Landscape and Urban Planning 169 (2018) 131–147

Contents lists available at ScienceDirect

Landscape and Urban Planning

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

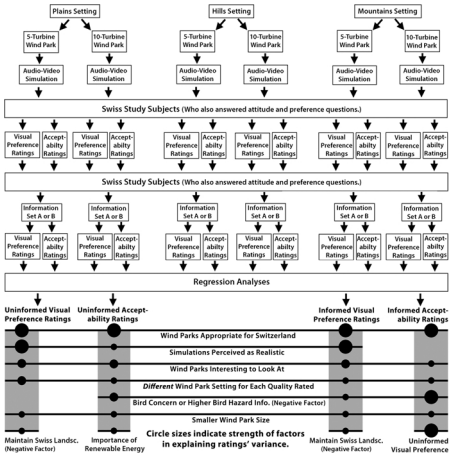
Research Paper

Dissecting perceptions of wind energy projects: A laboratory experiment using high-quality audio-visual simulations to analyze experiential versus acceptability ratings and information effects

R.G. Ribe[a,*], M. Manyoky[b], U. Wissen Hayek[b], R. Pieren[c], K. Heutschi[c], A. Grêt-Regamey[b]

[a] Institute for a Sustainable Environment and Department of Landscape Architecture, University of Oregon, USA
[b] Planning of Landscape and Urban Systems, ETH Zurich, Switzerland
[c] Empa, Swiss Federal Laboratories for Materials Science and Technology, Switzerland

GRAPHICAL ABSTRACT



ARTICLE INFO

Keywords:
Wind energy
Social acceptability
Landscape experience
3D visualization
Wind turbine noise
Impact assessment

ABSTRACT

A systematic and controlled laboratory study was conducted because non-experimental studies of wind energy perceptions have produced diverse findings in disparate settings. Ninety Swiss respondents experienced carefully constructed, calibrated and projected audio-visual simulations in a laboratory setting of two wind park sizes in each of three different settings in Switzerland. They rated each for experiential preference, simulation realism and acceptability. Before the next simulation, respondents were given information about each project's energy production, bird hazards, scale and setting type and again rendered the same ratings. These information sets were mostly stratified to produce a systematic variety of experimental conditions. Respondents then answered other questions about their experiences, concerns and attitudes regarding wind parks. Regression models predicted each of the two types of ratings, both with and without the wind parks' associated information sets. The first regression models employed technical wind park attributes and perceived simulation realism factors. Further models added factors derived from the information sets and respondents' attitudes and opinions. These models showed that affective experiential versus acceptability perceptions have different explanatory composition and are affected differently by information. Simple experiential perceptions contribute to informed

* Corresponding author at: 5234 University of Oregon, Eugene, OR 97403, USA.
E-mail addresses: rribe@uoregon.edu (R.G. Ribe), mmanyoky@alumni.ethz.ch (M. Manyoky), wissen@nsl.ethz.ch (U. Wissen Hayek), reto.pieren@empa.ch (R. Pieren), kurt.heutschi@empa.ch (K. Heutschi), gret@ethz.ch (A. Grêt-Regamey).

http://dx.doi.org/10.1016/j.landurbplan.2017.08.013
Received 9 May 2017; Received in revised form 22 August 2017; Accepted 26 August 2017
Available online 11 September 2017

acceptability perceptions. Respondents produced lower ratings if they saw simulations as unrealistic, particularly for experiential preferences. Setting types were not reliable predictors across all four rating types. Information and attitudes tended to improve the explanation of acceptability ratings more than they explained experiential ratings. Energy production was a weak factor, and bird hazard information a potent factor, in explaining both experiential and acceptability ratings.

1. Introduction

Landscape perceptions are often powerful in wind energy controversies (Bell, Gray, Haggett, & Swaffield, 2013; Gipe, 2002; Sijmons & van Dorst, 2012). These relate to the integrity of landscapes in expressing local culture and ways of life, people's deep identification with places, and upon scenery-dependent tourism (Devlin, 2005; Devine-Wright & Howes, 2010; Graham, Stephenson, & Smith, 2009; Lombard & Ferreira, 2014; Pasqualetti, 2004; Wolsink, 2013). Scenic quality and place attachment often motivate aesthetic perceptions instigating landscape protection agendas (Coleby, Miller, & Aspinall, 2009; Devine-Wright, 2005; Hall, Ashworth, & Devine-Wright, 2013; Jessup, 2010; Jones & Eiser, 2009; Johansson & Laike, 2007; Klick & Smith, 2010; Pasqualetti, 2000; Thayer & Freeman, 1987; Toke, Breukers, & Wolsink, 2008;van der Horst, 2007). These and other conventional political and environmental factors play in complex ways in wind energy controversies (Demski, 2011; Swofford & Slattery, 2010; Warren, Lumsden, & Birnie, 2005; Wolsink, 2007; Wüstenhagen, Wolsink, & Bürer, 2007); and can all come together into the political vessel of unacceptable landscape change (Breukers & Wolsink, 2007; Devine-Wright, 2005; Kahn 2003; Restall, 2010; Toke et al., 2008).

