mental health, sleep deprivation and home abandonments around the world may **appear** to have been “unintended consequences”, *but they were known to some key people nearly thirty years ago, particularly the US department of Energy, NASA, and the many universities involved in this extensive field research.*

The consequences of exposure to impulsive infrasound and low frequency noise generated by wind turbines **were also clearly well known to the global wind industry**, because of the dramatic change in design which resulted, and because the results were presented at the AWEA sponsored conference.

And I suggest the consequences of such exposure were also well known to many of the acoustical engineers who provide services to the wind industry, and to the lawyers who helped the developers with the confidentiality clauses in their contracts.

Acousticians as a profession are far more knowledgeable about the range of symptoms and sensations commonly called “annoyance” which have been reported by those exposed to infrasound, low frequency noise and audible noise than most health professionals, with the exception of some occupational physicians¹⁰ and some ear nose and throat specialists.^{11,12} Rural health practitioners^{13,14,15,16,17,18} have been at the forefront of trying to raise the alarm with health authorities and their colleagues about the severity of the impacts and clinical

consequences they are seeing in wind turbine neighbours. So far, those concerns have generally fallen on deaf ears within the health, planning and noise pollution bureaucracies and responsible authorities with few exceptions.

These exceptions have generally occurred after significant community protests, sometimes assisted by professionals also expressing their concerns, and in the case in Australia this has led to four parliamentary inquiries – two federally, and two state based inquiries. Just some of these exceptions include the following:

- Health Canada have initiated a study, ¹⁹
- the Australian National Health and Medical Research Council have commissioned another literature review ²⁰ after extensive criticism of the 2010 “Rapid Review”, and
- the South Australian Environmental Protection Agency conducted an acoustic survey after significant public pressure from the Waterloo community was applied. ²¹

However there are those within both the acoustics profession, and in the ranks of Public Health bureaucracies and academia who still continue to deny or ignore the reports of harm from residents, and their treating health practitioners, as well as the existing peer reviewed published evidence of distress and harm to health from wind turbine noise, recently catalogued by Drs Lynn and Dr Arra from the Grey Bruce Health Unit in Ontario. ²²

These so called “public servants” have never gone and directly collected data and information directly from the sick residents, despite in some instances having an obligation to do so under the provisions of their respective legislation. In some instances they ignore the express concerns of middle ranking public servants reporting to them, who are trying to do their jobs properly and are well aware of their statutory duties of care and ethical obligations (particularly in the case of medical practitioners).

Why is there such reluctance on the part of senior government health authorities globally, especially to accept and investigate such obvious suffering from the widely reported serious sleep deprivation at the very least?

Is it a reluctance to rock the boat with their political masters and mistresses?

Is it ignorance of the adverse health effects of environmental noise pollution, including the downstream health consequences of sleep deprivation with night time noise, and physiological stress, or cardiovascular disease, some of which have been in the media recently with the recent Aircraft Noise studies, and reported by the World Health Organisation in its publications about night time noise or Environmental noise?

Or is it because there is an attitude that rural residents are “collateral damage” in order to “save the planet”? That has certainly been put to me in a private conversation, by one Australian medical practitioner who is a very active member of both the Climate and Health Alliance, the Public Health Association and the Doctors for the Environment.

Perhaps not surprisingly, these three advocacy organisations in Australia containing some of the leading lights of public health in Australia have led the way in officially trumpeting the “nocebo” hypothesis, that the publicity about the symptoms and reported problems is itself CAUSING the problems.

Sadly they have not been nearly so active in advocating for carefully targeted research to investigate the adverse health consequences of environmental noise pollution – something which was recommended by a major Australian government health report in 2004, entitled “*The*

Health Effects of Environmental Noise – Other than Hearing Loss” and has since been quietly shelved.

Perhaps this attitude of “acceptable collateral damage” also partly explains why so few medical or health researchers want to get actively involved in data collection. I have also been told that some researchers have been told their future grants have been threatened, which has discouraged their interest. Others have been refused permission by their university to study the impacts of infrasound, for example.

In my opinion, there are some serious ethical issues for health practitioners who espouse this “nocebo” hypothesis, *because there is no evidence collected directly from the sick people living with the effects of the noise pollution, which supports this hypothesis*. It is instead used to try and stop concerned trained health professionals from speaking out about the problems. I have frequently been accused of causing people’s symptoms, and I have no doubt that was a deliberate attempt to try and stop the Waubra Foundation’s efforts to make sure these problems are no longer invisible, and the suffering no longer ignored.

