Annoyance, Health Effects, and Wind Turbines: Exploring Ontario's Planning Processes

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Résumé

En Ontario, les citoyens vivant dans des communautés où des éoliennes ont été construites ont tendance à avoir une opinion négative de ces développements et à se plaindre de leurs effets sur la santé. La Loi de 2009 sur l'énergie verte (*Green Energy Act*) est une politique de type « top-down » qui vise l'atteinte d'objectifs en matière d'énergie renouvelable. Cet article examine le processus de planification actuellement employé en Ontario pour l'énergie éolienne et suggère une relation entre le processus de planification de l'énergie éolienne, les perceptions négatives et le mécontentement. Une revue de la littérature concernant la planification d'installations éoliennes, les perceptions concernant les éoliennes et les impacts sur les résidants locaux sera suivie d'un examen et d'une analyse de la Loi de 2009 sur l'énergie verte et du processus d'autorisation de projets d'énergie renouvelable. Cet article suggère que l'utilisation d'une approche de type « top-down » est un des facteurs ayant suscité l'opinion négative et le mécontentement. Intégrer des approches concertées de planification dans le processus d'autorisation de projets d'énergie renouvelable est conseillé pour l'Ontario[1].

Mots clés: éoliennes, planification concertée, mécontentement, santé, énergie éolienne

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Abstract
Citizens of communities in Ontario where wind turbines have been built tend to have negative opinions of the developments and complain of health effects. The Green Energy Act in Ontario is a "top-down" policy which aims to meet renewable energy goals. This review paper will discuss the current planning process used in Ontario for wind energy and make the case for a connection between the wind energy planning process and negative perceptions and complaints of annoyance. A review of the academic literature examining wind turbine planning, perceptions of wind turbines, and impacts on the community will be complemented with a review and discussion of the Green Energy Act and Renewable Energy Approvals Process. It is speculated in this paper that the "top-down" approach is one of the factors leading to negative opinions and annoyance. Incorporating collaborative planning approaches into the Renewable Energy Approvals process is suggested for Ontario[2].

Key words: wind turbines, collaborative planning, annoyance, health, wind energy

1 Introduction

Wind energy capacity has been increasing worldwide, and although Canada's total wind capacity is modest compared to countries like China, the United States, Germany, Spain, and India, Canada was ranked fifth among nations for the megawatts of wind capacity installed in 2011 (World Wind Energy Association 2012). Between 2010 and 2011, Canada increased its wind capacity by over 30%, and the World Wind Energy Association states that Ontario's Green Energy Act is the sole reason that Canada ranked highly for wind energy growth (World Wind Energy Association 2012). The province of Ontario passed the Green Energy Act in 2009, and this act aims to both expand the use of renewable energy in Ontario and create jobs for Ontarians in the energy sector (Ministry of the Environment 2011).

There have, however, been issues with the Green Energy Act. The wind turbines that have been developed in Ontario have proven themselves controversial among citizens who live near proposed developments and after development, there are complaints about the noise and a range of health effects resulting from the wind turbines (Hill and Knott 2010). In popular literature there is a long list of reported symptoms resulting from wind turbines: headaches, palpitations, excessive tiredness, stress, anxiety, tinnitus, hearing problems, sleep disturbance, migraine headaches, and depression (Knopper and Ollson 2011). After reviewing the available grey literature and academic literature, Ontario's Chief Medical Officer of Health (CMOH) concluded that community engage-

ment in wind turbine planning can alleviate concerns about adverse health effects of the wind turbines, and that attitudes towards wind farms and perceptions of adverse health effects may be influenced by perceptions of fairness and equity (Chief Medical Officer of Health 2010).

The current literature indicates that living near a wind turbine can lead to annoyance (Knopper and Ollson 2011). There is currently an insufficient amount of research in the field indicating a relationship between wind turbines and health effects beyond annoyance. It is our opinion that the planning process may mediate the relationship between annoyance and wind turbines.

This review paper will start with an examination of the academic literature in the field of perceptions of wind turbines. Following this, the small body of academic and grey literature examining the relationship between wind turbines and health will be reviewed. Then, current approaches to wind turbine planning in Ontario will be discussed, focussing on Ontario's Renewable Energy Approvals process. A brief introduction to collaborative planning and examples of collaborative planning processes currently being used elsewhere will precede an argument connecting the planning process and the negative perceptions of wind held by Ontario residents who live near wind turbines. A discussion of how to reduce the negative perceptions of wind turbines that citizens in Ontario hold will end by suggesting more collaborative planning processes and changes to provincial policy[3]. This paper will be the first to discuss the problems with the planning process used for wind energy in Ontario, and will offer a unique perspective on the importance of the planning process by highlighting outcomes like annoyance and citizens' concerns for their health which may result from the types of provincial level policies that have been implemented in Ontario.

