Energy Research & Social Science 47 (2019) 102–112

Contents lists available at ScienceDirect

Energy Research & Social Science

journal homepage: www.elsevier.com/locate/erss

Review

The politics of evidence: Conflicting social commitments and environmental priorities in the debate over wind energy and public health

Jennifer Taylor[a,*], Nicole Klenk[b]

[a] Department of Geography and Planning, University of Toronto, 100 St. George St., Toronto, ON, M5S 3G3, Canada
[b] Department of Physical and Environmental Sciences, University of Toronto Scarborough, 1065 Military Trail, Toronto, ON, M1C 1A4, Canada

ARTICLE INFO

Keywords:
Wind energy
Human health
Science and technology studies
Rhetorical analysis

ABSTRACT

The question of whether wind turbines cause a range of adverse health effects has emerged as a key issue in social controversies over wind farms and become a topic of debate in the scientific literature. We review the literature from the perspective of Science and Technology Studies (STS) to examine the experimental evidence and argumentative reasoning constituting three main explanations for how wind turbines impact health: 1) Exposure to infrasound directly causes adverse physiological effects, 2) Exposure to audible noise is associated with annoyance and sleep disturbance, and 3) Psychogenic factors act as mediators to adverse effects. In addition to technical and pragmatic arguments, the debate consists of value-based arguments about the desirability of wind energy, how precautionary development should be, what counts as a valid health issue in public policy, and what counts as valid evidence in health research. Thus, it encompasses the conflicting social commitments and environmental priorities of the wider wind energy debate and the politics of evidence in the health sciences. It suggests the controversy is unlikely to be settled by science but that an STS perspective can provide insights to foster governance that more effectively addresses the complexity of health issues in wind energy transitions.

1. Introduction

The fierce social and political struggles that have accompanied the siting of new wind farms have been well documented in many countries, including: Australia [1], Canada [2], the United States [3], the United Kingdom [4], Spain [5] and the Netherlands [6]. Of the many concerns about wind energy, such as its impacts on avian life, property values, and landscapes, concern about the impacts of wind turbine noise (WTN) on human health has emerged as a key issue amongst wind farm opponents [7]. While WTN was first identified as a possible source of annoyance several decades ago [8], its potential to incur serious adverse health effects rose to prominence following the circulation of a self-published study entitled *Wind Turbine Syndrome: A Report on a Natural Experiment* [9] amongst 'anti-wind' networks [10]. Based on a case series of people living near wind turbines, Pierpont argued that inaudible low frequency noise generated by turbines "scrambles" the body's balance, motion and position sensors through non-auditory pathways resulting in a multitude of symptoms including headache, dizziness, tinnitus, heart-palpitations, vertigo, nausea, memory loss, sleep disturbance, and panic attacks. These claims have become a major issue of contention between pro- and anti-wind advocates, dismissed as lacking in scientific merit by the wind industry and environmental organizations[1] and promoted as evidence of wind energy's potential harm by anti-wind advocacy groups.[2] Consequently, questions surrounding wind energy's impacts on human health have garnered increasing attention in the mainstream media, policy and industry circles and, of interest to this paper, in scientific ones.

While the scientific literature on wind energy and human health is sparse in terms of empirical research, it consists of a relatively high number of reviews and perspective pieces (commentaries, opinions pieces, letters), which aim to evaluate the evidence in terms of its support for or opposition to links between WTN and adverse health effects [Appendix A in Supplementary materials]. The empirical evidence has also been reviewed by several governments facing community resistance to wind farms [Appendix B in Supplementary materials]. This keen interest in the state of the science reflects the prominent role of science in conferring legitimacy on the policies and regulations of wind energy development. In the struggle between wind farm

* Corresponding author.
E-mail address: jenl.taylor@mail.utoronto.ca (J. Taylor).

[1] Greenpeace [11] characterizes them as a 'myth' that has been 'busted' and the American Wind Energy Association [12] refers to them as "not supported by science".

[2] For example, *National Wind Watch*, *Waubra Foundation*, *European Platform Against Windfarms*

https://doi.org/10.1016/j.erss.2018.09.001
Received 24 November 2017; Received in revised form 30 August 2018; Accepted 6 September 2018

proponents and opponents to establish facts about wind energy's risks and benefits, scientific findings serve as key 'allies' in political debates as well as legal disputes, thus can play a defining role in social acceptance of wind energy and policy and development outcomes. Yet, the emphasis on getting the science 'right' in current studies of the literature belies the technocratic assumption that establishing scientific facts will resolve wind energy controversies [13]. As Clark and Botterill [14] argue, this is unlikely given that a contestation about 'what the facts are' lies at their very core. This paper takes a novel approach to reviewing the science by drawing on conceptual and methodological tools of Science and Technology Studies to investigate the scientific debate as a social and rhetorical process. Rather than validating particular scientific claims under the assumption that an objective scientific-technocratic rationality underlies one side of the debate, we approach knowledge production on all sides as taking place in complex networks of practices and struggles subject to power and economic relationships [15–17]. Driving this research are questions of the role of science in shaping wind energy policy, the rhetorical means employed in the struggle for dominance between competing arguments, and what the scientific debate reveals about competing values, worldviews and issues of stake and legitimacy.

