



## Analysis

# Understanding the Amenity Impacts of Wind Development on an International Border<sup>☆</sup>



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## ABSTRACT

Wind energy developments are often controversial. Concerns are often raised about negative impacts on local communities, including impacts on property values. Some of these negative impacts may be offset by compensatory payments made by wind developers. Community involvement in the planning and development process may also reduce negative perceptions associated with wind facilities. However, if the development is near a border between municipalities, states, or even countries, it is often the case that one or more jurisdictions will not be involved in the process or receive compensation, but will, nonetheless, face some costs or impacts from the development. We explore exactly this situation at the border between Canada and the United States in the Thousand Islands region where a wind farm is currently operating on the Canadian border island of Wolfe Island. Using a parcel-level hedonic analysis of property sales transactions, we find that properties in New York with a view of and/or in close proximity to the turbines significantly depreciated in value after construction of the turbines while no negative impacts were observed on properties in Ontario. We highlight a number of factors that could contribute to these differences in impacts on property values, which may also explain the variation in results that currently exists in the literature.

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## 1. Introduction

Renewable energy sources are a steadily increasing portion of our global energy mix. Such energy sources are a global public good – by substituting for more pollution-intensive fossil-fuel sources they reduce global pollution of criteria pollutants, such as NO<sub>x</sub>, SO<sub>x</sub>, Mercury, and others, as well as greenhouse pollutants like

CO<sub>2</sub>.<sup>2</sup> The benefits of these reductions are generally spread over a large area and, in the case of greenhouse gases, over the entire planet. The costs of these reductions, however, are more likely to fall on a much smaller geographic area. In some cases, in fact, renewable energy facilities can be thought of simultaneously as global public goods and local public bads. As evidence of this, siting new renewable energy facilities, particularly wind farms, is often controversial, with local governments and/or residents putting up stiff resistance. Common local concerns about wind developments include visual and aural disamenities, potential human health impacts, and impacts on wildlife. These perceived amenity and health impacts are likely to be reflected in property values as bids for properties in close proximity to wind turbines may be reduced. Research on the impacts of wind turbines on property values is a growing area of the literature, but remains without consensus in the results regarding these impacts.

A number of recent studies using the hedonic pricing method (Rosen, 1974) have found evidence of significant negative impacts (Gibbons, 2015; Heintzelman and Tuttle, 2012; Jensen et al., 2014; Sunak and Madlener, 2012), while other studies have not found

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<sup>2</sup> The exact emissions reductions from a wind facility depends very much on what other energy sources are displaced, the focus of Kaffine et al. (2013).

significant impacts (Hoen et al., 2011, 2015; Lang et al., 2014; Sims and Dent, 2007; Sims et al., 2008; Vyn and McCullough, 2014). These mixed results may occur due in part to issues inherent in the estimation of these impacts. Typically there are relatively few observations from which impacts are estimated for individual wind farms, which may affect the validity of the results or reduce the likelihood of finding statistically significant impacts. Hoen et al. (2015) addressed this issue by combining multiple sites around the U.S., which produced a large data set with many observations in close proximity to turbines. However, combining observations across multiple sites may obscure variation that may occur in the impacts across sites, which was demonstrated by Heintzelman and Tuttle (2012) where significant negative impacts were found at two sites but not at a third site. The mixed results in the literature may also suggest that there may not be a single, global answer to the question regarding impacts of wind turbines on property values; rather, the specific context for individual sites may influence whether significant impacts occur.

There are a number of factors related to context that may affect the nature of the impacts that wind turbines have on property values. The degree of local controversy related to wind development can potentially influence perceptions regarding the disamenity effects of wind turbines, which in turn could affect the willingness to pay for properties in close proximity to turbines. The impacts may be exacerbated by the presence of seasonal or vacation homes. Owners of these homes are likely to have more elastic preferences regarding changes in the amenities surrounding their property, and may be more likely to sell their property or less likely to buy a property due to an adverse change in amenities, which could contribute to a relatively greater impact on prices for these properties. Acting counter to these potential negative impacts are benefits that accrue through payments from developers to local landowners, through lease payments for use of the land, and to communities, through payments-in-lieu-of-taxes (PILOTs). Another potential influencing factor is public involvement in the approval and development process. If a community feels that they have not had sufficient input into this process, this can create considerable opposition to and negative perceptions of the turbines, which can be manifested in property value impacts, whereas if the community is involved throughout the process, residents may be less likely to hold negative perceptions of the turbines (Devine-Wright, 2005). As an extreme form of this, if the development happens near a border between communities, but is wholly contained within one community, the community without the development is unlikely to be consulted during the approval process and would not receive compensation from the developer. These neighboring communities, in other words, will bear some of the cost of the project with little prospect of receiving any benefits.