2 Perceptions of wind turbines

There are a variety of factors that may lead to approval or disapproval of wind turbines which have been examined thoroughly in the literature. These factors can be generalized into nine categories: physical factors, contextual factors, political and institutional factors, socio-economic factors, social and communicative factors, symbolic and ideological factors, community factors, personal factors, and environmental factors (Graham, Stephenson, and Smith 2009; Devine-Wright 2005a). A few of these are pertinent to this examination of the planning process and perceptions. First, a political and institutional aspect that was identified was political self-efficacy; approval is lower if residents have low political self-efficacy and feel as if they are incapable of influencing the political process (Wolsink 1989; Vecchione and Caprara 2009). Another political and institutional aspect that was identified was public participation and consultation; approval is higher when residents are consulted and take part in

the planning process (Graham, Stephenson, and Smith 2009; Hindmarsh and Matthews 2008; Dimitropoulos and Kontoleon 2009; Devine-Wright 2005b). Third, a contextual factor that leads to approval or disapproval is the landscape context; if certain features of the landscape cannot be used or enjoyed anymore because of wind energy developments, this would lead to disapproval (Graham, Stephenson, and Smith 2009). Fourth, an important socio-economic factor is shareholding and community ownership; perceptions are more positive when there is community ownership of the wind turbines and economic benefits to the community (Devine-Wright 2005a; Devine-Wright 2005b). It has been speculated that economic benefits to a community will occur only if community owners invest their profits into the local economy, although community ownership is not important solely because of the economic impact (Phimister and Roberts 2012). The real impact of community ownership is to change perceptions towards wind turbines (Warren and McFadyen 2010). So far in Ontario there are no community-owned wind farms and the value of payments that land-owners hosting wind turbines for energy companies receive is not publicized.

Opinions of wind turbines change over time, for example, as time passes they may be perceived as more attractive as they become part of the local landscape (Eltham, Harrison, and Allen 2008). One study found no change in acceptance of wind farms over the course of fifteen years, but the ability of residents to identify positive characteristics of the wind turbines increased (Eltham, Harrison, and Allen 2008). Approval rates are higher in citizens who have previous experience with wind turbines (Ladenburg 2010). Positive feelings towards wind turbines can result from thinking that wind turbines make the energy supply secure, that the wind turbines are an attractive feature of the landscape, that they benefit the community, and that they are controlled by members of the community (Graham, Stephenson, and Smith 2009; Eltham, Harrison, and Allen 2008). Wind turbines are less likely to gain approval from citizens who are men, citizens with higher incomes, citizens who frequently use space near wind turbine development for recreation, and neighbourhoods with higher social capital (Ladenburg 2010; van der Horst and Toke 2010). Residents of communities with high social capital typically: attend local meetings, vote, volunteer, read the newspaper, have high income, and are 'affluent greys in rural communities' (van der Horst and Toke 2010). Communities where wind farms have been rejected are more likely to have residents who were employed in the private sector, and own holiday homes in the community. The holiday homeowners are likely to be affluent and put higher value on the landscape (van der Horst and Toke 2010). One study found that higher education is related to more positive attitudes towards wind energy, yet another found that opinions vary based on education level (Firestone, Kempton, and

Krueger 2009; Landenburg 2010). Residents with a high school diploma are more likely to approve of wind turbines than those who do not have a high school diploma but respondents with a bachelor's degree were more likely to approve of wind turbines than those with a master's degree (Ladenburg 2010). Although education and income levels are often expected to be correlated, in the case of opinions of wind turbines the two variables do not seem to be related (Pomerleau et al. 1997).

The context for a wind power development is complex and reliant on a unique combination of factors; the variety of contextual factors that influence perceptions of wind turbines should not be over-simplified (Fischlein et al. 2010). Although it may seem that negative opinions of wind turbines are simply the result of NIMBY ("Not In My Back Yard') beliefs, it is worth considering what context the wind energy development is occurring in, and whether there are equitable and/or fair circumstances (Wolsink 2006; Wolsink 2007b).

3 How wind turbines may affect health

The development of wind energy infrastructure has been met with reports of adverse health effects from nearby residents. The symptoms, described in the popular literature as "wind turbine syndrome" include, but are not limited to sleep disturbance, headaches, irritability, fatigue, ear disturbances, and difficulty concentrating (Knopper and Ollson 2011). There is currently a modest amount of academic literature examining wind turbines and health effects, most of it assuming that health effects depend on the distance one lives from a wind farm; however, there is no evidence supporting this assumption (Knopper and Ollson 2011).

There is uncertainty as to how wind turbines may lead to health effects (Knopper and Ollson 2011; Pedersen et al. 2010; Pedersen, Moller, and Waye 2008; Pedersen et al. 2008). It may be that infrasound or low frequency noise leads to physiological or biological health effects, but this theory ignores the spectrum of factors that can lead to adverse health effects (Passchier Vermeer). The World Health Organization's definition of health describes biological, mental, and social well-being as determinants of health (World Health Organization 1946). In considering the possible relationship between wind turbines and health, these three aspects of well-being are equally important and can all lead to physiological outcomes (World Health Organization 1946; Knopper and Ollson 2011).

