The International Energy Agency
Implementing Agreement for Co-operation in the Research, Development, and Deployment of Wind Energy Systems

iea wind

## IEA WIND TASK 28

# SOCIAL ACCEPTANCE OF WIND ENERGY PROJECTS

## ”Winning Hearts and Minds”

# STATE-OF-THE-ART REPORT

## Country report of Canada

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**Abstract / Summary**

Wind energy has been expanding considerably in the past few years. Wind power is one of the technologies promoted to reduce our impact on the environment. Many countries have embraced this technology and are developing important wind farms to reduce their dependency on non-renewable energy sources. Canada has rapidly developed its wind energy capabilities, in less than 10 years it has installed over 3000 MW of wind capacity, and this number is set to continue increasing for the next few years. To continue with its rapid development, promoters and local governments must establish a clear understanding of the possible negative effects of wind energy and how to mitigate these effects. These are important steps to achieve social acceptance for new wind energy projects. This study aims to determine what is known on social acceptance of wind energy in Canada.

# Framing the issue

## 0. Introduction

### a. Introduction by the Operating Agent of IEA Wind Task 28

In 2009, many governments and organizations set new targets for CO2 reductions, renewable energies in general, as well as specific targets for wind energy deployment. All these targets require many single projects to be carried out both onshore and offshore that necessitate hundreds of siting decisions and therefore hundreds of communities accepting a wind project nearby.

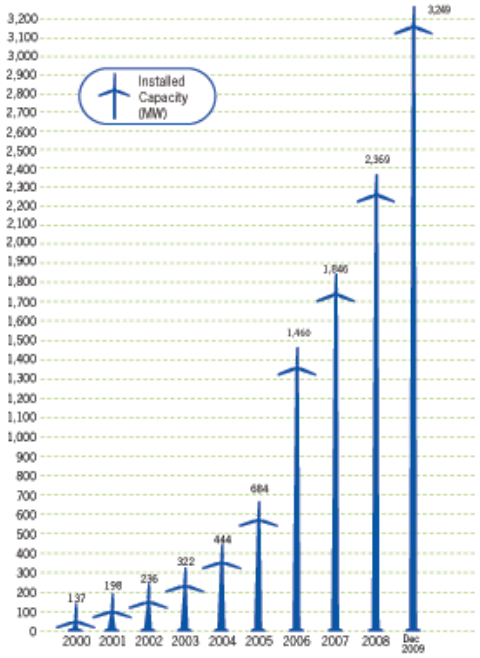
Research and projects are ongoing in many countries on how acceptance could be fostered, but we need to look beyond national borders to learn from each other and to complement each other's approaches. While Denmark has one of the longest traditions of co-operatively owned wind farms, Japan may bring its expertise in generating additional benefits for the communities hosting the turbines. While Ireland and Canada know about the effects of wind parks on tourism, Norway has conducted actual research on communication between society and science, e.g. concerning bird risks with wind farms.

In the framework of the IEA Wind Implementing Agreement, Task 28 collects and disseminates the current knowledge on how to increase acceptance of wind energy projects with the aim of facilitating implementation of wind energy and climate targets.

Ten countries have officially committed to Task 28 and have provided an input for cross-national comparison and discussion by writing a national report such as the one on hand. The Canadian report has been incorporated into the international State-of-the-Art Report by IEA Wind Task 28, available also on www.socialacceptance.ch.

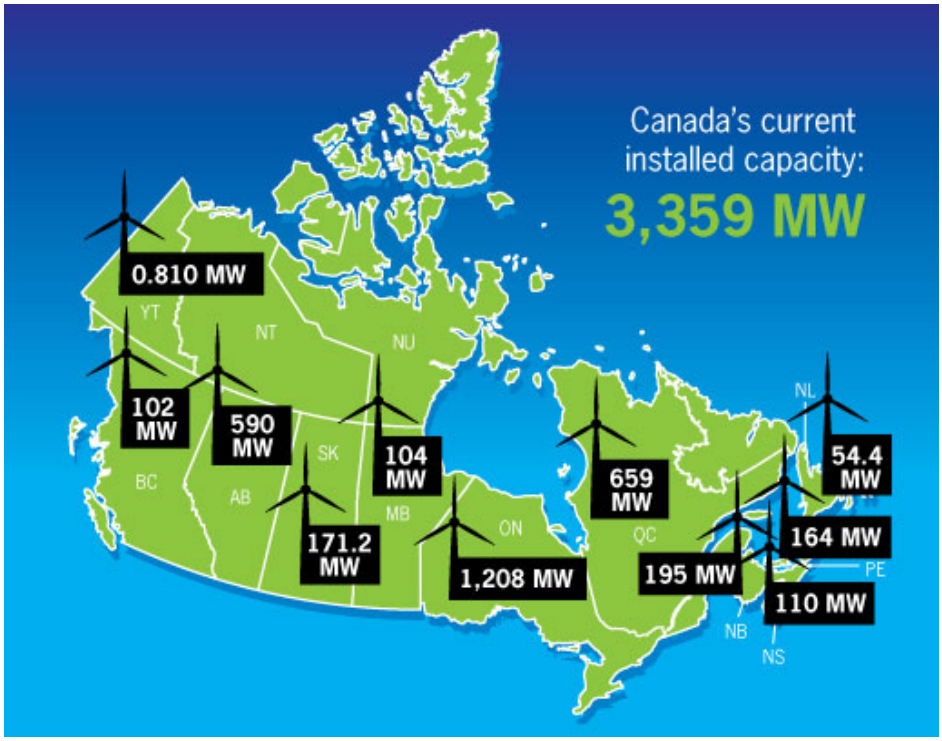
### b. The Issue: Social Acceptance of Wind Energy Projects in Canada

Canada has an enormous potential for the development of wind power. The very large land mass, some of the world's largest open prairies and the world's longest coastline (243 792 km), make it a perfect place to harness the wind's resources, as can be seen in the Canadian Wind Energy Atlas developed by Environment Canada[1]. However, Canada started its wind power development later then other countries, mainly because of its large hydroelectric capacity and the low cost of production of hydroelectricity. However, even with its late start, Canada has been able to develop very quickly its wind power production becoming, in 2008, the 12th country to have an installed capacity surpassing 2000 MW.[2]




Source: http://www.canwea.ca/farms/index_e.php

In late 2009, Canada has 3,359 MW installed capacity, enough to power the equivalent of just under 1,000,000 homes. It is also the first year that Canada has wind farms in every province.




Source: http://www.canwea.ca/farms/index_e.php

The momentum for wind energy in Canada is set to continue for the next few years with many additional projects on the drawing board and increased interest from the public and private sector. But for all these projects to be implemented a certain degree of social acceptance for wind power must be achieved.

# 1. Definitions

## a. Social Acceptance

The concept of social acceptance is often used by policy analysts but few researchers have offered clear and useable definitions. Wüstenhagen and his colleagues[3] identify three dimensions to define the concept of social acceptance. *Socio-political acceptance* refers to public opinion and the acceptance of key political and economic actors. This dimension of social acceptance raises the question: "whether and under what conditions wind energy would be considered to be socially and politically desirable and be brought in to contribute to society's energy supplies as a whole".[4] According to the author, political actors must build effective policies to enhance the community and market acceptance of wind power. Thus making socio-political acceptance the first element required in achieving general social acceptance.

