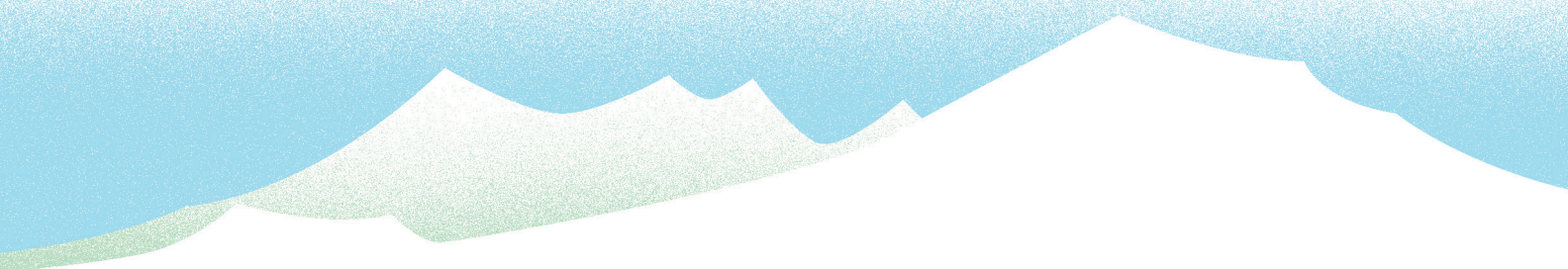

Green Provinces of Canada

Ontario and British Columbia lead the peloton
in the race to become Canada's greenest province*

By Erin Marchington

Illustrations by Clayton Junior





Here is a look at who's leading the way in each category:

Air and Climate: With a score of 87 per cent, the territory of Yukon secured top spot in this category by ranking first in four of nine indicators. Most notably, Yukon has reduced its greenhouse-gas emissions by 41.3 per cent between 1990 and 2009, greatly exceeding the Kyoto target of 6 per cent below 1990 levels by 2012. Per dollar of GDP it also has the lowest levels of fine particulate, mercury and chromium emissions.

Ontario, which scored 83 per cent, stood out as the top province by having the highest GDP per kilotonne of nitrogen oxide (NOx) and volatile organic compounds (VOC) emitted, and among the highest GDP per megatonne of GHG emissions. Ontario, like the Yukon, is the only other jurisdiction to achieve Kyoto compliance.

Water: Northwest Territories (N.W.T.) ranked first with a score of 80 per cent, taking top spot in half of the category indicators. Perhaps unsurprising for a sparsely populated jurisdiction, all monitored stations in N.W.T. were observed to have normal or high water quantity. Most impressive was N.W.T.'s water productivity. It had the highest GDP per litre of water use, with Alberta following closely behind.

The two provinces, however, with the highest overall score in this category were Saskatchewan and Manitoba, each scoring 78 per cent. They showed low counts of toxins released into water supplies and high rates per capita of secondary wastewater treatment.

Nature: The Yukon (82 per cent) and Alberta (81 per cent) scored significantly higher than others, each ranking first in two indicators. The Yukon ranked tops when it came to preserving the ecological integrity of its national parks. It also shared top spot with Alberta (and P.E.I.) by achieving greater than one visit per capita at its national parks in the 2010/2011 season.

Alberta – along with Quebec and Ontario – also had the highest percentage of forestland protected under the FSC-certified management indicator, with 5,656,930 hectares FSC-certified in 2010. B.C. has the most overall protected areas, followed closely by Alberta.

Transportation: Nunavut scored 95 per cent here, putting it far above all other provinces and territories. Kilometres driven per capita for both light duty (940.3 km) and heavy duty (62.7 km) vehicles were well below the national average of 9,069 km and 639.8 km, respectively. This may be partially explained by the lack of road and highway infrastructure in the territory. Only British Columbia came close to Nunavut's transportation performance – at least with respect to heavy vehicles, which in the province travelled an average of 132.9 km per capita.

Manitoba and Newfoundland had the highest fuel efficiency for heavy duty vehicles, while Quebec and Nova Scotia had the most fuel-efficient light duty vehicle fleets.