In response to concerns of Ontarians, and in response to the media, the Ontario Chief Medical Officer of Health produced a report that reviewed the available literature on wind turbines and health (Chief Medical Officer of Health 2010). The report concluded that: (1) there is no scientific evidence that demonstrates a link between wind turbine noise and reported symptoms such

as dizziness, headaches, and sleep disturbance, (2) the intensity of the sound from wind turbines is not sufficient to cause adverse health effects, but can cause annoyance via the fluctuations in sound, (3) low frequency noise or infrasound from wind turbines are below the threshold for expected health effects and there is no evidence showing that the low frequency noise or infrasound cause adverse health effects, (4) community engagement in wind turbine planning can alleviate concerns about adverse health effects of the wind turbines, and (5) attitudes towards wind farms and perceptions of adverse health effects may be influenced by perceptions of fairness and equity (Chief Medical Officer of Health 2010).

3.1 Biological mechanism

Wind turbines produce infrasound, which are sound frequencies that should be inaudible (Berglund, Hassmen, and Job 1996). A possible mechanism for infrasound to affect the body is that the inner ear is stimulated by infrasound, although sound is typically heard by stimulation of the outer part of the ear (Salt and Hullar 2010). In the popular literature the suggestion has been made that the infrasound from wind turbines, which is not heard but is instead sensed by the body, is the cause of the adverse health effects resulting from wind turbine (Knopper and Ollson 2011). The inner ear may also be stimulated by low frequency noise, which can cause mechanical vibration on the body surface near the chest and abdomen and is then sensed by the inner ear (Takahashi, Kanada, and Yonekawa 2002; Leventhall 2006). Although it is stated in the popular literature that infrasound or low frequency noise can lead to health effects, there is currently no direct evidence of this although it is still conceivable it affects the body through indirect pathways. It may be that infrasound or low frequency noise leads to physiological or biological health effects, but this is only one of the possible mechanisms—there may be other mechanisms by which mental and social well-being factors may lead to health effects. It is expected that there is a stronger relationship between social and psychological measures of health with wind turbines compared to biological measures of health, and perceived health effects that are not expressed as physical symptoms are equally valid to perceived health effects that are more easily expressed (Knopper and Ollson 2011).

3.2 Annoyance

With the development of wind turbines, there are a small proportion of residents living near wind turbines who will report experiencing adverse health effects but these complaints are not unique to wind turbines (Knopper and Ollson 2011). In the past, new technologies which have had rapid and widespread implementation have also caused reported health effects, for example: electro-

magnetic fields from cell phones or base stations (Siegrist et al. 2005; Seitz et al. 2005; Berg-Beckhoff et al. 2009). The symptoms reported by people who live near wind turbines (headache, trouble concentrating, fatigue, dizziness) have much in common with the symptoms reported by residents who live near cell phone towers or use cell phones (Seitz et al. 2005).

When citizens are faced with technologies that are unfamiliar, the potential risk is assessed using intuition and mediated by social influences (Slovic 1987). Similar to the presumption that electromagnetic radiation from mobile phone base stations and mobile phone usage are detrimental to health, it is currently speculated that low frequency noise and infrasound from wind turbines can also lead to health effects in nearby residents (Salt and Hullar 2010). The literature that examines the relationship between wind turbines and health effects commonly concludes that wind turbines cause annoyance in a fraction of nearby residents (Knopper and Ollson 2011). Annoyance is likely caused by the both visual impact as well as the audible noise that the wind turbine creates; wind turbine noise is perceived as annoying, and people pay attention to more annoying noises for a longer period of time (Pedersen and Larsman 2008).

The audible noises from a wind turbine are described as swishing, whistling, resounding, and pulsating/throbbing, or in more quantifiable measures the noise is loud, sharp, rough, fluctuating, and modulating (Pedersen, Moller, and Waye 2008; Waye and Ohrstrom 2002). It may be that the fluctuations in noise from a wind turbine are the highest cause of annoyance, but research shows that annoyance can stem from visibility, swishing of the sound, unpredictability of the noise, and the wind turbine noise at night (Pedersen, van den Berg, and Bakker 2009). Reported annoyance is higher when the wind turbines are more visible (flat terrain compared to rocky or hilly areas) and the visual impact of a wind turbine modifies how annoying the sound is perceived to be (Pedersen et al. 2008; Pedersen and Larsman 2008; Pedersen and Waye 2004). Reported annoyance of wind turbines is minimized when there is also loud road traffic noise nearby, and there is a significant difference in reported annoyance dependent on whether a respondent benefits economically from a wind turbine development (Pedersen et al. 2010; Pedersen, van den Berg, and Bakker 2009).