It is my opinion that the failure on the part of health practitioners to speak out about the serious problems they have seen has done immense harm, because the abuse of vulnerable people just continues and they continue to suffer, seemingly invisible to the health authorities.

Just how many people and lives need to be damaged before things will change?

How many suicides?

How many car accidents?

How many home and farm abandonments?

There are also ethical issues for medical practitioners who are well aware of the serious harm to the health of their patients, but choose to refuse to do anything other than privately suggest to their patient to leave their home.

How does one do that if one’s home is unsaleable?

How does one do that if one is so sick and exhausted, or if one’s employment is lost, and with it any chance of relocating and starting again?

How does one do that if one’s savings have been eaten away from the costs of getting away regularly in order to regain health?

What if one is elderly and frail?

What if one is young, and the child of a wind turbine host?

As Carmen Krogh from the Society for Wind Vigilance in Canada has often pointed out, there are social justice issues here, which are being universally ignored. Those in our rural communities who are the most disadvantaged are the worst impacted if they find they are adversely affected and cannot live in their homes. If the noise polluter does not buy them out, and their property cannot be sold, they are trapped.

In Australia, the most outspoken “denier” of harm to health from exposure to wind turbine noise is a sociologist and public health Professor²³ at Sydney University, whose PhD examined aspects of cigarette advertising.

Professor Simon Chapman recently assisted VESTAS with the launch of their “Act on Facts” campaign,²⁴ denying any harm to health from their wind turbines.

Professor Chapman has been invoking the “nocebo” hypothesis for some time,²⁵ but recently has cited new research from New Zealand by PhD candidate, Fiona Crichton²⁶ to support his frequent assertions that scaremongering or publicity about the symptoms is itself **causing** the symptoms.

Crichton’s research has been strongly criticised by experts in audiology²⁷ and acoustics²⁸ with a comprehensive knowledge of their subject matter and experience in this particular field of wind turbine noise. It used sound energy exposures in the infrasound range which were unrelated to the range of frequencies and impulsive characteristics of wind turbine noise. Experimental exposures were for only 10 minutes during the day, and the study utilised subjects who were apparently fit young adults.

In contrast, rural residents are exposed to wind turbine noise day **and night** when the wind is blowing, for up to 25 years, and are reporting their sleep is regularly and repeatedly disturbed in addition to a range of other effects which directly correlate with exposure to operating wind turbines. Rural residents are often not young, and may have chronic pre existing physical and mental illnesses.

Inconveniently for Crichton and Chapman, there is no such evidence of a “nocebo effect” collected **directly** from wind turbine affected residents in the peer reviewed research, nor is it consistent with the clinical findings of health practitioners and researchers from the UK,²⁹ Australia,³⁰ Scandinavia,³¹ the United States,³² Canada,³³ & New Zealand.³⁴

There is extensive clinical experience and a body of peer reviewed research evidence, which supports clinical concerns about the adverse health consequences of both chronic sleep deprivation, and chronic stress, regardless of the specific cause of that sleep deprivation or stress.

Dr William Hallstein, a psychiatrist from Falmouth, USA stated the following in a recent letter to the Falmouth Board of Health ³⁵:

“In the world of medicine illnesses of all varieties are destabilized by fatigue secondary to inadequate sleep. Diabetic blood sugars become labile, cardiac rhythms become irregular, migraines erupt and increase in intensity, tissue healing is retarded, and so forth, across the entire field of physical medicine. Psychiatric problems intensify and people decompensate. Mood disorders become more extreme and psychotic disorders more severe.”

Those who are young and fit report taking longer to be adversely impacted by exposure to wind turbine noise, unless they have underlying physical and mental health conditions, which make them more vulnerable or susceptible.

Dr Hallstein goes on to state the following ³⁶:

“People with no previously identified psychiatric illness are destabilized by sleep deprivation. Sleep deprivation experiments have repeatedly been terminated because test subjects become psychotic; they begin to hallucinate auditory and visual phenomena. They

develop paranoid delusions. This all happens in the “normal” brain. Sleep deprivation has been used as an effective means of torture and a technique for extracting confessions.”