*Community acceptance* refers to the acceptance of the local population, the communities that are directly affected by the installation of wind energy farms. "The question is which conditions will lead to the appearance of a NIMBY phenomenon or, on the contrary, to a favourable and concerted commitment by the population concerned".[5] Some of the elements that affect community acceptance are distributional justice, procedural justice and, whether the local population trusts the intentions and information of the investors and other actors from outside the community. This level of acceptance seems to fluctuate over time: it is high at the beginning of the wind energy project, and then it drops during the construction phase, although it remains positive, and finally it increases once the facility is operational.[6]

The approach of Wüstenhagen and his colleagues is interesting because it offers a broad approach through his layering of the concept of social acceptance. The community acceptance dimension offers a local perspective of social acceptance of wind power, but the authors go beyond this local dimension by exploring all the elements that can affect social acceptance. The socio-political and market acceptance offer insights on the commitment of policy actors for the development of wind power. It also shows the interest of economical actors and the various models promoted for this industry. All these elements, combined with the local dimension, have an effect on the social acceptance of wind power.

## b. On-Shore / Off-Shore

Currently, all the wind energy produced in Canada is produced through on-shore wind facilities. However, the potential of off-shore wind energy production is thought to be important and thus studies are being conducted on Canada's west coast and the Great Lakes. British Columbia's Hecate Strait may become the first off-shore wind farm in Canada. The first phase of a planned five-phase development of the NaiKun Offshore Wind Energy Project by NaiKun wind energy group is a 110 turbine project meant to produce 396 MW. The turbines are to be installed at least 4 kilometres off-shore. The project received its provincial environmental certification at the end of 2009 and is waiting for a federal environmental assessment determination before it can begin construction. It is set to begin energy distribution by 2013 and to be fully operational by 2014[7].

Following a process established by the Province of Ontario for optioning leases for offshore wind farms in the Great Lakes, several developers are making plans for offshore wind farms in Lakes Erie and Ontario.[8] Canada has adopted the International Electrotechnical Commission (IEC) definition for off-shore wind energy. Thus, according to IEC 61400-3 an off-shore wind turbine is a "wind turbine with a support structure which is subject to hydrodynamic loading".[9] Note that, economics, distance from shore and wind resources are some of the limiting factors of where off-shore wind turbines can be located. The NaiKun wind energy group does put some emphasis on some of these characteristics: "Offshore wind turbines must be sited where a consistent wind resource exists and in waters 30 meters deep or less. In areas where there are long stretches of shallow water, projects may be developed several kilometres from shore. On the other hand, in areas where water becomes deep more quickly, wind turbines must be built closer to shore. Today, most offshore proposals are sited at least 3-4 kilometres from the shoreline".[10]

## c. Large Scale / Small Scale

Small wind turbines, generally called 'small wind', are wind turbines with a production capacity of up to 300 kW and they usually produce electricity for a house, a farm, a business or a small community. Whereas large turbines, often grouped in *wind farms,* are widely used by utilities across Canada to provide grid electricity. In Canada, the small wind turbine market (SWT) breaks down into three categories:

- mini wind turbines 300 W-1 kW (off-grid operations such as battery charging or pumping water);
- small wind turbines 1 kW-30 kW (on-grid);
- medium wind turbines 30 kW-300 kW (on-grid)[11].

Canada's large scale installed wind capacity is 3,249 MW and, according to 2005 estimates, the small wind installed capacity fluctuates between 1.8 MW and 4.5 MW[12]. There are approximately 2,500 small wind turbines installed in Canada, 90% of which are mini wind turbines (less than 1 kW off-grid turbines)[13].

### d. Transmission lines

Wind energy has expanded very quickly in Canada and the integration of wind power into the existing grid is one of the major technical hurdles faced by the industry as a whole. Natural Resources Canada states that the grid integration of renewable energy should be a driver for a major infrastructure modernization project known as "smart grid". This "smart grid" needs to take into account a more decentralized energy supply and bidirectional power flows. According to the Independent Electricity System Operator, a smart grid refers to a "two-way system that monitors and automatically optimizes the operation of the interconnected elements of the power system – from the generator through the high-voltage network and distribution system, to end-use consumers"[14]. Some of the benefits of this smart grid are: "Improved system reliability; increased customer participation and environmental benefits"[15]. Ontario's Hydro One is investing in a plan for 20 major transmission projects which include enabler lines that have: "transmission capacity built to connect renewable projects"[16]. BC Hydro, AltaLink, Manitoba Hydro and Hydro-Québec also have plans to create a smart-grid[17].

# Industry Status and Stakeholders

## 2. National Wind Energy Concepts

Wind energy is the fastest growing renewable energy source in Canada with an average annual growth rate of 60 percent since 1998[18] with installed capacity increasing from 26 megawatts MW in 1998 to 3,249 MW by 2009. To understand how wind energy has developed it is important to have a general idea of the Canadian political system. Canada is a federation, which means that the work of governing the country is shared by the federal and provincial or territorial governments. The *Constitution Act* of 1867, with several later amendments, defines the jurisdiction of federal and provincial governments in the Canadian confederation. Natural resources are a provincial responsibility under the Constitution, but nevertheless wind energy production is encouraged by both federal and provincial levels of government. Municipal governments have been given a say in the development of wind energy through their provincial assignment of responsibility for zoning bylaws, for example in Toronto[19]. This is to say that, although Canada has had a very quick and successful implementation of wind energy, it is difficult to identify national wind energy concepts since this development has been possible because of both federal and provincial initiatives.

### a. Policies and strategies for wind energy

Most Canadian provinces have established policies to increase their production of energy through renewable sources. These targets vary considerably from one province to another but in general, we can say that provincial governments are trying to encourage renewable sources of energy including wind energy.

In British Columbia, the government has established an energy plan that aims to achieve energy self-sufficiency for the province by 2016 with 50% of new energy to come from clean energy sources[20]. This plan is also meant to ensure clean or renewable electricity generation continues to account for at least 90 percent of total generation. In New Brunswick, the government is committed to increase the amount of electricity from new renewable sources to 10% of total use by 2016[21].

Nova Scotia created a Renewable Energy Standard (RES). The RES requires that by 2013, 10% of the province's electricity requirement must be supplied by new renewable energy sources (5% by 2010 and an additional 5% by 2013)[22]. Some estimates demonstrate that the 2013 RES requirement will bring the total provincial renewable supply to approximately 22% (581 MW)[23]. The department of energy expects most of this supply to be met with commercial-scale wind energy projects, and estimates the number of utility wind turbines in the province may grow from the current 41 to over 300. Note that in 2009, the energy minister declared that by 2015, 25% of Nova Scotia's energy will be provided by renewable sources. However, it has not been established how this target will be achieved[24].

Prince Edward Island aims to increase its renewable portfolio standard (RPS) from 15% to 30% by 2013. To achieve this goal, the province plans to establish 500 MW of installed wind power by 2013[25]. Further increase of the RPS is planned for 2018 but no specific numbers have yet been established.

Newfoundland and Labrador established a target of 50 MW, which they have already achieved. It is yet unclear whether they will increase their production of wind energy since studies indicate that the grid capacity for wind power is 80 MW[26].

Saskatchewan sets ambitious targets to cut the province's greenhouse gas emissions by 32 percent by 2020 and 80 percent by 2050. One of the five components of this plan is to increase the use of renewable sources of energy including wind, but specific targets for wind power have not been established.