It's mid-summer and the air is thick. Thirteen riders form a peloton in the 10th stage of Le Tour De France, grinding their way through the French Alps. All are in pursuit of the coveted yellow jersey, cycling's most prestigious prize. But in the mountains with 10 more stages in the tour to go, it's still anybody's race. The riders are close together, drafting, and there are no breakaways yet.

Canada's provinces and territories have clearly formed a peloton in the 2012 Corporate Knights Green Provincial Report Card, with Ontario and British Columbia leading the pack and Alberta and Saskatchewan struggling to keep up. But no one has yet broken away in the race to become Canada's greenest province or territory.

We evaluated their environmental performance using a series of 35 indicators grouped into seven categories: air and climate, water, nature, transportation, waste, energy and buildings, and innovation. Building on previous CK green province reports, this year's ranking methodology used the most current available data (ranging from 2008 to 2011). Much of it came through federal sources that allowed for direct comparisons between Canada's 13 jurisdictions. One major source was Environment Canada's new Canadian Environmental Sustainability Indicators (CESI) database, which was just made publicly accessible last year.

Our aim is to give readers a snapshot of the environmental health and resource productivity of our provinces and territories, and in doing so give a sense of how serious each jurisdiction is in dealing with such challenges. As you read, it is important to note that these indicators are influenced not just by past provincial policy decisions, but also by municipal and federal policies. They also don't reflect the impacts of relatively new policies and programs, which will no doubt affect the conclusions of future reports.

Waste: With a score of 71 per cent Nova Scotia came out clearly on top, showing the highest efficiency in the area of waste disposal. The province earned \$80,000 in GDP for every tonne of disposed waste, making it twice as efficient as lowest-ranking provinces Manitoba and Quebec. No data was available for the territories.

Nova Scotia also scored relatively well for its waste diversion efforts. The province diverted 308 kg of material per capita annually, exceeding the national average of 251 kg/capita diversion and well within striking distance of leaders B.C. and New Brunswick.

Energy and Buildings: Many provinces and territories are struggling in this category and there is no clear front-runner. Overall winner B.C. scored a lacklustre 60 per cent. It didn't get highest score in any single indicator but was relatively strong across most of them. It received 89 per cent of its electricity generation from a combination of hydroelectric, wind, solar and other renewables, and had a total of 9,820 grant applications for the ecoENERGY home retrofit program last year, working out to about 22 applications per 10,000 people – higher than the national average.

Innovation: On the other hand, B.C. was the clear leader in the category of innovation with an overall score of 93 per cent. It achieved a very high grade for both the amount of venture capital its green technology businesses are attracting and the number of cleantech companies per capita that call the province home. Between 2002 and 2011 venture capitalists have invested over \$138 per capita in B.C.'s green startups; only Ontario comes close to this with an average investment of \$80.50 per capita. With 160 cleantech companies in total at the end of 2011, B.C. also has one of the highest numbers of companies per capita.

Where do we go from here?

In at least one of the seven categories in our 2012 Green Provinces Report Card we see the Yukon, Northwest Territories, Alberta, Nunavut, Nova Scotia and B.C. leading the way. Ontario didn't lead any single category, so how did it come out on top overall?

No one province or territory excels in every category, similar to cyclists in le Tour. Some achieve highest or second highest scores in one category, but lowest scores in other categories. Ontario and B.C. both topped our 2012 ranking because they achieved highest or second highest scores in multiple categories, and have no extremely low scores. Even so, out of an ideal overall grade of 100 per cent Ontario achieved only 61 per cent and B.C. achieved a grade of 60 per cent, which relative to other provinces gave them an A- letter grade.

There's room to do so much better. CK has calculated that if all provinces and territories got the highest score in each of the seven categories measured in our 2012 report, the Canadian average would be 86 per cent, making our nation more than just an excellent student. Indeed, it would put us in the category of green economy genius.

It's clearly doable. For each indicator of each category, it has already been done by at least one province or territory. To pursue such best practices on a national scale, however, will require much greater cooperation, collaboration, and information sharing than experienced so far.

