



# Adding insult to injury: The development of psychosocial stress in Ontario wind turbine communities



Chad Walker<sup>\*</sup>, Jamie Baxter, Danielle Ouellette

Western University, Canada

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## ABSTRACT

Though historically dismissed as not-in-my-backyard (NIMBY) attitudes, reports of psychosocial stress linked to wind energy developments have emerged in Ontario, Canada. While the debate and rhetoric intensify concerning whether wind turbines ‘actually’ cause ‘health’ effects, less sincere attention has been given to the lived experience and mental well-being of those near turbines. Drawing on theories of environmental stress, this grounded theory, mixed-method ( $n = 26$  interviews;  $n = 152$  questionnaires) study of two communities in 2011 and 2012 traces how and why some wind turbine community residents suffer substantial changes to quality of life, develop negative perceptions of ‘the other’ and in some cases, experience intra-community conflict. Policy-related forces, along with existing community relationships may help explain much of these differences between communities. We suggest a move beyond debating simply whether or not ‘annoyance’ represents a ‘health impact’ and instead focus on ways to minimize and attenuate these feelings of threat (risk) and stress at the community level.

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## 1. Introduction

The emphasis in some jurisdictions on using wind to meet carbon emission and sustainable energy targets has resulted in backlash from some host communities. In the case of Ontario, Canada, this backlash has included claims of negative health effects from local wind turbines. Ironically, the same technology is said to actually improve human health by replacing ‘dirtier’ technologies like coal (Markandya and Wilkinson, 2007) and avoiding disease outbreaks, malnutrition, and food insecurity associated with global climate change (Confalonieri et al., 2007; Jankowska et al., 2012; McMichael et al., 2006; WHO, 2002). Within the province and elsewhere, recent reports indicate that turbines are being linked to negative human health effects on those living ‘too close’ (Deignan et al., 2013; Krogh et al., 2011; McMurtry, 2011; Nissenbaum et al., 2012). In order to further investigate these potential linkages, Health Canada and the University of Waterloo are both now conducting epidemiological studies. While these projects hold promise for addressing the somatic components of health, there has been little work devoted to the psychosocial components of health and well-being (Shepherd and Billington, 2011). One

exception is a review of the noise annoyance literature by Pedersen and Halmstad (2003) who suggest the link to noise and negative psychosocial impacts is at least plausible based on comparison to air and road traffic noise studies. Because of the lack of psychosocial studies on turbines themselves, we draw on analogous theory and empirical work related to technological hazards and risk.

Despite widespread discussion of wind turbine-related health issues in the media and on the internet, the academic literature is relatively silent on the role of health risk perception and broader social determinants of health related to turbines. Instead, the current literature emphasises the dual and linked roles of turbine noise and aesthetics as motivators for concern and opposition (Devine-Wright, 2005; Eltham et al., 2008; Hill and Knott, 2010; Walker, 1995; Wolsink, 2006, 2000). Relatively less explored are community-level issues like stress-inducing intra-community social conflict (Baxter, 2006; Hill and Knott, 2010; Kasperson et al., 1988; Walker et al., 2014). Our study is rooted in humanistic geography which takes a more empathetic approach and more thoroughly traces the mechanisms for health impacts in two turbine communities immediately adjacent to each other.

The research context is Ontario – currently Canada’s leader in terms of turbine installations with approximately 2500 MW of capacity (~1600 turbines) or 34% of the country’s total (CANWEA, 2013). The province has promoted wind and other renewable energies through the Green Energy Act (GEA); an initiative that aims

<sup>\*</sup> Corresponding author. 1424 Social Science Centre, Western University, 1151 Richmond Street, London, Ontario, Canada N6A 5C2.

E-mail address: [cwalke26@uwo.ca](mailto:cwalke26@uwo.ca) (C. Walker).

to make Ontario a “... global leader in the development of renewable energy” (Government of Ontario, 2008).

The GEA has severely limited the arguments deemed acceptable by the government to reject a renewable energy project to two main issues: i) human health and ii) environmental damage. Though not referring to Ontario's Green Energy Act specifically, some have suggested that objectors may be selective in terms of their public complaints in order to align with what is considered legitimate by policy (Bosley and Bosley, 1988; Gipe, 1995). Thus, a focus on physical health complaints (e.g., nausea, cognitive deficits, dizziness/vertigo, and cardiovascular problems) may mask equally serious mental health and/or general quality of life impacts that have already been delegitimized by officials in the public sphere (Seglins, 2012; Talaga, 2010).