I sincerely hope Dr Hallstein’s words do not fall on deaf ears with the Falmouth Health Board members and other responsible authorities, who do indeed have the powers to **“stop the abuse”** as Dr Hallstein has requested.

The final word on the nocebo nonsense currently being peddled by some including Australian Green Senator Richard Di Natale (also a medical practitioner) is from Dr Michael Nissenbaum, who had this to say about non physicians invoking the use of a diagnosis of “the nocebo effect” in his final response to the Australian Federal Senate Inquiry in November, 2012. ³⁷

“... suggesting a diagnosis of ‘nocebo’ without investigating, ‘boots on the ground’, for more plausible, better understood, or more logical causes of a medical condition would normally constitute medical malpractice in most Western-based medical systems, including Australia. Individuals who are not physicians are not limited by this professional mandate or even necessarily this conceptual framework.

With respect to breaches of professional ethics, whilst medical practitioners have been undoubtedly guilty of ignorance, and in some cases, refusing to act empathetically and appropriately even with direct knowledge of real and serious suffering, the other professional group which is in many ways even more responsible, is that of acoustical engineers. Acoustical engineers are employed by and paid by a variety of clients, including the noise polluters, governments, residents or others who are affected by noise.

They are however expected to put the health, safety and welfare of the community ABOVE all commercial interests, at all times.

There is every indication globally, with respect to acousticians working for the wind industry, and some other noise polluters, that some are regularly breaching their professional codes of ethics by ignoring or dismissing the reported noise impacts of the wind turbine neighbours. Disturbingly, a number of ethical acousticians from four continents have told me personally of the bullying and harassment they have endured at the hands of their colleagues who have significant financial conflicts of interest.

In my opinion, it is therefore also long overdue for **all** acousticians to act according to their professional codes of ethics ^{38,39} and to put the interests of the health and safety of the community **first**, and to work collegiately with health professionals who are trained in accurate diagnosis of specific clinical conditions. A failure to do so now could result in far reaching consequences for them as a professional group.

To date, acousticians working as paid consultants with the noise polluting industries have unfortunately all too often chosen to “shoot the messenger” whether the messenger has been either the adversely impacted residents or concerned health practitioners, other acousticians, or researchers. Dr Nina Pierpont has been subjected to some particularly “special” treatment by a select few acoustic consultants, particularly Dr Geoffrey Leventhall, in a regrettable fashion.

That approach of “shooting the messenger” will not solve the current problems with respect to wind turbine siting and noise pollution regulation, nor will it stem the complaints being made about them to acoustical professional bodies, professional indemnity bodies, or the lawsuits for professional negligence. As wind turbines increase in size, the problems are predictably going to increase.

In rural Australia, acoustical consultants working for the wind industry or other noise polluters are regarded almost universally with complete contempt by those people whose health has been harmed by the noise pollution, regardless of the source of the noise (eg mining, CSG field compressors, gas fired power stations as well as wind turbines).

The acousticians and their professional bodies seem impervious to this, which is a dangerous situation for their profession, and in particular its leaders, if it is incapable of regulating adequate and acceptable professional behaviour. It is also potentially dangerous for individual acoustic consultants, whom angry and desperate rural residents regard as being personally responsible for what they describe as “torture” for themselves and their loved ones.

People who are desperate do not take well to having their suffering ignored or their families harmed.

There are many clinical clues and some animal and human research which acoustic engineers will not necessarily recognise, unless they are also medical practitioners or health researchers, or they have a good knowledge of neurobiology and neurophysiology, which suggest that disturbance of the vestibular sensory system, and the consequent sleep disturbance and physiological stress are integrally related and that the direct causal link is sound energy, whether it is frequencies above 200 Hz, or frequencies in the infrasound or low frequency noise spectra.

The cross disciplinary nature of the problems (and therefore the solutions) require a cooperative approach to this work.

There is now a growing global network of professional acousticians, health researchers, health practitioners and others who are actively sharing insights and information, which has greatly assisted progress in the last couple of years particularly.

Dr Paul Schomer’s recent paper⁴⁰ is one such collaborative effort, which itself generated very useful subsequent multidisciplinary public and private conversations which themselves advanced our collective understanding. This is only possible with mutual trust and respect, and ongoing dialogue.

