

# **Psycho-social mediators of reported annoyance and putative health-related symptoms associated with wind turbines: a discussion starter**

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There has been a long history of sometimes protracted episodes of community concern about environmental health risks said to be caused by new technologies. Some examples include the telephone[1], television sets, computer screens, microwave ovens, electric blankets and other household electrical appliances[2], mobile telephones and base stations[3, 4], fluoridation and vaccination[5]. Wind turbines present a classic case example of a relatively new technology which has generated claims about symptoms and illness said to be caused by exposure to the turbines.

There is large variability in self-reported annoyance and claims of health-related symptoms claimed as being associated with exposure to wind turbines. Most people who are exposed are not annoyed (eg: 723 of 754 – 96% residents in a recent Swedish study[6] , and indeed many welcome turbines in their locality. Two studies have reported that those who live closest to turbine developments are the most positive about them, particularly after the turbines are operating[7, 8]. However a small minority of those exposed can become very annoyed and some claim that exposure to turbines makes them ill. Studies have also reported the paradoxical findings of dose-response relationships between sound exposure and noise perception. For example, a Swedish cross-sectional study of 351 people living in a densely populated area containing 16 turbines, found that compared to other sources of community noise such as road traffic, many of those studied reported greater annoyance with turbine noise than with louder other sources[9].

Such findings point to factors extrinsic to the noise generated by turbines which play important mediating roles in whether or not those exposed are annoyed or express symptoms they claim are caused by their exposure. Mediating factors are well known in studies of risk perception and community outrage. However, the research literature on wind turbines reporting on this variability and examining psycho-social factors associated with annoyance and health variables is relatively small, and none of this research appears to have been published about Australian communities with turbines.

**Aircraft noise** A similar phenomenon – community annoyance and self-reported health symptoms relevant to aircraft noise - has been studied extensively[10] and was subject to

research at the beginning of the last decade in relation to questions being asked about residents' exposure to noise under flight paths into Sydney airport. This work concluded:

- Self-reported physiological/health effects differed across areas with the same aircraft noise level consistently with differences in psychological reaction across these areas. Beliefs about expected change in future noise levels added to the level of self-reported physiological symptoms predicted by noise level. These results are consistent with the hypothesis that expectations regarding future noise levels contribute to the physiological impact of noise, which may be reduced by addressing psychosocial factors related to noise reaction[11].
- Negative impacts of noise exposure on health and performance may result in part from "learned helplessness," the syndrome typically produced by exposure to uncontrollable events. People may perceive environmental noise to be uncontrollable, and several effects of noise exposure appear to parallel "learned helplessness" deficits. Perceptions about noise were better predicted by measures of perceived control than by noise level. [12]

Wolsink[13] found that 46% of the variance between opposition and non-opposition to turbines was explained by factors which included feelings about perceived visual intrusion of wind turbines and perceptions about wind power as a clean source of energy. Pedersen & Waye also found that respondents' attitudes to the visual impact of wind turbines on landscape scenery influenced noise annoyance[9].

A Swedish grounded theory study[14] to generate conceptual models and hypotheses for further testing, reported the views of 15 people living near turbines. Personal values about the living environment appeared to influence perceptions about turbine noise, with those who saw rural areas as suitable places for economic growth being indifferent to the noise, while those who valued the countryside as a place that should be quiet and relaxing felt the noise intruded on privacy. The authors hypothesized "that exposure from wind turbines would be more negatively appraised in an area that is perceived as unspoiled than in an area where several human activities take place." [6] The same authors subsequently reported that variables like "having renovated a dwelling" was associated with increased annoyance about turbines, and that "people choose environments that harmonise with their self-concept and needs, and that they remain in places that provide a sense of continuity." [6]

Risk communication and perception researchers such as Sandman have produced matrices of factors which have been often found to be associated with increased levels of community “outrage” about putative environmental threats to health[15-18] . These factors have been identified repeatedly in research on predictors of community outrage about alleged environmental hazards arising from new and particularly “imposed” technology. Sandman, drawing on Covello and others distinguishes primary from additional factors, with primary factors being those which have been shown to be more strongly associated with increased levels of community concern. The table below indicates the likely applicability of these factors to the case of predicting community concern about wind farms.