## 2. Literature review

The focus of this study is on the psychosocial impacts of wind turbine development at both the individual and community level. Elliott et al. (1993, p.791) define the term as a complex mix of “distress, dysfunction, and [or] disability manifested in a wide range of psychological, social and behavioural outcomes ...” (see also Elliott et al., 2004; Luginaah et al., 2002; Wakefield and Elliott, 2000). Outcomes may include worry, anger, despair, tension, community division (Wakefield and Elliott, 2000) and conflict (Couch and Kroll-Smith, 1994; Edelstein, 1988). The above studies draw on environmental stress and coping theory (Baum et al., 1982; Lazarus and Folkman, 1984), which views stress as an outcome of the way in which environmental forces “threaten an organism's existence or well-being” (Baum et al., 1982; p. 15). Symptoms manifest from the combination of appraisal of threat and perceived lack of resources to cope with that threat (Baum et al., 1982). Thus, various types of developments pose risks (threats) to individual health and community psychosocial well-being through (perceived) exposure to harmful chemicals and a perceived lack of resources to deal with that threat. Yet, studies involving technological hazards tend to narrowly define psychosocial impacts as the combination of concern about the facility (appraisal of threat) and actions towards the facility (problem focused coping) (e.g., Elliott et al., 1997; Luginaah et al., 2002; Wakefield and Elliott, 2000). This may be a side effect of using mainly quantitative, survey-dominant methodologies. There are exceptions though; including the qualitative interview-based work of Baxter (2006) who focuses more on social conflict and its relation to the local internal dynamics at the community level (see also Barnes et al., 2002; Mason et al., 2014).

In our study of wind turbines, we move beyond the individual and take a holistic approach that considers the interplay between individual and community. We do this by combining both survey and in-depth interview based work in the same study. This approach is consistent with the work of other geographers (Meth and McClymont, 2009; Wyley et al., 2007) who use mixed-methods to fill theoretical and empirical gaps, incorporate multiple truths, and “produce [both] the generalizable and the particular” (Warshawsky, 2014, p. 161).

There is some reference to psychosocial impacts already in the wind turbine literature, particularly in relation to noise annoyance. In contradistinction to the idea that physiological determinants of stress (e.g., noise) are the only legitimate turbine health impacts, these studies tend to tightly couple annoyance and health through the WHO concept of well-being – without specifically using the term ‘psychosocial’ (e.g., Nissenbaum et al., 2012) or by using it only fleetingly (Pedersen and Halmstad, 2003). Nevertheless, Shepherd and Billington (2011, p. 393) do use this term to suggest that turbines impact health through a number of interrelated pathways

whereby, “a simple stimulus–response relationship is inadequate, and more attention needs to be paid to psychosocial factors when assessing the impact of wind turbine noise”. In their review of the health effects of turbine noise, Pedersen and Halmstad (2003) seem to agree by pointing out that annoyance itself should be investigated further; since there tends not to be a dose response relationship between noise and annoyance. Like the hazards studies, these turbine studies/reviews tend to focus on the individual; yet stress, appraisal and coping are also embedded in wider social contexts.

The definition of health impacts itself is highly politicized in the policy context of wind turbines and is thus reasonably considered a determinant of psychosocial impacts. One debate hinges on the notion of whether annoyance is considered a (legitimate) health impact (Shepherd et al., 2011). Claims against annoyance-as-health determinant may then be viewed as a tactic to delegitimize the complaints of locals convinced they are experiencing health harm from some other aspect of turbines (e.g., vibration, noise). In a pivotal document from the Ontario Medical Officer of Health, annoyance was acknowledged as an impact of turbines, but it was simultaneously decoupled from direct health impacts – which are implicitly presumed to be more legitimate (CMOH, 2010). Further, a Canadian Wind Energy Association sponsored report specifically stated that though noise from turbines in particular evokes annoyance (e.g., Pedersen and Waye, 2004) the latter “is not considered an adverse health effect or disease of any kind” (Colby et al., 2009, p. 3–13). On the contrary there is some support for the idea that environmental noise can contribute to feelings of anxiety (Stansfield et al., 2000) stress, nausea and mood changes (Babisch, 2002) but these principles are rarely applied to wind turbines. Further, there are recent studies which suggest that noise and annoyance may be indirectly linked to the more legitimized somatic health effects through their relationship to sleep (Pedersen et al., 2007; Shepherd et al., 2011). For example, based on self-report surveys Nissenbaum et al. (2012) found that lower quality sleep and poorer mental functioning can be simultaneous impacts from living close to turbines. What is important for our purposes is that the public debate surrounding this evidence is may be reasonably considered a determinant of psychosocial impacts on its own.

## 3. Methodology

Most studies about wind turbines, including studies of the psychosocial impacts from turbines, are quantitative. This has prompted a call for more qualitative and mixed methods studies (Aitken, 2010; Devine-Wright, 2005; Ellis et al., 2007). Our study is mixed methods, guided by a grounded theory framework that is flexible and allowed concepts to be developed inductively (face-to-face interviews), then interrogated further quantitatively (surveys) (Charmaz, 2006; Pedersen et al., 2007). We define a “community” pragmatically, in the sense of a collection of households in close proximity to a turbine development. Port Burwell, Ontario was chosen as the primary site because it is home to Erie Shores Wind Farm, one of the earliest large-scale wind farms in the province with 66 turbines (99 MW) (CANWEA, 2013). Clear Creek, neighbouring Port Burwell to the east is home to a total of 18 turbines (~30 MW). The move into Clear Creek was facilitated by the grounded theory design whereby residents in Port Burwell talked about those who are dissatisfied with turbines living “down the road”.

The interviews were audio recorded, transcribed, and analyzed for emergent themes with the help of NVivo qualitative data management software. The 2012 survey was conducted after the majority of interviews were complete, is based on themes in the

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