It may be that the most significant adverse health effects from wind turbines are the stress they cause those who live nearby, and this may be exacerbated by the fact that a landscape featuring wind turbines may have a reduced restorative capacity for residents. Stress and annoyance are important health effects even though they may not be easily measured through physiological indicators (Bakker et al. 2012). Rural landscapes which appear to be more natural, have low ambient noise, and few visual intrusions are more likely to cause annoyance when wind turbines are built (Pedersen and Waye 2008). When there

is an expectation that the terrain imparts a restorative quality wind turbines will hinder restoration, recovery, and regaining strength (Pedersen and Waye 2008). People choose to live in natural settings specifically for their restorative outcomes and these are the types of landscapes where wind turbines are typically installed (Hartig and Staats 2006; Hartig et al. 2003; Korpela et al. 2010; Staats and Hartig 2004; Laumann, Garling, and Stormark 2003; Hartig, Mang, and Evans 1991). Residents who consider their home and its surrounding landscape to be a restorative refuge and also heavily identify themselves by their home, and claim to be unable to escape the noise and visual impact of wind turbines (Pedersen and Waye 2008; Pedersen, Hallberg, and Waye 2007). Although most residents can hear wind turbines and see flickering light, annoyance is more likely in residents who consider the wind turbines to be intruders (Pedersen, Hallberg, and Waye 2007).

4 Wind turbine siting and planning

There is a substantial literature that examines both the wind turbine siting and planning processes (Coles and Taylor 1993; Dixsaut et al. 2008; Khan 2003; Sorensen 2007). This research is useful and informative, as it helps create a standard methodology for identifying preferred sites for wind power development based on criteria such as terrain, land use, and wind energy. However, we must differentiate between the "siting" and "planning" of wind turbines—the wind energy decision-making process should not be limited to identifying appropriate terrains and through the planning process should incorporate social and political factors in decision making, and ideally incorporate opinions of all relevant stakeholders (Lejeune and Feltz 2008; Janke 2010; Rodman and Meentemeyer 2006; Nadai 2007). The planning process is a crucial step in creating wind power developments that are acceptable to the community especially given examples from other countries where wind turbines face opposition and low social acceptance. In the United Kingdom, wind turbine developments have been met with low acceptance at the community level as well as low approval rates for development application by local planning authorities (Toke 2005; Toke, Breukers, and Wolsink 2008). More specifically in American state of Massachusetts, development in Cape Cod has been met with opposition and arguments about economic feasibility, impact on local wildlife, and the impact on the landscape, both for the innate value of the landscape and the impact that the wind turbines will have on tourism (Kempton et al. 2005; Pasqualetti 2011).

4.1 Wind turbine siting and planning in Ontario

The Green Energy Act aims to create feed-in-tariffs for renewable energy, create new jobs for workers in Ontario, and increase the use of renewable energy sources in Ontario (Ministry of the Environment 2009). To avoid financial

risks and project delays resulting from a growing social resistance, the Renewable Energy Approvals process was altered to streamline the approvals process so that wind energy projects were no longer subject to aspects of the Environmental Assessment Act or the Planning Act (this includes the provisions for zoning by-laws and official plans) (Ministry of the Environment 2011; Hill and Knott 2010). This change to the approvals process means that municipalities in Ontario can no longer regulate wind turbines; however, the policy does enable the government to reach renewable energy policy objectives (Hill and Knott 2010; Watson, Betts, and Rapaport 2011). This was done, according to Ontario Premier, so that "Municipalities will no longer be able to reject wind turbines, solar panels or bio-fuel plants because they don't like them. We can't allow interests to oppose these simply because they don't like them." (Canadian Broadcasting Corporation February 10, 2009). The Premier also stated that the provincial government were "going to find a way through this new legislation to make it perfectly clear that NIMBYism will no longer prevail when it comes to putting up wind turbines, solar panels and bio-fuel plants" (Canadian Broadcasting Corporation February 10, 2009).

If a wind development proposal meets the criteria set by the Ontario government, then the development can proceed regardless of the wishes of the local government or community. Wind turbines with a capacity of over 3 kilowatts (kW) must get approval from the Ontario government through the Renewable Energy Approvals process and as the capacity of the project increases there are more restrictions regarding where the wind turbines can be placed (Ministry of Environment 2011). Wind turbines with a capacity of 50kW or more must meet minimum setback requirements from features of the built environment (roads, residential dwellings, property lines) and the natural environment (wetlands, conservation reserve, wildlife habitat, woodland) (Ontario Legislature 2011).

There are three main steps to develop renewable energy infrastructure in Ontario. First, the application is prepared with evidence of environmental studies and community, Aboriginal, and municipal consultations (Ministry of the Environment 2011). Second, the government will review the application and issue a decision (Ministry of the Environment 2011). Third, if the project is approved approvals and permits are issued and permission to being construction begins (Ministry of the Environment 2011)

The requirement for public interactions under the Renewable Energy Approvals process is to host a community consultation in the planning stages of the wind development, and host another meeting once the project has become more established (Ministry of the Environment 2011). At the first public meeting, which occurs during the applicant's project planning, the public is given the opportunity to ask questions and the project applicant is to make it clear to the public that the plan will evolve based on their comments (Ministry of

the Environment 2011). In the second public meeting, the public is given the opportunity to review the completed project reports and proposal (Ministry of the Environment 2011).