American Acoustician Rick James also deserves special mention – he has played a crucial role in educating or reminding us all about highly relevant longstanding acoustical knowledge and research which seems to have been conveniently “forgotten”. Rick’s paper over a year ago, published in the Bulletin of Science, Technology and Society ⁴¹ entitled “*Wind Turbine Infra and Low Frequency Sound: Warning signs that were not heard*” is an excellent summary of what has for too long been denied or forgotten.

It was Rick who drew my attention to the Kelley research I mentioned earlier, which nearly 30 years ago established both direct causation of annoyance symptoms from wind turbine generated infrasound and low frequency emissions resonating within building structures, but also a baseline of operating parameters to help prevent annoyance from infrasound and low frequency noise. ⁴² Yet as I said at the beginning, these operating limits for infrasound and low frequency noise exposures to prevent annoyance (and therefore adverse health effects) from wind turbines, based on an extensive US Government Department of Energy funded acoustic field and laboratory research program, have never been implemented.

Whilst it is not yet clear that these parameters would adequately protect the health of vulnerable members of the community from the effects of chronic cumulative exposure, ***why are these limits for infrasound and low frequency noise exposure universally ignored by***

those members of the acoustics profession who have written the wind turbine noise pollution regulations for governments?

It is important to note, however, that wind turbines are not the only source of this health damaging sound energy, as Rick James's paper makes clear. ⁴³

The Waubra Foundation is equally concerned about the plight of those living beside other noise polluting industrial facilities, which result in similar tragedies, which is why our Acoustic Pollution Assessment Guidelines document ⁴⁴ is not specific for wind turbine noise. We have been contacted with requests for information and assistance by affected people living in urban as well as rural areas, and the noise and vibration sources have included coal mining, gas fired power stations, large refrigeration units with compressors and swimming pool compressors in city apartment blocks.

The symptoms are identical in many instances, all of course correlating directly with exposure to the noise and vibration.

One of the more distressing stories I have heard recently was about a young child with a disability living near a coal seam gas field with low frequency noise emanating from the field compressor. The child spent its days and some of its nights banging its head against the wall of the home, to try and get rid of the sound from inside its head. Eventually the family were bought out by the noise polluter, and yet again, joined the ranks of those silenced from telling their story by the 'gag' clause in the contract with the noise polluter.

The insidious practice of silencing sick people must stop.

There are fundamental abuses of human rights occurring, and vulnerable citizens such as young children, the elderly and the chronically ill are predictably being seriously harmed from the combined effects of chronic sleep deprivation and chronic stress, in addition to the other symptoms of wind turbine syndrome, itself a subset of what could be called "infrasound and low frequency noise syndrome".

The effects on unborn children have not yet been documented, because of the lack of research, but pregnant women are advised to get adequate sleep, nutrition and avoid stress for good reason. This is impossible for all too many living with health damaging infrasound and low frequency noise pollution from wind turbines, and the chronic nausea, which can accompany it. I hope those health and acoustical professionals working with authorities and noise polluters who have avoided or ignored their duties of care and professional ethics are held accountable for the damage that is being done *because of their continued denial of the problems or their refusal to investigate them adequately and with professional and scientific integrity.*

I salute my professional colleagues in health and acoustics who have had the courage to lead by example, to speak out about the problems, or to conduct important pioneering research. ⁴⁵

I particularly salute those who have withstood the public and private bullying and intimidation from colleagues with ideological or vested commercial interests, and have chosen instead to steadfastly abide by their professional codes of ethics, to "first do no harm", and to "hold paramount the safety, health and welfare of the public". ⁴⁶

Stephen Ambrose is one of these professionals who has real integrity and courage, and who together with his colleagues Robert Rand and Rick James and others have made a significant American contribution to global understanding of the problems caused by wind turbine noise. It has been a delight to work closely with him over the past couple of years.

An edited version of this speech was given in person to the Falmouth conference on 19th October, 2013 by Curt Devlin, on my behalf.