Alberta's provincial government aimed to get an additional 3.5 percent of energy generated through renewable and alternative sources by 2008[27]. The government has not yet established new objectives.

The government of Quebec has set a target of 4000 MW of wind energy by 2015[28] and the government of Ontario gave a directive in 2006 stating that the production of electricity by renewable sources should increase to 2700 MW by 2010[29]. The government of Ontario has also passed a *Green Energy Act,* which led to the creation of a Feed-In-Tariff program.

**b. Incentive programs for wind energy**

Policies, strategies and targets for wind energy and renewable energy production demonstrate political will to encourage these technologies, whereas incentive programs demonstrate political action in this field. Incentive programs can be considered a good measure of the government's commitment to wind energy. How much a government is willing to spend is an interesting indicator but more importantly is how that money is distributed (e.g. net-metering, feed-in tariff) and to whom (e.g. small productions only, large producers). A well-structured plan will streamline the process to create new wind power facilities and make them economically viable on the long term. Incentive programs will help the development of wind energy in the country but can also have a positive economic impact for the local population (job creation) and for the government (tax revenue). Indeed, a study conducted by GE Energy Financial Services, an important wind developer, demonstrated that the renewal of the ecoEnergy for Renewable Power program could generate $287 million for the government[30].

Financial incentives have contributed greatly in the development of Canada's wind energy. Ontario's recent creation of a feed-in-tariff (FIT) will likely have the same effect in the province. Preliminary reports show that there are 8,000 MW of new renewable energy projects proposed under the FIT program and 79% of them are wind energy projects[31]. Here is a list of some of the current and recent wind energy incentive programs offered by the federal and provincial governments.

FEDERAL PROGRAMS:

ecoEnergy for Renewable Power.

| | |
|---|---|
| Announced | Budget 2007 |
| Budget | $ 1,48 billion over 10 years |
| Goals | To support up to 4,000 MW of clean electricity from renewable sources such as wind, biomass, low impact hydro, geothermal, solar photovoltaic and ocean |
| Mechanism | 1 ¢/kWh production incentive |
| Status | **Funding is nearly all committed** |

Source: http://www.ecoaction.gc.ca/ECOENERGY-ECOENERGIE/power-electricite/index-eng.cfm

The Clean Energy Fund

| | |
|---|---|
| Announced | Budget 2009 |
| Budget | $ 795 million over 5 years |
| Goals | To support the development and demonstration of promising technologies, including large-scale carbon capture and storage (CCS) projects, and renewable energy and clean energy systems demonstrations. |
| Mechanism | Request for proposals (RFP). |
| Status | $ 650 million for large scale carbon capture and storage demonstration projects;<br>$ 150 million for research on a range of clean technologies;<br>**$ 200 million for smaller-scale demonstration projects of renewable and alternative energy technologies.** |
| Note | **Large scale wind farms are not a target of this fund. However, demonstration and research and development wind projects are.** |

Source: http://www.nrcan.gc.ca/eneene/science/ceffep-eng.php

EcoLogo for Renewable Low-Impact Electricity

| | |
|---|---|
| Announced | 1996, as an element of Environment Canada's national ecolabelling program for environmentally preferable products and services. |
| Budget | N/A |
| Goals | Establishes certification and labelling criteria for renewable low-impact electricity generation and products, including wind power, towards identifying and providing customer assurance of environmentally preferable electricity. |
| Mechanism | Supports voluntary green power markets and government programs such as the ecoENERGY for Renewable Power Program and the New Brunswick Renewable Portfolio Standard. |
| Status | EcoLogo certification criteria are undergoing an update in 2010. |
| Note | Green power marketing programs, often focussing on wind power, have been present in several provincial jurisdictions since 1997, commencing with the efforts of Enmax, the electrical utility of the City of Calgary which made its first sale to Environment Canada to supply its offices and laboratories in Alberta. Active sales to residential and institutional/commercial customers exist in British Columbia, Alberta, Saskatchewan, Ontario and Prince Edward Island. |

Source: *Green Power Programs in Canada—2007* (unpublished manuscript by the Pembina Institute)

SELECTED PROVINCIAL PROGRAMS:

| | | |
|---|---|---|
| Prince Edward Island | Sales Tax Exemption | A sales tax exemption is provided for purchases of small (100kw or less) wind turbines. |
| | Net Metering | Customers who generate 100 KW or less of renewable electricity will be billed for the difference of the value of energy contributed to and drawn from the grid. |

| | | |
|---|---|---|
| New Brunswick | Embedded Generation (Feed-in tariff) | New Brunswick Power will purchase power from small generators who produce from 100kW to 3000kW of power. The feed-in tariff rate established on April 1st 2009 is 9.445 cents per kWh. The technologies that can apply for this program are: biogas, biomass, solar, small hydro or wind. |
| | Net Metering | Customers who generate up to 100 KW of power can receive credit for any power contributed to the grid, at the same rate which they would pay. |

Source: http://www.nbpower.com/html/en/conservation/renewable_projects/renewable_projects.html

| | | |
|---|---|---|
| Saskatchewan | Green Options Partner Program | This program will provide medium-scale power producers the opportunity to responsibly generate and sell between 100 kilowatts (kW) and 10 megawatts (MW) of electricity to SaskPower. At this time, the program is expected to have a purchasing cap of 50MW per year. Of this amount, SaskPower is allowing up to 25MW of it to be generated from wind generation and the remainder from other environmentally responsible generation technologies. The Green Options Partner Program is still in development. |
| | Net Metering | Customers who wish to generate up to 100 kW of their own electricity from renewable sources can get a credit on their electricity bill for power contributed to the grid. The amount of credit is limited to not more than the amount of power purchased over a two-year period. In addition, the province will pay a one-time fee equivalent to 35%, maximum $35,000, to offset start-up costs. |
| | Small Power Producers Policy | Customers may interconnect a generating facility, up to 100 kW in size, to SaskPower's electricity distribution system. SaskPower will purchase any excess energy provided to the grid at a firm price of 8.42 ¢/kWh. |

Source: http://www.saskpower.com/independent_power_producers/

| | | |
|---|---|---|
| British Columbia | Net Metering | Allows producers of 50 kW or less to pay only for power used over and above that which they produced, as measured by a two-way meter. |

Source: http://www.bchydro.com/planning_regulatory/acquiring_power/net_metering.html

| | | |
|---|---|---|
| Northwest Territories | Community Renewal Energy Fund | The program assists community-based installations of alternative energy systems, or the conversion of an existing conventional energy system to alternative energy technology. Funding of up to one-half of the project cost is available, to a maximum of $50,000 per year. |
| | Medium Renewal Energy Fund | This program is available to assist commercial businesses, including off-grid camps and lodges that want to incorporate commercially available alternative energy technologies into their operations. The maximum amount that will be provided to any recipient is $15,000 per year. |
| | Small Renewal Energy Fund | The program is available to assist residents to integrate commercially available, clean energy technologies on their property, building or other assets for the intent purpose of reducing fuel usage. The maximum amount that will be provided to any recipient is $5,000 per year. |