The paper is organized by the three broad explanations for how WTN is hypothesized to impact human health in the peer-reviewed literature (Fig. 1): 1) exposure to the infrasound (inaudible sound) component of WTN directly affects the inner ear causing adverse physiological effects such as those characterized as 'Wind Turbine Syndrome' [9], 2) WTN levels and proximity to wind turbines positively correlate with levels of annoyance, sleep disturbance, and reduced quality of life, wherein annoyance is conceived as either an effect of WTN or a mediator to other adverse effects 3) psychogenic factors, such as turbine visibility and negative expectations, mediate between WTN and adverse effects and are more reliably predictive than noise levels or proximity to turbines. Our analysis shows the literature has expanded in scope over time from primary concern with the physical impacts of inaudible and audible WTN to include studies of the influence of subjective experiences on reported health effects (Fig. 2). It identifies the 'trials of strength' [15] faced by competing explanations and their policy implications for wind energy development and sheds light on how the evidentiary hierarchy of the health sciences is deployed in the controversy; how it constrains the types of allowable evidence and draws boundaries between what is or isn't scientifically defensible. Moreover, it reveals the scientific debate is constituted by competing value-based arguments that embody the conflicting social commitments to technology and environmental priorities of the wider political debate over wind energy.

2. Conceptual framework

The field of STS has responded to growing recognition that modern scientific and technological endeavors are not neutral and have profound social, political, environmental and economic consequences. As Pinch and Leuenberger [18] observe, its focus has shifted over time from how scientists become political [19–21] to how politics and social relations shape scientific knowledge and how this affects the dynamics of controversies. Controversies have long served as useful junctures for STS scholars to investigate the social and political dimensions scientific knowledge production because they provide an opportunity for public scrutiny of experts and 'expert' knowledge claims and the uncertain, partial and contingent conditions under which they become 'facts' [22]. Key conceptual and methodological tools that have emerged to study the processes of scientific fact-making include the principle of symmetry in the analysis of competing scientific claims introduced in Bloor's [23] *Strong Programme* and Collins's [24] theory of "interpretative flexibility" with respect to how opposing sides in a debate interpret and apply scientific findings. Among the most influential has been Latour's study of how "trials of strength" are settled in the making of science and technology [15]. For Latour, the most important rule of rhetoric is "to ask the (imaginary) reader what sort of trials it will require before believing the author" [25, p.2], in other words, what assumptions, arguments and evidentiary hurdles must a theory or object overcome to acquire sufficient power to become a 'well established fact' or 'unproblematic object', also known as a 'black box' [15]. To succeed in a trial, scientists must draw on various 'allies' to strengthen their cases and increase their defensibility. Together these allies, be they theories, methods, people, organizations, objects, capital, cultural practices, etc., constitute a network which upholds and ratifies each element of itself [26]. This actor-network approach suggests that it is not the agreement of many people that renders a theory or method a black box but rather the experimental evidence and apparatus, including the non-human actors, enlisted to resist forces that challenge it and "act as a as a unified whole" to persuade others of its legitimacy [15, p.131]. Successful theories and methods are explained by examining the combinations and interactions of elements that make them successful rather than evaluating whether they are true or false.

Taking this approach, our study arrives at the wind and health debate "before the facts and machines are blackboxed" [15, p.258] and examines how methods, empirical evidence and rhetorical arguments combine in the pursuit of legitimacy and dominance in steering wind

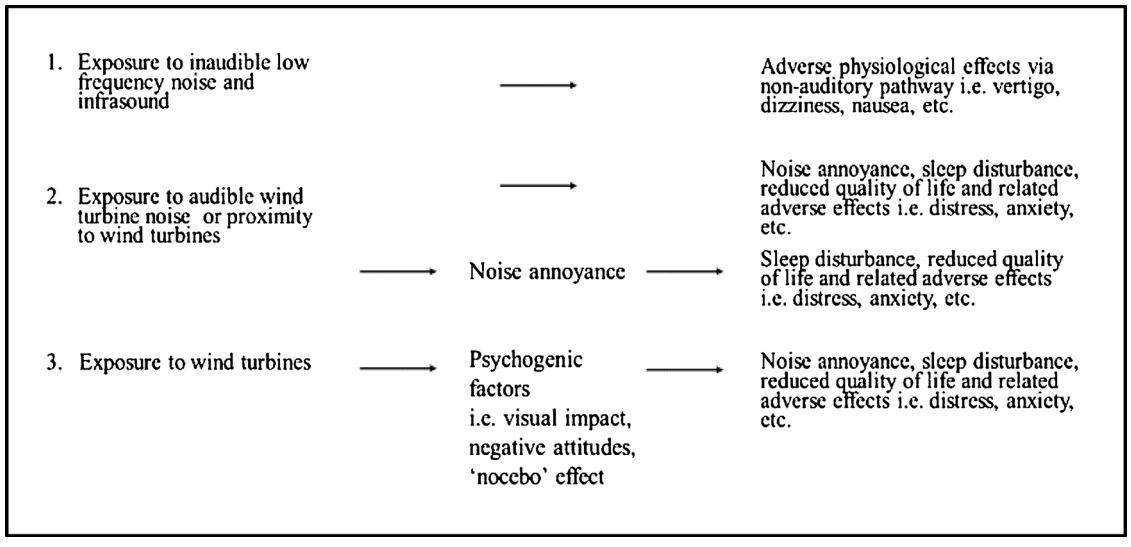

Fig. 1. Dominant explanations for reported adverse health effects related to wind turbine noise in the scientific literature.