The Renewable Energy Approvals Technical Report suggests that applicants/developers host additional public meetings, as well create a "public liaison committee" which would be a group of residents who can participate in the development of the project (Ministry of the Environment 2011). The Renewable Energy Approvals guide also suggests, but does not require applicants to be "a good neighbour" meaning that they should be aiming to create positive relationships between the public, the municipality, and the developer, especially in communities where there is a high level of concern about a wind project (Ministry of the Environment 2011). This would include, for example, minimizing the impacts of operation on the community by considering: the use of voluntary agreements to shut down operation under specific conditions, valued resources and minimizing impact on these resources, impacts on tourism, and creating visual barriers (Ministry of the Environment 2011).

On one hand, Ontario can be praised for this provincial level policy which streamlines approvals in order to reach policy goals, and standardizes development requirements for wind turbines across the province, but Ontario can also be criticized for creating a policy that undermines planners and community members (Watson, Betts, and Rapaport 2011). This "top-down" method is useful for achieving goals, but an approach that uses collaborative or communicative planning processes may be better suited for wind turbine planning so that the opinions of the community that will be directly affected by the planning decision are included in the decision-making (Nadai 2007). This is especially important in the planning of wind turbines in Ontario, as the issue is complex and contentious. Although there are developments that create minimal interest or opposition in the community and require minimal engagement with the community, the backlash towards wind turbine developments in Ontario indicate that this is an inadequate amount of consultation (if it can be considered consultation or meaningful participation at all) (Johansson and Laike 2007). In Ontario, communities have been limited to a "commenting role" and feel as if they have lost control over what is developed in their communities despite the public outreach that is mandatory for project approval being referred to as "consultation" and "participation" (Watson, Betts, and Rapaport 2011). Limiting the voice of the community means that community consultations are viewed as an opportunity for the developer to "educate" the community in hopes that opinion about wind turbines will shift (Arnstein 1969).

4.2 Moving towards collaborative planning for wind turbines in Ontario

There are two planning approaches that are relevant to wind turbine planning. The first is a "top-down" decision making process, whereby decisions are made by politicians or professionals in order to meet policy objectives (Nadai 2007; Hayden Lesbirel 1990). The second is a collaborative planning approach, which is a more "bottom-up" approach that will be discussed later. The Green Energy Act in Ontario and the Renewable Energy Approvals process is an example of a "top-down" approach.

Collaborative planning is a "bottom-up" planning process which expects that the role of the planner is to mediate communication between different stakeholders so that they can reach a mutually beneficial agreement over a planning issue (Fainstein 2000; Healey 1996). With the collaborative model of planning, especially "turbulent environments" or "complex communities" can communicate and negotiate a plan of action in a self-regulated way (Seelig and Seelig 1996). It is assumed that through collaboration, the consensus found among stakeholders represents the public interest (Seelig and Seelig 1996). Given the complexity of planning a wind turbine development and the resultant "turbulence" that may occur collaborative planning may be a useful approach that leads to results which are more favourable for all interested parties.

The theory of collaborative planning assumes, first, that stakeholders do not have fixed interests or hold structural positions. For example: a structural position could be "capitalist" and when it is assumed that a "capitalist" stakeholder has rigid capitalist beliefs on all issues there appears to be no value in collaboration and discussion. Collaborative planning assumes a "capitalist" stakeholder, or any other stakeholder, will not reflexively follow a certain belief system when there is discussion and collaboration among a variety of stakeholders (Fainstein 2000). A stakeholder may protest a wind turbine development initially, but perhaps with communication among stakeholders with a goal of finding compromise, flexible viewpoints that are held by stakeholders can be expressed. Unlike other planning approaches where planners can interpret the public interest and apply their expertise or preferred planning principles to a situation, collaborative planning is a process that defines and limits the role of the planner to a facilitator between stakeholders (Seelig and Seelig 1996).

In the case of wind turbine siting, decisions are often made by experts, but the consequences of the planning decisions are felt entirely by the citizens who live nearby, although this process is not unique to wind turbine planning (Simao, Densham, and Haklay 2009). Stakeholders from the community have the capacity to offer local empirical knowledge to the planning process as opposed to scientific-based knowledge that may be offered by 'experts' (Simao,

Densham, and Haklay 2009). The planning process should instead incorporate experts from many different fields along with community members, while encouraging collaboration in finding a solution to wind turbine planning and siting that is a compromise for all parties. Many citizens may approve of wind energy and a heavier reliance on renewable energy, but will oppose specific developments (Bell, Gray, and Haggett 2005).