Source: http://www.enr.gov.nt.ca/_live/pages/wpPages/aetp.aspx

| | | |
|---|---|---|
| Québec | Energy Innovation Assistance Program | This program aims to encourage the development of new technologies or innovative processes focusing on energy efficiency or emerging energy sources by financially supporting project developers who actively contribute to the various stages of the innovation process. The financial assistance amounts awarded by the Agence de l'efficacité énergétique have been raised to $250,000 for demonstration activities part of an energy efficiency project and to $1M for projects featuring emerging energy sources. This funding is mostly used for research and development and experimentation but can also be applied for pre-market and feasibility studies. |
| | Net Metering | Allows producers of 50 kW or less to pay only for power used over and above that which they produced. |

Source: http://www.aee.gouv.qc.ca/en/technological-innovations/program-to-promote-energy-efficiency-ppee/

| | | |
|---|---|---|
| Ontario | Feed-in tariff (FIT) Program | The FIT program is open to bioenergy, solar, water and wind (on-shore and off-shore). Small, medium and large renewable energy projects that generate more than 10kW of electricity. The FIT program will pay 13.5¢/kWh for on-shore wind generation and 19¢/kWh for off-shore. |
| | Micro-Feed-in tariff (MicroFIT) Program | The microFIT program is open to bioenergy, solar, water and on-shore wind. Very small renewable energy projects, such as home or small business installation generating 10kW or less of electricity. The microFIT program will pay 13.5¢/kWh for wind power. |

Source: http://fit.powerauthority.on.ca/

### c. Spatial planning

The installation of a wind turbine in Canada can require permits and authorizations from the federal, provincial and municipal governments. Each of these levels of government has established guidelines according to their responsibilities towards their citizens and to mitigate possible adverse effects of wind turbines, some of these provisions even include maximum height of wind turbines. The Canadian Wind Energy Association (CANWEA) has tried to establish guidelines for rural wind projects in Ontario. These guidelines identify two key considerations when establishing setback distances: ensuring acceptable sound levels for surrounding dwellings and ensuring public safety for ice shedding and turbine failure. These setbacks are identified as:

1. Neighbouring Dwelling Setbacks: calculated with the Ontario Ministry of the Environment regulations for appropriate sound level limits for rural areas (estimated at 250 m or greater given current wind turbine technology);

2. Public Road Setbacks: a minimum distance equal to one blade length plus 10 m from the nearest public road;

3. Property Line Setbacks: a distance equal to one turbine blade length plus 10 m from all property lines unless appropriate agreements or easements are put in place with adjacent property owners;

4. Radio, Telecommunication and Radar System Setbacks: determined according to a review of the guidelines developed by the Radio Advisory Board of Canada;

5. Environmentally Sensitive Areas and Natural Feature Setbacks: determined through site-specific study as part of either provincial or federal environmental assessment processes[32].

The Ontario government, however, did not follow these guidelines. The government established the Renewable Energy Approval law, which established its own guidelines for setbacks. This law, which came into force in 2009, establishes the largest setback requirements in Canada, the United States and eight European countries – a minimum setback of 550 metres for one to five wind turbines, with setbacks increasing with the number and the sound level rating of turbines[33].

The New Brunswick Department of Natural Resources also established minimum setback distances:

| Land Use/Cover | Setbacks |
|---|---|
| Crown lands boundaries, lakes, watercourses, wetlands and coastal features (as defined by the Coastal Areas Protection Policy) | 150 m, or 1.5 x height of turbine, whichever is greatest |
| Public highways, roads and streets (including roads and streets within the boundaries of a city, town or village), designated as highways under the Highways Act; and areas designated for those purposes in a plan adopted under the Community Planning Act | 500 m, or 5 x height of turbine, whichever is greatest |
| Existing recreational, institutional and residential areas, and areas designated for those purposes in a plan adopted under the Community Planning Act | 500 m, or 5 x height of turbine, whichever is Greatest |
| Other built-up areas, e.g. industrial areas | 150 m, or 1.5 x height of turbine, whichever is greatest |
| Communication, fire, airport and other tower structures Archaeological & Historical Sites (listed by the Culture & Sport Secretariat) Wind power option agreement areas, wind test towers and wind farms, either existing or under application review; unless occupied by, or part of applicant's proposal | 500 m, or 5 x height of turbine, whichever is greatest |
| Endangered species habitat (NB Endangered Species Act); important migratory bird nesting sites and migration routes (Migratory Birds Convention Act); important water-bird breeding colonies; national wildlife refuges; wildlife management areas (Fish & Wildlife Act) | 1000 m |

Source: http://www.gnb.ca/0085/pdf/NBwindEnergy.pdf

Environment Canada's Canadian Wildlife Service produced the *Wind Turbines and Birds - A Guidance Document for Environmental Assessment* in April 2007[34]. The primary mitigation strategy envisaged to reduce potential risk to birds from wind turbines to be considered during the planning of wind energy developments is suitable location of wind farms.

In the past 2 years, scientists in the Acoustics Division of Health Canada's Consumer and Clinical Radiation Protection Bureau have analyzed the scientific literature, developing proposals for a mitigation criterion for wind turbine noise.[35] This work helps Health Canada advise on the human health effects of wind turbine noise, primarily under the *Canadian Environmental Assessment Act.*[36]

### d. Strategies: From policy to local acceptance

The establishment of important setbacks, the obligation of environmental assessments and public consultation are some of the strategies used to mitigate the problems that might arise with local acceptance of wind power. In the case of the Statia Point Tupper wind farm project, the Canadian Coast Guard was concerned that the turbines might have: "serious negative effects on radar surveillance of shipping in the Strait of Canso".[37] To mitigate the safety problems that might arise, Lea Barker, a radar specialist recommended either to update the radar system or to add a second radar in order to eliminate false readings on the radar[38].

## 3. Stakeholders / target groups

### a. Stakeholder's perspectives towards wind energy

Stakeholders are a very large and diverse group that include government officials, developers, the population in general and the local population. Stakeholder groups have different perspectives of wind energy. There is data on the perspectives of some groups but not others; this might be the consequence of Canada's recent development of wind energy.

### b. Utilities / grid owners

There are 16 major generating electric utilities in Canada: 8 are provincially owned, 7 are investor-owned, 2 are municipally owned, and 2 are territorial crown corporations. Most utilities have undergone an evolutionary change in their attitudes to wind energy since the 1990s, and become accepting of wind energy as a useful source of power to be managed as part of a broad supply mix. For example, in 2006 the Alberta Electricity System Operator (AESO) indicated that its: "concerns about wind's variability were significant enough that it was unwilling to allow more than 900 MW of wind energy on the grid until it had an opportunity to further analyze and understand the implications"[39]. By 2009 and after completing their research, the AESO: "not only removed the 900 MW threshold for wind energy development, but it is now supporting the construction of new transmission lines for the purpose of connecting more than 3, 000 MW of wind energy production to the Alberta grid."[40]

### c. Developers / investors

Ernst and Young publish regularly a report that focuses on Renewable energy country attractiveness indices, which rank countries based on their alternative energy investment 'friendliness'. Over the past few years Canada has been ranking high on these indices. In the latest report, dated November 2009[41], Canada ranked 9th for overall attractiveness for all renewable energies, and it ranked 6th for attractiveness for wind energy investments on the long term. This index is a composite of attractiveness for on-shore and off-shore wind energy. Canada's high ranking is mostly the result of its on-shore attractiveness and its large unexploited on-shore and off-shore capabilities. Canada's near-term wind attractiveness – a two-year forward view "based on the parameters of most concern to a typical investor seeking to make a near-term investment"[42] – is much lower. However, Canada has a high renewable infrastructure index, which provides: "an assessment of the general regulatory infrastructure for renewable energy"[43].