Behind that is the belief that each and every province and territory can achieve continued economic prosperity without needless sacrifice to the environment, and the natural capital necessary to sustain our long-term well-being. 🌱

Methodology

Research Team:

Erin Marchington: Lead researcher

Katie Howard: Researcher

Green Provinces Advisory Committee:

Faisal Moola, program director of terrestrial conservation and science at the David Suzuki Foundation

Sachi Gibson, technical and policy analyst at the Pembina Institute

Jose Etcheverry, assistant professor, Faculty of Environmental Studies, York University

Sources of Data:

Environment Canada, Natural Resources Canada, Forest Stewardship Council, Parks Canada, Transport Canada, Statistics Canada, Cleantech Group, Analytica Advisors

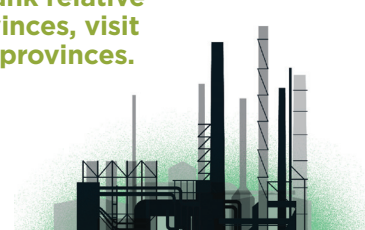
Methodology:

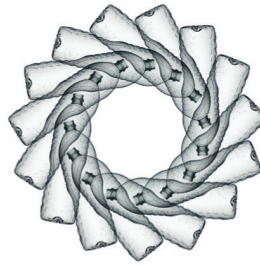
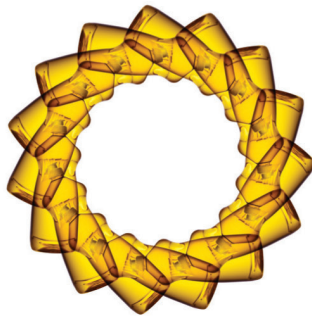
For methodology, details on each indicator and analysis limitations, go to corporateknights.com/greenprovinces

*How the layout was approached

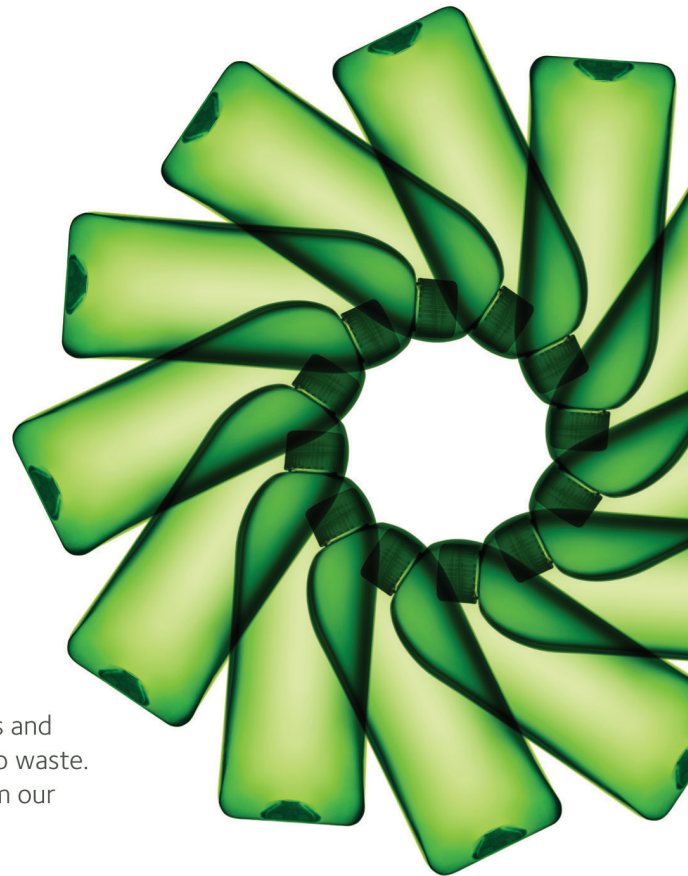
The next six pages in this package show the overall ranking, grade and individual category ranking for Canada's 10 provinces, starting with British Columbia and moving east to Newfoundland and Labrador. Our Green Provincial Report Card ranks the country's 13 provinces and territories together, but the low population densities of the territories make it difficult – and not particularly helpful – to directly compare with provinces in some categories. For this reason we have excluded the territories from the layout of the summary report that follows. Please note that the rankings that follow will, as a result, be out of 10, not 13.