Author: Sarah Laurie, currently CEO, Waubra Foundation www.waubrafoundation.org.au

Former Rural General Practitioner (Family Physician) in South Australia

References

1. Kelley, N et al, 1985 "Acoustic Noise associated with Mod 1 Turbine; its source, impact and control" <http://waubrafoundation.org.au/resources/kelley-et-al-1985-acoustic-noise-associated-with-mod-1-wind-turbine/>
2. Kelley, N 1987 "A Proposed Metric for Assessing the Potential of Community Annoyance from Wind Turbine Low-Frequency Noise Emissions" <http://waubrafoundation.org.au/resources/1987-problem-with-low-frequency-noise-from-wind-turbines-scientifically-identified/>
3. Hubbard, H 1982 "Noise Induced House Vibrations and Human Perception" (1982) 19:2 Noise Control Engineering Journal 49 <http://waubrafoundation.org.au/resources/hubbard-h-1982-noise-induced-house-vibrations-human-perception/>
4. Kelley, N et al, 1985 op cit
5. Kelley, N et al, 1985 op cit
6. Kelley, N et al, 1985 op cit p 190
7. Kelley, N et al, 1985 op cit
8. Kelley, N 1987 op cit
9. Kelley, N 1987 op cit
10. Johansson, M 2013 Open Letter "Big Wind Turbines, Health and Disease, a Danish Perspective" <http://waubrafoundation.org.au/2013/big-wind-turbines-health-disease-danish-perspective/>
11. Black, O 2009 Statement to Planning Hearing, Illinois, <http://waubrafoundation.org.au/resources/dr-owen-f-black-md-neuro-otologist-re-wind-turbine-syndrome/>
12. Farboud, R. Crunkhorn and A. Trinidad, "Wind Turbine Syndrome: Fact or Fiction" (2013) Journal of Laryngology & Otology, 1 of 5 <http://waubrafoundation.org.au/resources/wind-turbine-syndrome-fact-or-fiction-farboud-et-al/>
13. Harry, A <http://waubrafoundation.org.au/resources/dr-amanda-harry-groundbreaking-survey-sick-residents/>
14. Iser, D <http://waubrafoundation.org.au/resources/dr-david-iser-2004-conducts-first-survey-patients-living-near-wind-project/>
15. Pierpont, N <http://waubrafoundation.org.au/resources/dr-nina-pierpont-submission-australian-senate-inquiry/>
16. McMurtry, R <http://waubrafoundation.org.au/resources/mcmurtry-evidence-known-adverse-health-effects-industrial-wind-turbines/>
17. Reider, S <http://waubrafoundation.org.au/resources/dr-sandy-reider-testimony-calls-for-moratorium-wind-farms/>

18. Trask, P <http://waubrafoundation.org.au/resources/psychologist-peter-trask-calls-government-listen/>
19. Health Canada announcement <http://waubrafoundation.org.au/2012/health-canada-announces-wind-turbine-noise-and-health-study/>
20. NHMRC announcement <http://waubrafoundation.org.au/resources/nhmrc-announce-second-literature-review-wind-farms-health/>
21. South Australian EPA announce acoustic survey
<http://waubrafoundation.org.au/resources/worlds-eyes-will-be-waterloo-as-wind-turbines-go-trial/>
22. Arra & Lynn, 2013 Powerpoint presentation of findings of literature review, itself submitted for peer review and publication
<http://waubrafoundation.org.au/resources/association-between-wind-turbine-noise-and-human-distress/>
23. Open letter to Simon Chapman <https://www.wind-watch.org/documents/letter-from-sarah-laurie-to-simon-chapman/>
24. Vestas media release 18th June, 2013
<http://www.vestas.com/Default.aspx?ID=10332&action=3&NewsID=3294>
25. Multiple references to various opinion pieces in footnotes to open letter to Simon Chapman <https://www.wind-watch.org/documents/letter-from-sarah-laurie-to-simon-chapman/>
26. Crichton, T et al 2013, "Can Expectations Produce Symptoms From Infrasound Associated With Wind Turbines" <http://waubrafoundation.org.au/resources/crichtonf-et-al-can-expectations-produce-symptoms-infrasound-and-wind-turbines/>
27. Punch, J 2013 <http://waubrafoundation.org.au/resources/review-crichton-et-al-can-expectations-produce-symptoms-from-infrasound/>
28. Swinbanks, M 2013 <http://waubrafoundation.org.au/resources/swinbanks-can-expectations-produce-symptoms-from-infrasound/>
29. Harry, A op cit
30. Iser, D, Trask, P op cit
31. Multiple Scandinavian studies, listed in Arra & Lynn, op cit
32. Nissenbaum, M et al September, October 2012 "Effects of Industrial wind Turbines on Sleep and Health" Noise & Health <http://waubrafoundation.org.au/resources/effects-industrial-wind-turbine-noise-sleep-and-health/>
33. Krogh, C et al <http://waubrafoundation.org.au/resources/windvoice-self-reporting-survey/>
34. Shepherd, D et al 2011 September – October 2011 "Evaluating Impact of Wind Turbine Noise on Health related Quality of Life" Noise & Health
<http://waubrafoundation.org.au/resources/effects-industrial-wind-turbine-noise-sleep-and-health/>
35. Hallstein, W 2013 Letter to Falmouth Board of Health
<http://waubrafoundation.org.au/resources/hallstein-w-falmouth-wind-turbines-sleep-deprivation-psychiatrist-weighs/>
36. Hallstein, op cit
37. Nissenbaum, response to question on notice to Australian Federal Senate inquiry November, 2012 <http://waubrafoundation.org.au/resources/michael-nissenbaum-senate-renewable-energy-inquiry/>
38. Details of the British, Canadian, American and Australian codes of ethics are at the following: <http://waubrafoundation.org.au/resources/acoustic-organisation-codes-conduct/>
39. Cooper, S 2012 "Wind Farm Noise: an ethical dilemma for acousticians"
<http://waubrafoundation.org.au/resources/wind-farm-noise-an-ethical-dilemma-for-acousticians-steven-cooper/>