No other studies on the opinion of developers were found for Canada. Canada is experiencing a 30% annual growth rate for wind energy[44] and private investors are responsible for most of these developments. The interest of developers for Canadian wind energy has even pushed GE Energy to produce a report on the economical benefits for the government to renew the ecoEnergy program. The report states that, a renewal of the program could generate close to 300 million $ of profit for the government[45].

### d. Financial institutions

According to Wind Energy Law Practice Group at Dale & Lessmann LLP law firm, no Canadian commercial bank is directly involved in wind energy development. The law firm explains that: "Canada's banks observe some of the most conservative lending guidelines in the world".[46] They also state that Canadian banks are more likely to invest in already built developments rather than offer financing for new developments because of the risk involved. For example, Toronto Dominion talks of the benefits of investing in 'green power' but encourages investments in hydroelectricity. The report does talk about wind energy and its possible benefits but concludes on its investment risks[47]. A similar market study by the Royal Bank of Canada indicates that the economical effects of wind energy are not yet fully understood. The report does say that wind energy is a good investment but is not desirable for grid operators and consumers[48].

### e. National opinion makers, policy makers and general opinion

A study done in 2006 determined that "the Canadian government and all major federal political parties have made explicit plans to move toward cleaner, more renewable and efficient energy sources"[49], clearly demonstrating that national opinion makers considered renewable energy as a priority. For wind energy, this situation still seems to be a reality, although the nature of federal support may change over time. On the provincial level, the governments have been committing more and more every year to the development of wind energy, by establishing objectives and applying financial incentives. The most noteworthy accomplishment of this commitment is that 2009 is the first year that every single Canadian province produces part of its on-grid electricity through wind power.

Canadians are favourable to renewable energy in general and they have a good opinion of wind energy. A large 2008 survey shows that 88% of Canadians are supportive of provincial governments requiring that a specific portion of electrical energy produced comes from new renewable sources like wind and solar and 87% of people surveyed supported the Canadian Wind Energy Association's plan to encourage that 20% of Canada's electricity needs should be met by wind energy. As well, 67% of Canadians say all new energy demand should be met with renewable energy sources, and one of the most revealing numbers is that 65% of Canadians say they are willing to pay more for renewable energy. Finally, 29% of Canadians say that wind energy would be their first choice if they could choose their source of electricity, while 32% felt it would be their second choice[50]. Another survey by Angus-Reid showed that 89% of Canadians thought that using renewable sources of energy is positive for Canada because they are better for the environment[51]. A 2007 survey showed that wind power was the energy source most likely to gain public support for future development in Canada, with only 16% opposition[52]. Other surveys of the opinion of renewable energy have been done on provincial levels with similar results. Although the opinion for renewable energy is favourable, the Conference Board of Canada indicates that there is a lack of national opinion polls specifically on wind energy[53].

Many Canadians continue to affirm their support for wind energy through green power purchasing, the voluntary choice of wind power or other renewable low-impact electricity for their own use. Green power sales volumes, largest in Alberta, reached some 2,000,000 MWh in 2007[54].

### f. Educators

No specific studies were found on the opinion of educators and teachers towards wind energy. Many resources do exist for teachers who want to integrate renewable energy in their syllabus. Some of these resources, such as the ones offered by government websites (e.g. Natural Resources Canada) are for alternative sources of energy[55], while others (e.g. the Canadian Wind Energy Association) deal directly with wind energy. Many of these pedagogical resources have been gathered and reviewed by the Energy Council of Canada (ECC). However, this review is for energy education in general, not for wind or other new renewable energy. Thus, many of the resources offered, deal specifically with hydro-electricity. One of the main issues raised by the ECC, which can be transposed to wind energy education, is the lack of a Pan-Canadian Framework for educators; this means that there is no uniformity in the curriculum. Some private companies also offer educational material for teachers. For example, Enmax, an energy distribution, supply and service provider, has launched an interactive educational pilot project in Alberta called Gen E. Enmax offers educational resources to 30 teachers in 15 schools and has installed alternative sources of energy (solar and wind) in 8 schools[56]. Enmax is going to use the feedback from these teachers to evaluate the project and would like to offer it to schools across the province in about a year from now. It would be interesting to survey the opinion of Canadian teachers towards wind energy, as it has been done for example in Greece[57].

### g. National, regional and local administration

Many provincial governments have steadily supported renewable energy, encouraging the development of wind energy in their respective provinces. This can be seen through the objectives and goals set for wind energy production by these governments and the incentive programs they have established to achieve them. The province of Ontario has been recognized as "Green Energy Champion"[58] for passing *the Green Energy & Green Economy Act,* which is intended to create 90,000 jobs over the next decade and produces "an attractive investment regime to facilitate the rapid deployment of renewable energy"[59] using a feed-in tariff program.

Comprehensive studies have not been done to determine the perception of local administrations but there is anecdotal evidence of the support of renewable energy by municipal governments. The city of Calgary was recognized for its commitment to build wind farms to supply 100% of the electricity for municipal operations, while the city of Edmonton recently established a task force to determine how renewable energy can be used within the city. The city of Toronto installed deep lake water cooling and powers City Hall with renewable energy, they also enabled the installation of the first North-American urban wind turbine. There are plans as well for the construction of a wind turbine in the city of Montreal.

### h. Local population

The opinion of local communities to wind farms varies. In Prince Edward Island (PEI) 75% of residents think there should be more wind farms[60]. An opinion poll conducted on behalf of the NaiKun project in British Columbia showed that 73% of those surveyed support the project[61]. The most interesting survey of local population was done in Québec. In this survey, 500 people, that live less than 10 km away from a wind far, were asked what their opinion was of the wind farm before and after its construction. Before the construction, 83% of the population was favourable to the construction. After the construction, 86% were favourable[62].

There are organised groups that perceive wind farms positively and negatively. Wind Concerns Ontario has a detailed list of these organisations in Ontario that have concerns about wind farms[63]. A few clear examples of resistance to wind projects are the Pubnico wind farm in Nova Scotia and Toronto Hydro offshore anemometer installation. Both these projects provoked strong negative public reactions. There are also groups that have a positive perception of wind farms like the Citizens for Renewable Energy[64].

### i. Visitors / tourists

A Canadian study on the effects of wind farms on tourism was done in Prince Edward Island (PEI)[65]. Tourism in PEI generates annually over 350 million $, which represents over 7.5% of the provincial GDP[66]. As well, 15% of the island's electricity needs are generated by wind and the stated goal is to increase this number to 33% by 2013. Although PEI is the smallest Canadian province, because of the importance of tourism and wind power, this study can serve as an interesting barometer for the effects of wind farms on tourism in Canada. According to this report, tourists in general support the creation of wind farms, 82% of visitors agreed that there should be more wind farms in PEI and that the provincial government should financially support the creation of more wind farms. The study demonstrates that most visitors seem to support wind energy[67] but only 44% think that wind farms add to the attractiveness of the region. Note that only 50% of the visitors interviewed actually saw a wind farm during their visit of the island.