Discussion of collaborative planning techniques for wind turbine siting has been limited in the academic literature. Collaborative planning has been facilitated through the use of internet-based spatial decision support systems or virtual reality programs which allow stakeholders to visualize or create wind turbine siting scenarios which could then be shared with other users/stakeholders and subsequent online discussion can occur (Simao, Densham, and Haklay 2009; Bishop and Stock 2010). There are many examples in other fields where web- and computer-based technologies were used to enable the collaborative planning process (Simao, Densham, and Haklay 2009; Bishop and Stock 2010; Coors, Jasnoch, and Jung 1999; Alshuwaikhat and Nkwenti 2002).

A "real-life" example of collaborative planning is one where key players from macro, meso and micro levels of organization interact through three stages (Despres, Brais, and Avellan 2004). First, the problem is collectively diagnosed and the challenges to change are identified (Despres, Brais, and Avellan 2004). Second, the orientations and objectives of the key players involved are defined from perspectives like sociodemographic, ecological, and economic aspects (Despres, Brais, and Avellan 2004). Third, through participation and communication, a development plan and strategy is established with consensus (Despres, Brais, and Avellan 2004). This general method has been used for national forest planning, suburban retrofitting, and watershed planning, so a non-technology based collaborative planning process for wind turbines is could also follow this method (Cheng 2006, Despres, Brais, and Avellan 2004; Singleton 2002). It should be noted that by the nature of an open planning process, a proposal will face scrutiny from a range of stakeholders, which means that the resultant wind farm will not be a surprise to residents, and may result in less negative opinion (Ellis et al. 2009).

There are drawbacks and criticisms of collaborative planning. An emphasis on communication and collaboration downplays the importance of the social and economic context, the processes used for spatial public policy once consensus has been reached, and the importance of theory in planning decisions (Huxley and Yiftachel 2000; Tewdwr-Jones and Allmendinger 1998). It may be idealistic to assume that stakeholders representing different or opposing viewpoints can reach consensus or resolution; reaching a settlement and resolving that there are differences of opinion may be the most realistic option (Stevenson 2009). This critique has been discussed specifically within the context of

wind turbines and even if consensus is not found, it still a preferred method of governance for wind turbine planning (Ellis, Barry, and Robinson 2007).

5 Using the planning process to reduce the negative effects of wind turbines on citizens

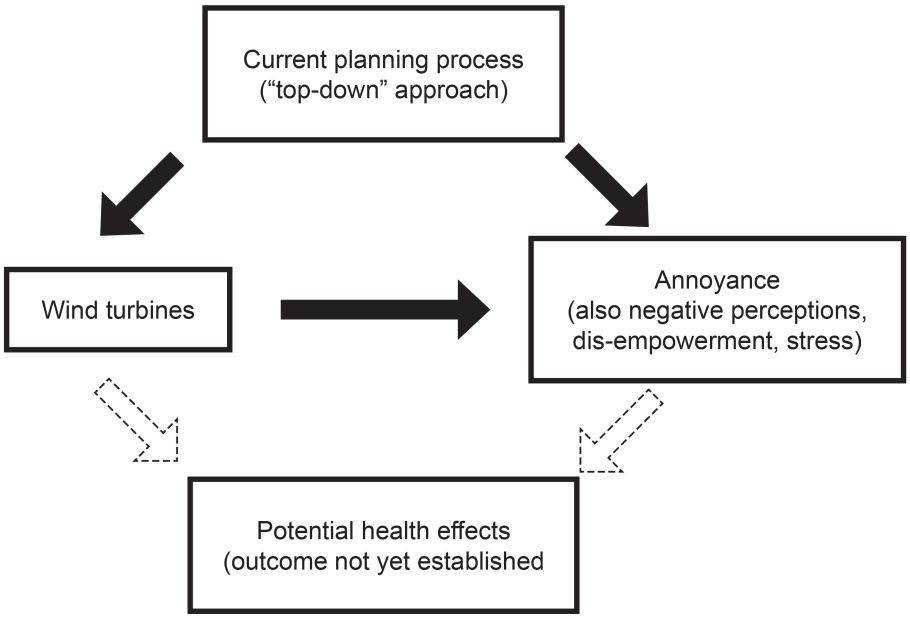
Research articles in the field of wind turbine planning and wind turbines and health often state that the planning process is a source of tension that may be connected to, and must be alleviated before, the health effects of wind turbines can be addressed (Jobert, Laborgne, and Mimler 2007). Wind turbine developments are planned and sited with minimal community consultation which likely leads to decreases in social-psychological variables such as locus of control, self-efficacy, and social capital, and it may be that this results in real and perceived health effects (Mandarano 2009; Lachman and Weaver 1998). Wind developers, citizens, and academics from the UK have discussed from multiple perspectives, that wind power has become a multi-faceted planning problem, especially since the planning process has focussed mainly on streamlining the approvals process and not emphasizing the need for stakeholder engagement and input (Ellis et al. 2009). This is largely the case in the Canadian province of Ontario where provincial legislation dictates wind turbine siting and setbacks, leaving municipalities and citizens without power or input in the planning process (Watson, Betts, and Rapaport 2011). Although this is an efficient way to meet green energy goals, streamlining the decision making process downplays the importance of social interaction with the planning system (Ellis et al. 2009). Planners and researchers must continue to try to understand what enables or impedes the social acceptance of wind turbines and begin advocating incorporating social acceptance into the planning process (Ellis et al. 2009).