40. Schomer, P et al 2013 “A proposed theory to explain some adverse physiological effects of the infrasonic emissions at some wind farm sites”
<http://waubrafoundation.org.au/resources/schomer-et-al-wind-turbine-noise-conference-denver-august-2013/>
41. James, R 2012 “Wind Turbine Infra and Low Frequency Sound: Warning signs that were not heard” Bulletin of Science, Technology and Society 32 (2) 108-127. This document is accessible from Sage Publications at <http://bsts.sagepub.com> It was also included by Professor Colin Hansen as an attachment to his submission to the Australian Federal Senate Inquiry in November 2012 (it can be accessed by going to the Inquiry Website http://www.aph.gov.au/Parliamentary_Business/Committees/Senate_Committees?url=ec_ctte/renewable_energy_2012/submissions.htm Scroll down to Submission No. 26.)
42. Kelley, N et al 1985 op cit, p 225
43. James, R 2012 op cit
44. The Waubra Foundation’s Acoustic Pollution Assessment Guideline – first issued May 2012, further modified in March, 2013 <http://waubrafoundation.org.au/about/acoustic-pollution-assessment/>
45. See for example the list of health, engineering and research professionals compiled by the European Platform Against Wind Farms 2013, and those who participated in the Canadian Broadcasting Documentary WindRush at <http://www.epaw.org/documents.php?article=ns53>
There are also those who agreed to sign a document called the Darmstadt Manifesto in 1998, which was concerned with a variety of problems with wind turbines, but included the issues of wind turbine noise and health effects, accessed from <http://waubrafoundation.org.au/resources/darmstadt-manifesto-1st-september-1998/>
46. **Professional codes of conduct for acousticians** in Australia, the UK, Canada and the USA are detailed on the Waubra Foundation website:
<http://waubrafoundation.org.au/resources/acoustic-organisation-codes-conduct/>
The Hippocratic Oath did not actually contain the words “primum non nocere” which translate to “**first do no harm**”. Nevertheless it is the phrase commonly invoked and widely understood to be a responsibility of physicians, and it is an integral part of ethical guidelines and clinical decision making. Documents such as the Australian Health Practitioner’s Regulatory Authority’s “Good Medical Practice – **a code of conduct for Doctors** in Australia” make it clear what is expected by Health Regulatory Authorities downloadable from <http://www.medicalboard.gov.au/Codes-Guidelines-Policies.aspx>
The provisions of the **Nuremburg code** are also relevant to consider here, given that the governments of nation states are engaged in what amounts to an “experiment” by allowing the placement of large wind turbine technology close to human habitation and workplaces **without first demonstrating that this technology is safe**. Governments (made up of both elected officials and “public servants”) are also in almost all cases refusing to take any responsibility for either investigation of the reported problems, adopting an adequate precautionary approach, or properly funding independent multidisciplinary research. (see http://en.wikipedia.org/wiki/Nuremberg_code)