Tourist perceptions were also evaluated in a study in the Gaspé Region of Québec[68], where about 85% of visitors have seen the wind farms. Visitors generally expressed a positive attitude towards wind farms, 94.7 % of visitors expressed a good, very good or excellent perception of wind farms. One of the interesting elements of this study was that respondents who could see wind farms during the interview process had a higher than average positive attitude towards wind farms[69]. As well, respondents 25 to 44 years old had a slightly more positive perception of wind farms and visitors concerned with the environment had a very positive perception. When asked about the establishment of new wind farms in the future, 56.4% preferred to see a concentration of wind turbines (more than 12 turbines) in a few places, rather than fewer turbines (less than 12) in multiple locations.

## Variables Influencing Social Acceptance

## 4. Well-being

A study in Quebec revealed that the main issues raised during public consultations by the local population before the construction of wind farms were: landscape, well-being, which includes noise and health concerns, and environmental effects[70]. Wind Concerns Ontario, an advocacy group whose mission is "to protect the health, safety and quality of life of the people of Ontario from industrial wind turbines"[71], identifies 5 key concerns:

1. Health and safety, including noise and other health concerns;
2. Information and explanation, which involves proper information about wind power and transparency from the developer;
3. Protection of heritage and culture;
4. Protection of the natural environment;
5. Socio-economic impacts[72].

### a. Standard of Living, Quality of Life and Health

There is anecdotal evidence in Canada of adverse health effects caused by wind farms[73]. Research seems to have demonstrated that these are isolated incidents[74]. In 2010, the National Collaborating Center for Environmental Health (NCCEH) published a review document that addressed most of the adverse health effects caused by wind farms[75]. The main conclusions of this report can be found summarized in the following table:

| Hazard | Possible Sources | Evidence | Mitigation |
|---|---|---|---|
| Sound/Noise | Turbine mechanics or blade motion (aerodynamic) | • Sound levels are below health and safety limits<br>• Annoyance and sleep disruption are common when sound levels are 30 to 45 dBA<br>• Noise perception is associated with perception of visual impact, lack of direct economic benefit, and negative attitudes toward turbines | • Utilize setbacks and land use planning to minimize sound levels and sound propagation |
| Low frequency sound<br>Infrasound | Turbine mechanics or blade motion (aerodynamic) | • Evidence of health effects at levels >80 dB<br>• Lack of evidence regarding levels produced by wind turbines (<70 dB) | • Install turbines with rotor upwind of turbine base<br>• Utilize setbacks to minimize sound levels |
| EMF | Generators<br>Grid connection lines<br>Transformers<br>Underground cables | • No community exposure from turbine EMF<br>• No EMF generated at surface from underground cables | • N/A |
| Shadow flicker | Blade motion when sun is low in sky | • Flicker frequency is below range likely to induce epileptic seizures<br>• Annoyance is more likely if flicker occurs while people are at home | • Use of non-reflective and/or dark coloured blades<br>• Maintain flash frequency below 3 Hz (60 rpm for 3-blade turbine) |
| Ice throw/ Ice shed | Glaze or rime ice falling from stationary turbine or thrown from moving blades | • Physical danger to people or passing vehicles<br>• Ice tends to fall straight down; usually falls well within setbacks | • Utilize setbacks to minimize risk of injury from ice fall<br>• Utilize operational controls to cease turbine operation during icing conditions |
| Structural failure | Blade or tower cracking or falling | • Physical danger to people or passing vehicles<br>• Cases of failure rare and normally contained within 500 m of base | • Utilize setbacks to minimize risk of injury in the event of structural failure |

Source: http://www.ncceh.ca/files/Wind_Turbines_January_2010.pdf

In most cases, the NCCEH recommends setbacks to reduce possible hazards. They also discredit infrasound and EMF hazards since the emissions from wind turbines are lower than dangerous exposure levels. Moreover, the NCCEH points out that there are gaps in the scientific knowledge on the health effects of wind turbines; these include: data on the health effects from long-term exposure to low levels of low frequency sound; impact of wind turbine sound on sleep physiology; risk of ice throw in regions where glaze ice is common; research to measure the efficiency of current setbacks to prevent injury and epidemiological data to assess health status before and after wind farm development. These gaps in the literature are confirmed by the *Institut national de santé publique du Québec*. The main conclusion of this report is that the most important health hazard involved with wind farms is annoyance and most of the negative effects can be reduced by using proper siting distances and by involving the local population in the design phase[76].

The Chatham-Kent Municipal Council in Ontario commissioned a similar study and it determined that as long as the Ministry of Environment Guidelines concerning siting of wind farms where followed the adverse health impacts for the local population would be negligible[77]. Similar reports that have verified available literature reach similar conclusions. For example, Dr. Isra Levy, Medical Officer of Health from the Ottawa Public Health, states that the review of the literature regarding wind turbine related health issues did not find evidence of health effects that would warrant public health interventions at this point in time[78].

**b. Lights, Noise, Shadow**

The noise generated by wind turbines has always been one of the main issues described by the local population as an irritating factor of wind farms. Trying to reduce these concerns, CANWEA commissioned two studies to *Howe Gastmeier Chapnik Engineering* (HGC), one on sound and the second on infrasound. The study on infrasound concluded that: “Studies completed near Canadian wind farms, as well as international experience, suggest that the levels of infrasound near modern wind turbines, with rated powers common in large scale wind farms are in general not perceptible to humans, either through auditory or non-auditory mechanisms. Additionally, there is no evidence of adverse health effects due to infrasound from wind turbines”[79]. Similarly, the sound study concluded that: “Modern wind turbine manufacturers have virtually eliminated the noise impact caused by mechanical sources, and instituted measures to reduce the aerodynamic effects”[80]. These results are corroborated by a study published by the government of Canada[81]. The study also says that there have been cases where sound issues have arisen with the local population but that these can be resolved by establishing best practices. The best practices recommended by the study are:

1. Identifying all ‘potentially critical receptors of noise’[82] (such as residences, institutions, sacred sites, etc) during the planning phases.
2. Creating good public relations early in the planning by educating the public about the sound generated by the turbines.
3. Maintaining community involvement throughout the project.
4. Dispel inaccurate concerns and rumours concerning wind farms in a straightforward and honest manner.
5. Analyse each situation separately (the consultants do not recommend general minimum distance guidelines).
6. A technical assessment should be done if there are potentially sensitive receptors less then a kilometre away.
7. Ambient sound levels should be monitored in order to provide a benchmark for sound measurements.
8. Accurate sound power data for the turbines should be provided by the manufacturer.
9. Prediction of sound levels need to be made with accepted methodology and take into account the layout of the wind farm and topography of the region.
10. Specific numeric criteria for the sound pressure level need to be established by every jurisdiction (they recommend following the Ontario Ministry of the EnvironmentNPC-232 *Sound Level Limits for Stationary Sources in Class 3 Areas (Rural)* and PIBS 4709 *Interpretation of Applying MOE NPC Technical Publications to Wind Turbine Generators)*[83].