5.1 How can collaborative planning result in reduced annoyance?

It may be that a collaborative planning process could lead to decreased reporting of annoyance for three reasons. First, because it is unlikely that wind turbines will be placed close to homes or in locations that mar a valued visual landscape if citizen stakeholders are given an opportunity to take part in the planning process. Second, because the collaborative process may result in acceptance of wind turbines so that locations that are close to homes or that predominate on the landscape will not be perceived as annoying. Third, incorporating and showing respect for the opinions of people who will eventually live near a wind turbine development will likely make them less resentful of the development in question, potentially avoiding negative social-psychological effects, annoyance, and stress. The relationship being presented here shows that the planning process creates wind turbine developments but also leads to annoyance, negative psychosocial factors, and stress (Figure 1). Wind turbines can

cause annoyance and psychosocial stressors and could potentially cause other health effects, but the latter has not been established. Social-psychological factors like sense of control, mastery, and social capital, are likely to be impacted by collaborative decision-making processes or the lack thereof (Mandarano 2009; Lachman and Weaver 1998; Holgersen and Haarstad 2009; Hoch 2002). As has been done with large-scale energy projects in the past, a social impact assessment on the Green Energy Act and Renewable Energy Approvals process could have predicted, before implementation, the subsequent complaints of annoyance and any other consequences that have impacted communities, and addressed beforehand as a preventative measure (Freudenburg, 1986; Cocklin and Kelly 1992).

Figure 1: Speculated pathways between the planning process, wind turbines, annoyance, and health



One of the reasons that the Renewable Energy Approvals process was implemented was so that Ontario's renewable energy goals would be met and risk would be reduced for potential investors (Canadian Broadcasting Corporation February 10, 2009). Germany, a country with a much larger wind energy capacity than Canada, gives communities a voice in the development and planning of wind turbines and this does not hinder development, as seen by Germany's substantial wind energy capacity (Jobert, Laborgne, and Mimler

2007). Changing the planning process would likely change how wind farms are implemented and hinder the province's ability to meet renewable energy goals (Warren and McFadyen 2010). The scale of developments, if decided by a community, would likely be smaller and at a more devolved scale than is currently the norm, with less wind turbines and smaller wind turbines (Warren and McFadyen 2010; Jones, Orr, and Eiser 2011; Ellis, Barry, and Robinson 2007). Small-scale renewable energy developments are viewed as an active way for communities to take park in generating renewable energy and large scale-developments are instead owned by private developers and passively "hosted" by communities (Devine-Wright 2011). Smaller wind farms do not benefit from the cost reduction that results from economies of scale, and a larger number of small wind farms can be resource intensive from an administrative perspective compared to a smaller number of small wind (Warren and McFadyen 2010). Given that approval of wind turbines is higher in citizens who have previous experience with wind turbines, it may be that even if collaborative planning initially leads to smaller scale wind projects being developed (Ladenburg 2010). Once members of a community are comfortable with the technology it may be possible to increase the scale of developments with community approval.

It may be that giving a community a voice will result in stakeholders staunchly opposing wind turbines. If that is the case, opposition may lead to creative problem solving and alternate schemes; there may be resolution where a community prefers to have other forms of renewable energy developed or community-wide energy conservation initiatives over wind turbine development to combat climate change (Ellis, Barry, and Robinson 2007).

5.2 What can a planner or policy-maker do?

Although the Renewable Energies Approvals process may have been implemented to ensure that Ontario meets green energy goals, this method has resulted in a loss of control for citizens and municipalities, and negative opinions of wind power developments. Although a wind turbine planning process that is focussed mainly on streamlining the approvals process is an efficient way to meet green energy goals, focussing effort on improving the speed of the decision making process downplays the importance of stakeholder engagement (Ellis et al. 2009). It may be time to reassess our wind energy policy and planning practices, especially in Ontario. There may be better approaches that encourage implementation of wind power while minimizing negative impacts on the community. Consideration should be given into making the "good neighbour" suggestions in the Renewable Energy Approvals guide a requirement for all wind turbine developments as well as changing guidelines regarding required setbacks, ownership models, and required community involvement. The wind turbine planning processes in Germany and France

are similar to Ontario in that regional government can approve the development but the actual locations where wind infrastructure can be built can be determined by the community (Jobert, Laborgne, and Mimler 2007). Allowing communities to regulate wind development to places that they prefer reduces fear and distrust between the community and the wind developer, resulting in higher levels of social acceptance than we may seen in Ontario (Jobert, Laborgne, and Mimler 2007).