**Table: Primary and additional components predicting community outrage about putative environmental risks to health: the case of wind turbines.**

<b>A: Primary factors</b>			
<b>INCREASES OUTRAGE IF ...</b>		<b>REDUCES OUTRAGE IF ...</b>	
exposure coerced (among those not electing to house turbines on their land)	✓✓	exposure voluntary (among those electing to house turbines on their land)	✓✓
agent industrial	✓✓	agent natural	
agent exotic	✓✓	agent familiar	
agent memorable	✓✓	agent forgettable	
consequences dreaded (eg: cancer, birth defects)		consequences not dreaded	✓
consequences catastrophic (ie: many people suddenly and badly affected)		consequences chronic	✓
true hazard unknowable (ie: science largely “open”)	✓	true hazard knowable (ie: broad scientific consensus about effects)	
hazard controlled by others	✓✓	hazard individually controlled	
exposure unfair (ie: not all citizens exposed equally)	✓✓	exposure fair	

sources untrustworthy (ie: scientists, officials associated with source)	✓	sources trustworthy	
process unresponsive (ie: demands for action not quickly met)	✓✓	process responsive	
<b>B: Additional factors</b>			
affects vulnerable population (eg: children, retirees)	✓	affects general population	
health effects delayed		effects immediate	✓
substantial risk to future populations		no threat to future populations	✓
victims identifiable (ie: named complainants)	✓✓	victims statistical	
not preventable		Preventable	✓
few benefits		many benefits	✓✓
substantial media attention	✓✓	little media attention	
opportunity for collective action	✓✓	no opportunity for collective action	

(✓✓ = applies strongly to wind turbines; ✓ = likely to apply less strongly)

## Some research questions about psychosocial aspects of community reactions to wind turbines.

**Can variations in Australian resident annoyance and self-reported health symptoms over wind turbines be explained by the same variables found in international studies?**

The above brief summary of some of the mediating factors found to be associated with annoyance suggest a range of variables that could be explored in any planned Australian studies.

### **Is payment for “hosting” wind turbines protective against annoyance?**

Land owners are paid considerable money by wind energy providers for having turbines installed on their land. Some of these landowners live on these properties, and so can live in close proximity to the turbines. Those with multiple turbines on their land can derive significant annual income, while neighbours living on nearby adjacent land with unfavourable topography who may be able to see and hear the turbines on neighbouring properties are denied such benefits. If turbines pose a threat to health and are “objectively” annoying, then the null hypothesis would suggest that they should be equally annoying and pose equal health threats to both those who deriving income from them and those who do not. Concern about the impact of adjacent turbines on land values may cause The turbines thus become a symbol of perceived “unfairness” and features of the turbines such as the “swoosh” sound that might otherwise be unremarkable, may become anxiety-generating preoccupations.

Important questions arise about whether receipt of such payment may act as an “antidote” to annoyance and the reporting of symptoms alleged to be associated with exposure to turbines. Might payment be “protective” against annoyance and symptoms? This variable ought to be included in any studies of annoyance and illness as a potentially important explanatory variable.

One recent Dutch study found that “people who benefit economically from wind turbines have a significantly decreased risk of annoyance, despite exposure to similar sound levels” and that “High turbine visibility enhances negative response, and having wind turbines visible from the dwelling significantly increased the risk of annoyance. Annoyance was strongly correlated with a negative attitude toward the visual impact of wind turbines on the landscape.” [19]

Claims by those opposing windfarms that those who have contacts with energy companies preventing them from speaking out about annoyance or illness need to be investigated. I have a copy of one such contract which contains no such “gag” clauses and have been informed by other energy companies and lawyers that confidentiality clauses which exist in some contracts would not extinguish any common law rights to redress over any injuries or hurt said to be caused by turbines, nor would it prevent any person who had signed such a contract from talking publicly about their concerns.