A further study, published in 2009, looked at the health effect of wind turbines[84]. This study, jointly commissioned by the American Wind Energy Association (AWEA) and the Canadian Wind Energy Association (CANWEA), discovered that there is a large body of accumulated knowledge about sound and health. The study found no evidence that the audible or subaudible sounds emitted by wind turbines have any direct adverse physiological effects[85]. The multidisciplinary panel concluded that:

> "a. Sound from wind turbines does not pose a risk of hearing loss or any other adverse health effect in humans.
>
> b. Subaudible, low frequency sound and infrasound from wind turbines do not present a risk to human health.
>
> c. Some people may be annoyed at the presence of sound from wind turbines. Annoyance is not a pathological entity.
>
> d. A major cause of concern about wind turbine sound is its fluctuating nature. Some may find this sound annoying, a reaction that depends primarily on personal characteristics as opposed to the intensity of the sound level"[86].

This latest report was not able to assuage the concerns raised by groups opposing the rapid expansion of wind energy in Canada. For example, the Society for Wind Vigilance and Wind Concerns Ontario heavily criticized the report claiming that it was neither authoritative nor conclusive[87]. One of the main issues is the objectivity of the study as it was funded by AWEA and CANWEA and it: "displays selective bias favouring"[88] their positions. They also criticize the fact that the AWEA/CANWEA report states that wind turbines can cause "annoyance, stress and sleep disturbance" but it does not consider the consequences of these issues. The Society for Wind Vigilance points out that the World Health Organization states that sleep disturbance can have serious health consequences[89].

In the past two years, scientists in the Acoustics Division of Health Canada's Consumer and Clinical Radiation Protection Bureau have analyzed the scientific literature[90], developing proposals for a mitigation criterion for wind turbine noise. This work helps Health Canada advise on the human health effects of wind turbine noise, primarily under the *Canadian Environmental Assessment Act*.

### c. Dynamic of regional identity, place attachment

After health issues, one of the arguments most often used against wind turbines is that they have a large visual impact[91], in other words, they are considered "ugly"[92]. Aesthetics are obviously not a health concern, but they can influence the noise perception of wind farms[93]. The aesthetic effect of wind turbines on local landscape will be affected by a variety of elements, including regional identity, perceived aesthetic and environmental value. Some of the measures proposed by a research group from the *Université du Québec à Rimouski* to reduce the negative aesthetic impact are:

1. Establish laws and regulations regarding advertising and posting on wind turbines and adjacent buildings;
2. Create a program to maintain these structures;
3. Preliminary studies on the aesthetics of the region, including identifying local places of interest to be maintained;
4. Involving the local population to identify the local places of interest;
5. Creating simulations to create the best implementation strategy[94].

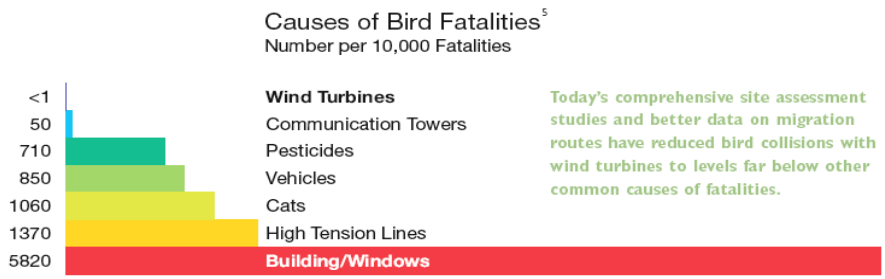
There are many examples of areas and towns that have adopted some of these strategies. Truro in Nova Scotia and the district of Taber in Alberta, are two examples where open meetings are held for questions concerning visual impact. In the case of Taber developers may even need to provide: "an analysis of the visual impact of the project especially with respect to the scenic qualities of the landscape. The analysis would include the cumulative impact of other systems in the area and the impact of overhead transmission lines"[95]. In another example, the village of Belledune requires that all small turbines must be painted a non-reflective, non-obtrusive color, and cannot be used for displaying any advertising except for reasonable identification of the manufacturer of the installation. A Best Practices report done in New Brunswick concluded that these mechanisms allowed for "a consensus (…) be reached through a fair, participatory process for accessing public concerns and working to minimize them"[96]

Another important issue often raised is the impact of wind farms on real estate value. According to a study done by the division of Science and Technology of the Canadian Library of Parliament[97], there is proof that noise pollution and visual impact combined can have a negative impact on land value near wind farms: "Estimates from Australia, the United Kingdom and the Netherlands all suggest that property value may be decreased by 30% by the visible presence of wind turbines"[98]. A similar study conduct in the United States demonstrated that wind farms can have on average a negative effect on property values of 20,7%[99]. A local real estate agent in Ontario conducted his own research, obtaining similar results. He compared market value of properties inside windmill zones and outside windmill zones over a period of 3 years. He discovered that properties inside the windmill zones were on the market twice as long as the ones outside the zone before selling, they sold on average for 48 000$ less and 11% were never sold, as opposed to only 3%[100]. This was the only study found on real estate values in Canada.

### d. Valuation of ecosystems

The construction of wind farms has an impact on the local ecosystems, thus affecting local fauna and flora. This has been an important issue for many local residents but also for conservationists. A report commissioned by the New Brunswick government concluded as follows: "Environmental effects to surrounding ecosystems can be mitigated or minimized through proper planning and consideration of equipment use. Remediation of the surrounding environment should be a part of the post construction work"[101].

Another important issue is the effects on birds and bats. Indeed in 2005, a literature review done by the government of Canada concluded that "there is not doubt that wind turbines kill and injure birds"[102]. The direct causes of deaths are caused by contact with moving rotors and electrocution. Indirect causes are loss or changes of habitat[103]. Environment Canada's Canadian Wildlife Service contracted with Bird Studies Canada in 1984 to produce "Wind Turbines and Birds: A Review", which provided a perspective on the potential risk of wind turbines to birds and bird habitat in the context of the much larger major risks. The major causes for bird fatalities can be seen in the following graphic.




Source: http://www.canwea.ca/images/uploads/File/NRCan_-_Fact_Sheets/6_wildlife.pdf

A study conducted in Alberta determined that barotrauma (damage to body tissue associated with sudden drops in atmospheric pressure) is the main cause of bat deaths near wind turbines[104]. Mitigation strategies to reduce these fatalities are being explored.

Environmental assessments will help to understand the consequences of wind farm installation in specific situations. In Canada, these assessments have to be done in order to obtain federal funds, if the construction is planned on federal land or if certain other permits, licenses or federal approvals are required[105]. The *Université du Québec à Rimouski* produced a document called *Énergie éolienne et acceptabilité sociale: Guide à l'intention des élus municipaux du Québec*[106] that is meant to help municipal governments understand some of the consequences of wind power and offers a series of actions to mitigate the environmental effects of wind turbine installation. These can be summed up in five general criteria:

1. Develop a better understanding of the local ecosystem;
2. Limit the maximum work area;
3. Involve the local population in the consultation;
4. Create an agreement with the developer so they recreate the original environment;
5. Have follow-up studies to assess changes in the environment[107].

## 5. Distributional justice

### a. Distributional justice

Distributional justice, although an important issue, is not always a concern for groups that question the construction of wind farms in their communities. For example, of all the important issues raised by Wind Concerns Ontario, distributional justice is not mentioned[108]. This being said, distributional justice can help mitigate some of the other negative perceptions of wind farms. A preliminary study commissioned by the government of Nova Scotia stated that "Social science research has found the concepts of procedural justice or a fair process and distributive justice are of use when considering social opposition to projects. Opposition increases when people feel that projects are a *fait accompli,* or that they have been left out of decision-making. Concerns over distributive justice occur if people feel that a small group receives the benefits of the project in the form of revenue, while everyone else loses"[109]. It concludes that there are two solutions to establish distributional justice: increasing local ownership and early engagement of the local population in the decision making process. They point out that local ownership is a complement and not a substitute to fair processes, which must include:

1) Appropriate participation

2) Ability of voice to be heard

3) Adequate information

4) Being treated with respect

5) Unbiased decision-making

6) "Decisions that are responsive to information and that are correctable in the face of new information"[110]

A study done in Québec concludes with similar recommendations[111].