For a detailed look at how the territories performed and where they rank relative to each other and other provinces, visit corporateknights.com/greenprovinces.





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British Columbia

Strengths

A green-energy powerhouse that gets 89 per cent of its electricity from renewables and is a hotbed for clean technology innovation. In the area of transportation, B.C. is the province with the lowest vehicle-kilometres travelled per capita, for both heavy duty and light duty vehicles. B.C. is also one of the least wasteful provinces, with a relatively high GDP per tonne of waste disposed and one of the highest waste diversion rates in the country.

Weaknesses

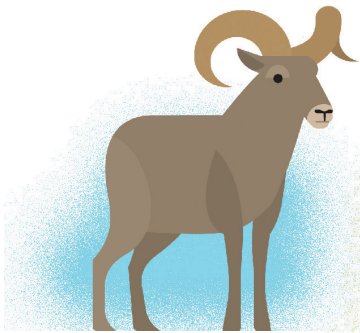
Gets low grade for water and could do much more to lower GHGs and other pollutants. B.C. had the lowest number of water stations with “normal” or “high” water quantity, a poor water quality score, and less than 60 per cent of its population is served with secondary wastewater treatment. GDP per kilotonne of GHG and non-GHG emissions are mostly above the national average, but not reflective of a province blessed with vast green-energy resources.



Ranked 2nd

A-

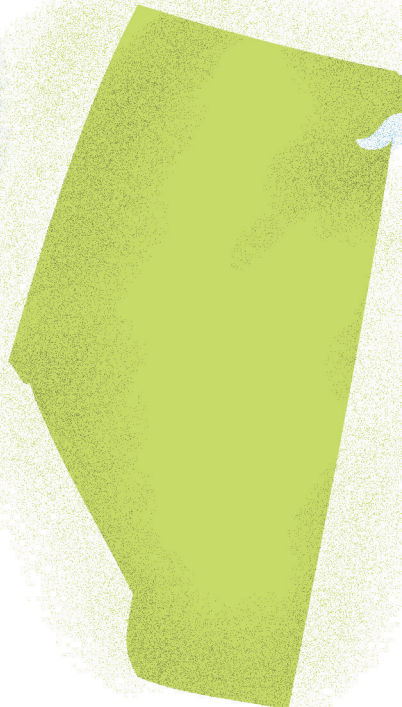
- 4th Air + Climate
- 9th Water
- 4th Nature
- 1st Transportation
- 2nd Waste
- 1st Energy + Building
- 1st Innovation



Ranked 9th

C

- 10th Air + Climate
- 5th Water
- 1st Nature
- 10th Transportation
- 7th Waste
- 10th Energy + Building
- 5th Innovation



Alberta

Strengths

Rates high in the nature category with 12.4 per cent of land given protected status to conserve habitat of ecological importance. Also tops in percentage of forest land certified under Forest Stewardship Council and has relatively high visits per capita to national parks. In water category, is province with highest GDP per litre of water used. It hosts an above-average number of clean technology companies, while nearly 10 per cent of new housing starts are “green homes,” ahead of most provinces.

Weaknesses

Low energy productivity, highest residential energy use per capita, and province with least amount of renewables in electricity mix at 5.72 per cent. Province with the highest number of kilometres travelled per capita, for both heavy duty and light duty vehicles. Second-highest GHGs per capita and second-lowest carbon productivity, reflecting oil sands growth and heavy dependence on fossil fuels for electricity generation. This is also reflected by high emissions of non-GHG pollutants, including NOx, VOCs and chromium.

Saskatchewan

Strengths

Performs well in water category. Has relatively low releases of mercury, lead and cadmium into water systems, and has secondary wastewater treatment for more than 90 per cent of population. Virtually all monitored water stations report normal or high quantities with fairly average quality ratings. Citizens keen on home efficiency. Province had highest number of applications per capita for the 2011/12 ecoENERGY home retrofit program.