Comparisons between different jurisdictions show that there is no standard reaction to wind turbine developments; there are differences in terms of the sources of wind turbine conflicts, how these conflicts are resolved, and the expectation of citizen involvement in the planning process (Jobert, Laborgne, and Mimler 2007; Wolsink and Breukers 2010). Implementation and planning of wind energy varies by Canadian province. Setbacks from an off-site residential dwelling can be as low as 175m from in Nova Scotia to 1 500m in Ontario, and although municipal government regulates wind development in Nova Scotia the provincial government regulates wind development in Ontario (Watson, Betts, and Rapaport 2011). These discrepancies mean that planners in Nova Scotia have a significant responsibility in determining appropriate setbacks and Ontario planners have no control over wind development in their jurisdiction (Watson, Betts, and Rapaport 2011). Since there is no standard effect of wind turbines on nearby residents, it is fair to look upstream at policies and planning processes to assess why there are such large discrepancies in public opinion and perceptions. Opposition to wind projects in Germany where there is economic participation, early involvement of key stakeholders, and local government participation is relatively low compared to England and the Netherlands where these methods are less prevalent (Wolsink 2006; Jobert, Laborgne, and Mimler 2007; Wolsink 2007a). In Ontario the planning process does not incorporate community trust and empowerment which is part of the planning process places like Germany and France (Jobert, Laborgne, and Mimler 2007). This may result in the conclusion that a more collaborative planning approach is appropriate in Ontario, where there is no incentive for developers to consult with and accommodate the opinions of the community (Simao, Densham, and Haklay 2009).

There are indicators that can be used to determine if there is adequate community participation, which may be adopted into an approvals process to mitigate opposition and subsequent annoyance (Loring 2007). Evidence that a variety of participants being involved in the planning process, that barriers to involvement in participation were minimized, and that decisions were made collectively by community members, planners, and developers, could be added into the Renewable Energy Approvals process so that only projects that meet

minimum standards for collaborative planning and community participation will receive approval for development (Loring 2007).

Another option is adopting a policy for community-based wind power projects is a promising option in Ontario (Toke, Breukers, and Wolsink 2008). If wind turbine developments lead to a economic benefit that could be shared by many of the nearby residents, either as compensation or through ownership, then citizens may feel more empowered, and be less opposed to wind power developments (Bell, Gray, and Haggett 2005) .

6 Conclusions

This article addresses the annoyance and health concerns that citizens in Ontario have towards wind turbines, by reviewing the academic literature in this field from other nations. The provincial level renewable energy policy in Ontario is contrasted to the literature that discusses planning processes. Based on this, more collaborative planning processes and policies that empower citizens, as have been used elsewhere, may mitigate annoyance and negative opinions of wind turbines in Ontario. The Green Energy Act and Renewable Energy Approvals process in Ontario does not give citizens or municipalities control over the development happening in their community, and this needs to change. It is likely that negative opinions, annoyance and stress will be reduced with a new decision-making model.

Although the Green Energy Act and Renewable Energy Approvals process is an efficient way to reach renewable energy goals, the opinions of citizens and municipal planners are not being incorporated into decision-making. The movement towards green energy in Ontario may benefit from a different planning process for wind energy as well as different economic models which benefit the communities hosting the wind turbines.

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Notes

[1] Voir l'addenda qui décrit les changements dans la procédure d'autorisations de projet d'énergie renouvelable.

[2] See addendum describing changes to the Renewable Energy Approvals process.

[3] See addendum describing changes to the Renewable Energy Approvals process.

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Addendum

On March 22, 2012 Ontario's Feed-in Tariff Program Two-Year Review Report was released (Ministry of Energy 2012a). This document included several suggestions for change to the Renewable Energy Approvals process which the Ontario government has agreed to implement (Ministry of Energy 2012b). Two of the six suggestions are consistent with the suggestions in this article and will be briefly described.

First, FIT applications with community support or ownership need more time to mobilize, so application with community support or ownership will be given priority over other applications (Ministry of Energy 2012a). Projects with support or ownership from the community or community organizations will be awarded points for this and 10% of the FIT contract capacity will be put aside for local community projects (Ministry of Energy 2012a). Second, FIT applications which have support from the local municipality will also be encouraged. Applications which demonstrate support from the local municipality will be awarded points in the FIT approval process (Ministry of Energy 2012a).

The decision to implement these suggestions indicates that the Ontario government is encouraging participation and consultation in the wind turbine

planning process, and this is a positive step towards a collaborative planning process. However giving preference to projects that incorporate collaboration is not equivalent to expecting and requiring collaboration. It is too soon to know how this change in policy will work in practice and whether it will have an impact on participation, collaboration, and reports of annoyance.