### b. Ownership models

The Ontario Sustainable Energy Association (OSEA) defines community energy projects as: "a class of sustainable energy projects that are owned, developed and controlled in full or in part (50 percent or more) by residents of the community in which the project is located"[112]. A study conducted in New Brunswick demonstrated that a majority of the local population surveyed preferred to have 100% local ownership[113] of wind projects. This being said, privately owned wind farms produce the great majority of wind energy in Canada. Private companies have benefited the most from government financing for the development of wind energy. This being said, there is a growing tendency for local communities to create energy plans[114]. According to a recent study, these community energy plans seek to incorporate citizens' ideas and opinions and transform citizens on active stakeholders in the areas of energy production, delivery and consumption[115]. Most of these energy plans adopt policies to increase energy efficiency and conservation. According to St. Denis and Parker, reasons why renewable energy projects are not integrated in these energy plans, include "the need for more information regarding renewable options, a lack of local capacity or funding, or the relatively low price of conventional electricity and fuel in Canada"[116]. Still, community projects are being developed. For example, in Ontario the Community Power Fund, a fund that supports the development of: "Ontario-based community organizations pursuing local renewable energy projects"[117], seeks to develop 75 MW of community power by the end of 2010[118]. Some examples of community energy projects in development can be found in the following table:

| Organization | Project | Type | Location | Size |
|---|---|---|---|---|
| WindShare | Ex Place Turbine | Wind | Toronto | 1 MW |
| TREC | LakeWind | Wind | Rural Ontario | 20 MW |
| Windfall Ecology Centre | Pukwis Community Wind Park | Wind | Georgina Island | 20 MW |

Source:
http://www.greenenergyact.ca/Page.asp?PageID=122&ContentID=887&SiteNodeID=201&BL_ExpandID=43

1. OSEA has identified ten advantages of community **More Renewable Energy:** The success of wind energy in Denmark and

   Germany is largely due to community ownership.
2. **Stimulates Economic Development:** Creates new skilled jobs and long-term investment throughout Ontario.
3. **Strengthens Rural Communities:** Generates new income for farmers and rural landowners.
4. **Increases Local Acceptance:** Democratic ownership, community involvement and member education encourages acceptance.
5. **Conserves Energy:** Increased member education and awareness leads to reduced consumption.
6. **Saves Money:** Generating energy closer to where it is used reduces transmission and distribution costs.
7. **Protects the Environment:** Reduces air pollution and the emission of gasses that contribute to climate change.
8. **Improves Health:** Reduces smog-related illnesses and premature deaths.
9. **Ethical Investment:** Offers a socially responsible investment for the every-day Ontarian.
10. **Improves Grid Reliability:** Smaller scale, localized generation helps avoid massive 'Blackouts'[119] power:

Indeed all Canadian proponents of community wind energy use Denmark and Germany as examples to follow.

Community wind energy still represents a small portion of wind energy. New initiatives, policies and funding options could encourage the creation of more community energy projects. The Ontario *Green Energy Act*, which offers a Feed-in-Tariff, has provisions for the creation of community wind projects: "The FIT Program contains two provisions designed to encourage the development of Aboriginal and community-based projects: reduced security payments and an additional price incentive called a price adder"[120]. In Quebec, Hydro-Québec has offered a tender in 2009 for 250 MW of community wind power[121]. This call for tender has already received at least 11 proposed projects.

There are currently many more investment options specifically developed for community based power projects, but they are mostly accessible only in Ontario[122]. The first community-owned wind project was built in 2002 in Toronto[123], Ontario, following a contribution agreement from the Government of Canada to develop the community power concept. It also happened to be the first urban-sited turbine to be constructed in North-America.

Prince Edward Island created an energy savings bond program: "The bond program was created to give Islanders an opportunity to be partners in wind energy development, to invest in a green energy future"[124].

## 6. Procedural Design

### a. Procedural design

CANWEA has established an 11 steps plan to building a wind farm. These steps are:

1. Wind Assessment
2. Wind farm design
3. Environmental study
4. Land acquisition
5. Permitting and public consultation
6. Economic and financial analysis
7. Manufacturing
8. Site preparation
9. Construction
10. Commissioning
11. Operate and maintain[125].

It is difficult to know if they are being used by developers, and if they have an impact on social acceptance.

The *Université du Québec à Rimouski* (UQOR) offers guidelines for municipal governments[126] to help with the acceptance of wind farms in local communities. There are three steps to this strategy:

1. Preliminary information: this involves a phase of education for public officials, so they can answer questions that the population may have. This must be done through consultation with independent experts in the field, and it should be done early in the planning phase. It is also recommended to have a specific person dealing with the wind power issue. In this phase, the best way of communication with the population must be determined by the public officials (the document does not offer any specific insight as to how this must be achieved).
2. Consultation with the local population: the objective is to identify the preoccupations and expectations of the local population as well as trying to determine possible compromises. Debates, public assemblies and forums are regarded as best practices for this stage. Once again, this stage must occur early on and has to have a great deal of transparency.
3. Alternative actions: identify alternatives to the proposed project, which might include local financing possibilities and, which has to achieve a large consensus for the location[127].

## 7. Implementation Strategies

Specific studies on implementation strategies in Canada have not been found other than the ones discussed in the procedural design section. Anecdotal discussions over possible implementation strategies were found, but no conclusive or comprehensive study demonstrated best practices for implementation strategies.

### a. Visual impacts, photomontage, Communication campaigns

Most documents reviewed discussed the importance of involving the local population with identifying the aesthetic features of the area and that the developer present visual aids so the population can see the effects of the wind turbines in their area. No Canadian research was found on how these visual aids impacted social acceptances or if various formats of visual aids had different results.

### b. Communication strategies, Social marketing

Wind developers did not share their communication strategies with the researchers. The most common response was that these strategies depend on the specifics of the area considered.

### c. Checklists, guidelines: conclusions from existing examples

CANWEA offers a set of case studies of various wind farms in Canada. These case studies offer very little insight as to how social acceptance was achieved, or, in some cases, if it truly was.

# Summary and Conclusions

## 8. Conclusions

### a. What we know already

This State-of-the-Art report has summarized the current research and scientific knowledge available on social acceptance in Canada. A general overview of the position of most stakeholders, but not all, was achieved. Studies were found on variables influencing social acceptance in Canada but a few of these rely on research done in other countries. Although there is information about wind energy in Canada, there are information gaps on social acceptance of wind power in Canada.

### b. What needs to be done yet

Areas where further research is required have been identified. Recent country-wide and provincial opinion polls should be done in order to discover if any differences exist between provinces. On a more local level, studies need to be conducted on the implementation strategies used by current wind power facilities. Further research needs to be done on the opinion of some Canadian stakeholders such as utilities/grid operators, financial institutions, educators and local administrations.

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