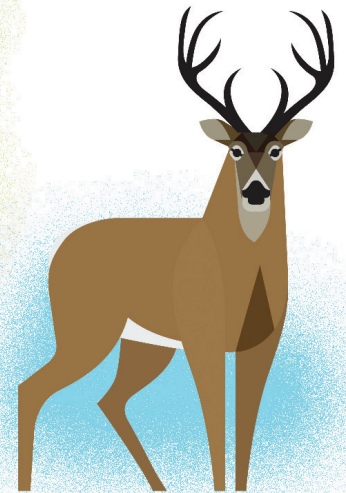
Weaknesses

Saskatchewan has one of the lowest GDPs per tonne of waste disposed and one of the lowest waste diversion rates in country. It has lowest energy productivity, the second-highest residential energy use per capita, and an electricity system heavily dependent on coal. Province with the second-highest number of kilometres travelled per capita for light duty vehicles and third-highest for heavy duty vehicles. Has highest GHGs per capita, lowest carbon productivity score, and saw highest growth of GHG emissions in the country between 1990 and 2009.

Ranked 10th

C

- 9th Air + Climate
- 2nd Water
- 6th Nature
- 9th Transportation
- 8th Waste
- 9th Energy + Building
- 7th Innovation



Ranked 8th

C+

- 6th Air + Climate
- 1st Water
- 10th Nature
- 8th Transportation
- 9th Waste
- 2nd Energy + Building
- 9th Innovation



Manitoba

Strengths

Like Saskatchewan, Manitoba is a high performer in the water category, but also does well in energy. It has relatively high GDP per litre of water used and 98 per cent of population has secondary wastewater treatment. As well, all water monitoring stations show normal or high levels and there is below-average release of toxins. Manitoba's electricity mix is virtually 100 per cent renewable.

Weaknesses

Its economy is wasteful. It only produces \$40,000 in GDP for every tonne of waste disposed – putting it tied for last place with Quebec – and it has the lowest waste diversion per capita in Canada. In transportation, its heavy-duty vehicle fleet averages second-highest kilometres travelled per capita (provinces only) and has the lowest fuel efficiency in the country. Its national parks, meanwhile, score lowest on ecological integrity.