The factors discussed above are explored in this paper, using a unique setting in which a large wind farm was constructed on the Canadian island of Wolfe Island in the St. Lawrence River along the border between Canada and the United States. This setting is ideal for examining the impacts of these contextual factors, particularly the cross-border impacts and the influence of seasonal or vacation homes. While the wind turbines on Wolfe Island affect the viewshed for properties on both sides of the border, the development of this wind farm involved public consultation and compensation only on the Canadian side. In addition, many of the properties on the American side, particularly those with views of the turbines, are seasonal or vacation homes rather than primary residences.

We use a hedonic analysis and property sales data to examine and compare how property values on both sides of the border have been impacted by the Wolfe Island wind turbines. In this analysis, a difference-in-differences approach is used to compare transaction prices before and after approval or construction of the wind farm as well as between homes which can and cannot view the turbines, or are at varying distances from the turbines. We employ fixed effects to mitigate potential omitted variables bias as well as to control

for property market trends and seasonality of prices. We find evidence of negative property value impacts on the American side after construction of the turbines for properties in close proximity to the turbines and/or with a view of the turbines. In contrast, we do not find evidence of significant negative impacts on the Canadian side.

## 2. Study Region

Wolfe Island, which is the largest island in the Thousand Islands region, is situated at the entrance of the St. Lawrence River in Lake Ontario, directly across the river from the community of Cape Vincent in the state of New York. The Wolfe Island wind farm was developed by Canadian Hydro Developers<sup>3</sup>, which initially submitted a proposal for construction of this wind farm on the western half of the island in July 2005 (Keating, 2006). The official plan and zoning bylaw amendments necessary to allow this project to move forward were passed by council in November 2006, and the project was officially announced on the Wolfe Island website in April 2007. Construction of the 86-turbine, 197.8 MW facility began in May 2008 and was completed in June 2009, at which time the wind farm became operational (Ontario Power Authority).

On the American side, we focus on Jefferson County, which sits at the northern edge of New York and borders both the St. Lawrence River and Lake Ontario. Throughout the past decade, wind energy has divided public opinion in the county. The region has been the targeted site for several recent American wind facility proposals, including in the Town of Cape Vincent and in the Town of Hounsfield, on Galloo Island in Lake Ontario, all of which have been highly controversial.

Newspaper coverage and letters to the editor in the New York media regarding the Wolfe Island facility clearly expressed Jefferson County residents' opposition to turbines due to negative aesthetic impacts. A Cape Vincent journalist feared that the turbines "will take away [the] image and...beauty of [his] township", deterring prospective seasonal residents who "contribute so much in taxes and expertise" (Radley, 2009). A Chaumont resident characterized the wind farm as "blight on landscape" (Lynne, 2009). Finally, a seasonal resident of Chippewa Bay described the waterfront view of facility nighttime lighting as "a jolt to the entire landscape and to [his] mind, ...like a jab in the ribs" (Quarrier, 2009).

Similar sentiments have been expressed by residents of Wolfe Island, where the construction of this wind farm generated considerable controversy and public opposition. Opponents of the wind turbines have expressed concerns regarding "the industrialization of this rural community" and how the turbines "forever change the landscape into something that doesn't fit here" (Fast et al., 2015). As with Cape Vincent, there are a considerable number of seasonal residences on Wolfe Island, many of which are waterfront properties. According to Fast et al. (2015), summer cottages comprise about one-third of all residences on the island. As such, visual amenities play a significant role in the value of these properties, and owners of these properties have expressed concerns regarding potential negative impacts on property values arising due to the visual disamenities associated with wind turbines. As one seasonal resident stated, "why would I want to live there [with the turbines]?" (Fast et al., 2015) In one case, property owners brought an appeal to Ontario's Assessment Review Board to have the assessed value of their waterfront property reduced due to the devaluation caused by the wind turbines. This appeal was ultimately rejected due to a lack of evidence of negative impacts. But this case highlights the underlying concerns that exist among residents of Wolfe Island regarding impacts of wind

<sup>3</sup> Canadian Hydro Developers was acquired by TransAlta in 2009.

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