### **Does the prevalence of annoyance and self-reported symptoms vary between turbines installed by different companies?**

Wolsink wrote critical reflections on the “NIMBY” (not in my backyard) syndrome as the most common explanation for the differences in widespread community support for wind power and local opposition to the turbines[13]. He is critical of NIMBYism as an adequate explanation for opposition and emphasized that “institutional” factors (the behavior, communication and

policies of wind energy companies in turbine areas) is likely to be critical in understanding community acceptance or opposition to turbines.

In light of Wolsink's analysis, it would be interesting to examine different Australian communities where different energy companies are operating to determine whether there are any differences in the proportion of residents expressing annoyance and/or health symptoms. Such a study might also investigate residents' perceptions of corporate responsiveness and openness.

### **Competing interests: None**

1. Aronsen, S., *The Lancet on the telephone, 1876-1975* Medical History, 1977. **21**: p. 69-87.
2. Savitz, D., *Overview of epidemiological research on effects of electrical and magnetic fields and cancer*. Am Ind Hygiene Assoc J 1993. **54**: p. 197-204.
3. Burgess, A., *Cellular phones, public fears and a culture of precaution*. 2004, Cambridge: Cambridge University Press.
4. Chapman, S. and S. Wutzke, *Not in our backyard: media coverage of community opposition to mobile phone towers: an application of Sandman's outrage model of risk perception*. Aust NZ J Public Health, 1997. **21**: p. 614-20.
5. Leask, J.A. and S. Chapman, *An attempt to swindle nature: press anti-immunisation reportage 1993-1997*. Aust N Z J Public Health, 1998. **22**(1): p. 17-26.
6. Pedersen, E. and K. Persson Waye, *Wind turbine noise, annoyance and self-reported health and well-being in different living environments*. Occup Environ Med, 2007. **64**(7): p. 480-6.
7. Warren, C.H., et al., *Green on green: public perceptions of wind power in Scotland and Ireland*. J Experimental Planning and Management, 2005. **48**(853-75.).
8. Kalledis, J.K., *Social attitude towards wind energy applications in Greece*. Energy Policy, 2005. **33**(595-602.).
9. Pedersen, E. and K.P. Waye, *Perception and annoyance due to wind turbine noise--a dose-response relationship*. J Acoust Soc Am, 2004. **116**(6): p. 3460-70.
10. Morrell S, Taylor R, and L. D., *A review of health effects of aircraft noise*. Aust NZ J Pub Health, 1997. **21**: p. 221-36.
11. Hatfield J, et al., *The influence of psychological factors on self-reported physiological effects of noise*. Noise Health, 2001. **3**: p. 1-13.
12. Hatfield J, et al., *Human response to environmental noise: the role of perceived control*. Int J Behav Med, 2002. **9**: p. 341-59.
13. Wolsink, M., *Wind power and the NIMBY-myth: institutional capacity and the limited significance of public support*. Renewable Energy, 2000. **21**: p. 49-64.
14. Pedersen, E., L.-M. Hallberg, and K. Wayne, *Living in the vicinity of wind turbines - - a grounded theory study*. Qualitative Research in Psychology, 2007. **4**(49-63.).
15. Sandman, P., *Responding to community outrage: strategies for effective risk communication*. 1995, Fairfax, Va. : American Industrial Hygiene Association.
16. Sandman, P., *Hazard versus outrage in the public perception of risk*. in: Covello, V.T., McCallum, D.B., Pavlova, M.T. (eds.) *Effective risk communication*. 1989, New York: Plenum Press.
17. Sandman, P., *Risk = Hazard + Outrage. A formula for effective risk communication (video)*. . 1989, Fairfax, Va.: American Industrial Hygiene Association.

18. Covello, V., D. Von Winterfeldt, and P. Slovic, *Communicating scientific information about health and environmental risks: problems and opportunities from a social and behavioural perspective*. In: Covello, V., Lave, L., Maghissi, A., Uppuluri, V.R.R. (eds.) *Uncertainties in risk assessment and management*. 1986, New York: Plenum.
19. Pedersen, E., et al., *Response to noise from wind farms in The Netherlands*. *J Acoust Soc Am* 2009. **126**(634-43.).