1.1. A diverse preponderance of non-experimental studies

Numerous studies have identified factors related to public perceptions of on-shore wind farms (Dai, Bergot, Liang, Xiang, & Huang, 2015; Demski, 2011; Devlin, 2005; Katsaprakikas, 2012; Karydis, 2013; Ladenburg & Möller, 2011). Most have employed non-experimental methods outside of the laboratory, without controlled treatments with pretests and posttests, such as survey research, field studies, simpler correlation analysis with little accounting for multiple factors and interactions, case studies, and content analyses. These are vulnerable to experimenter expectancy biases, poor replicability, and weak or no testing of mediator or moderator variables; and they tend not to contribute much to theory building, indicating a need for laboratory experiments (Singleton et al., 1993).

Non-experimental studies (Table 1) have been in various locations and landscapes, affected by locally diverse legal, cultural, political, historical and economic contexts. Factors important in some studies are not in others. Studies have identified different small sets of significant perceptual influences, differently measured, and sometimes inconsistent or contradictory across studies. Such studies may prove locally anecdotal by failing to best isolate the effect of project attributes upon perceptions, or by inadequately controlling confounding factors to misattribute root causes of public perceptions. Such studies may fail to provide valid and reliable guidance to planners, permitting authorities, and developers beyond each study's geographical context. Laboratory studies might help to triangulate with these less experimental studies toward more generally valid and widely applicable findings.

2. Study goals

This experimental study explored the complexity of factor interactions affecting perceptions of "wind parks" as they are known in Switzerland. It employed a one-group pretest-posttest design with information as the treatment (Cook & Campbell, 1979). It employed controlled laboratory methods seeking to minimize researcher expectancy and expectancy effect biases. The experimental methods aimed to identify mediator variables and factor interactions that may be of more widely and reliable value to decision makers, rather than anecdotal to particular landscape, historical, political and cultural contexts that derived the findings of previous studies. In this sense only, it hoped to identify relative factor strengths and contingencies, rather than exact predictive models, which may be more replicable than findings from previous field studies of wind energy perceptions. If validated and replicated elsewhere, such more reliable 'meta-results' might contribute more to theory building than disparate, more anecdotal findings from previous studies.

The study investigated some common contextual and factual contingencies effecting perceptions, and how attitudes may compound these. It investigated wind park perceptions by controlling the confusion of confounding influences that often play upon field studies by substantially emulating a psychological laboratory experiment. Precisely controlled audio-visual simulations of wind park experiences, and a few generic and essential attributes of a stratified set of the simulated landscapes were systematically investigated. The aim was to carefully explore the basic structure of public perceptions as an aid to planners' interpretation of research findings in their own situations, as suggested by Bishop (2011), Tsoutsos et al. (2009), Krohn and Damborg (1999) and Molnarova et al. (2012).

Table 1
Classification of selected non-laboratory studies of public wind energy project perceptions and opinions by their primary data type and/or research method.[a]

Associating attitudes and opinions with people's demographic and geographical attributes: (Bond, 2010; Pasqualetti, 2011; Stephens, Rand, & Melnick, 2009; Swofford & Slattery, 2010; Van der Horst & Toke, 2010; Warren et al., 2005)
Investigating attitudes and opinions related to perceptions by interviewing subjects: (Ben-Cheikh, Abdellatif, & Bakini, 2015; Butler et al., 2015; Cass & Walker, 2009; Fischlein et al., 2010; Hall et al., 2013; Parkhill, Butler, & Pidgeon, 2014; Sovacool, 2009)
Content analyses of media and advocacy discourse: (Ariza-Montobbio & Farrell, 2012; Cowell, 2010; Ellis et al., 2007; Fisher & Brown, 2009; Graham et al., 2009; Jepsom et al., 2012; Restall, 2010; Stephens et al., 2009)
Structured surveys without any or many ratings of images or views of wind farms: (Baxter, Morzaria, & Hirsch, 2013; Bidwell, 2013; Devine-Wright & Howes, 2010; D'Souza & Yiridoe, 2014; Ek, 2005; Firestone, Bates, & Knapp, 2015; Jacquet & Stedman, 2013; Jones & Eiser, 2009; Kaldellis, 2005; Katsaprakakis, 2012; Klick & Smith, 2010; Lombard & Ferreira, 2013; Meyerhoff et al., 2010; Swofford & Slattery, 2010; Warren & McFadyen, 2010; Yiridoe, 2014)
Comparisons of attitudes and/or stated perceptions between places with and without wind farms: (Baxter et al., 2013; Jones & Eiser, 2009)
Comparisons of attitudes and/or stated perceptions before and after wind farm construction: (Coleby et al., 2009; Eltham et al., 2008; Vanderheyden and Schmitz, 2015; Wolsink, 1988)
Public ratings of actual or simulated photos or of views in the field exploring visual attributes that contribute to wind farm perceptions: (Betakova et al., 2015; Bishop, 2002; Hoffman, 2013; Lothian, 2008; Palmer, 2015; Wang, Mwirigi, & Isami, 2013)
Mixed methods using ratings of photos in combination with one or more of the types above: (Johansson & Laike, 2007; Mulnarova et al., 2012; Tsoutsos, Drandaki, Frantzeskaki, Iosifidis, & Kiosses, 2009)

[a] These lists are not exhaustive but include a variety of examples within each category.