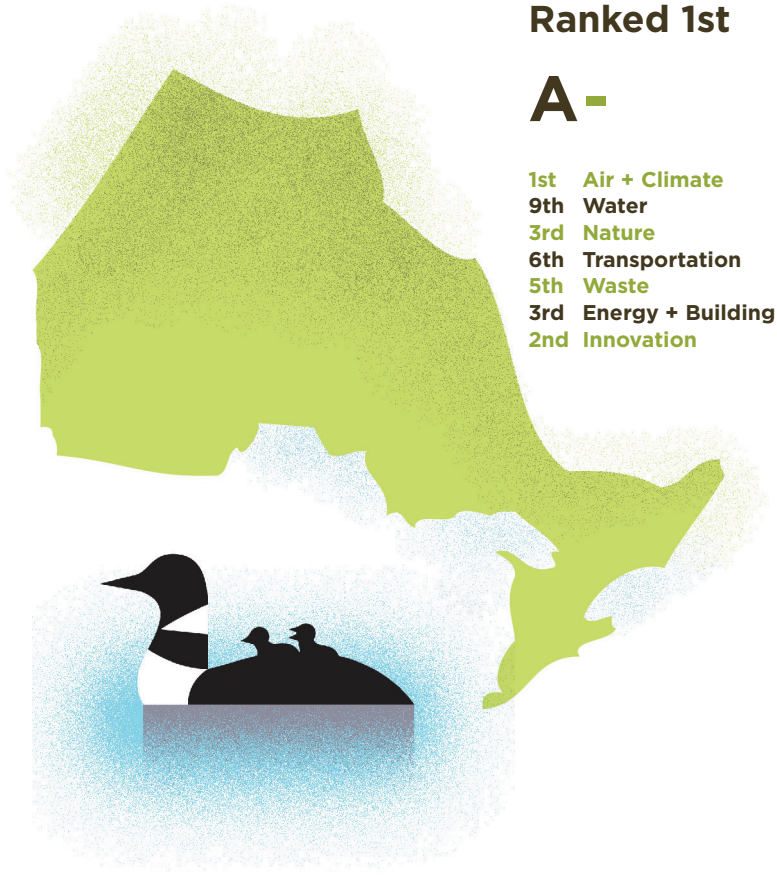
Ontario

Strengths

Still on a path to phase out coal power and phase in more renewables, Ontario already scores high in air and climate. It generates the most GDP per kilotonne of NO_x, VOCs, and particulates, and for every megatonne of CO₂-equivalent GHGs. It has reduced GHGs by 6.5 per cent since 1990, making it the only province to reach Kyoto emission-reduction targets. It gets high marks for building green homes and embracing energy retrofits for old ones, and is a clean technology leader.

Weaknesses

Waste diversion per capita is below the national average. Among provinces, it has the lowest visits per capita to national parks. Its residential sector's energy use per capita is slightly below the national average. In the area of water, it scores near the bottom because of high levels of mercury, lead and cadmium releases relative to the other provinces.



Ranked 1st

A-

- 1st Air + Climate
- 9th Water
- 3rd Nature
- 6th Transportation
- 5th Waste
- 3rd Energy + Building
- 2nd Innovation

Quebec

Strengths

The province scores well in the air and climate category, having reduced its GHG emissions by 1.9 per cent since 1990. Also leads the country with the lowest GHG levels per capita. An emphasis on boreal forest protection has led to over 50 per cent of its forests being FSC certified. Hydro-electric power continues to power the province, with 97 per cent of energy generation coming from renewable sources. Light vehicles are fuel efficient, burning 9.9 litres per 100 km.

Weaknesses

Quebec receives lowest water score by maintaining poor water quality, releasing large amounts of mercury, lead and cadmium into streams and rivers, and consuming 706 litres of water a day per capita. National park visitation is sporadic, with under 1.5 million visits last year. The waste score is reduced due to the province being tied with Manitoba in generating the highest levels of waste compared to GDP output. Chromium emissions are elevated in the air and climate category.



Ranked 4th

B

- 3rd Air + Climate
- 10th Water
- 2nd Nature
- 3rd Transportation
- 4th Waste
- 4th Energy + Building
- 6th Innovation

New Brunswick

Ranked 7th

C+

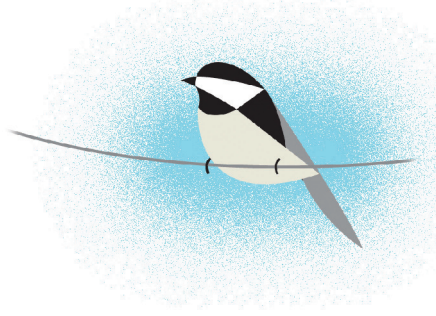
- 7th Air + Climate
- 6th Water
- 9th Nature
- 2nd Transportation
- 3rd Waste
- 6th Energy + Building
- 8th Innovation

Strengths

Earns high grade in transportation, with lowest levels of heavy duty vehicle usage after B.C. New Brunswick is competitive on waste, with highest rate of diverted material per capita annually. The province's water quality leads the nation, and it has the greatest percentage of cumulative species that are not in danger at 88 per cent. The population, along with that of Saskatchewan, took the greatest advantage of the federal ecoENERGY home retrofit program.

Weaknesses

Only 3.1 per cent of the province qualifies as a protected nature area, and there are no FSC certified forests. New Brunswick uses greatest amount of water per capita, and residential consumption is high. Inefficient levels of GHG per capita push air and climate scores down, along with elevated sulphur oxide and mercury emissions. Low energy productivity, along with inefficient residential energy use, places the province in front of only Alberta and Saskatchewan in energy category.



Ranked 5th

B-

- 8th Air + Climate
- 4th Water
- 5th Nature
- 7th Transportation
- 1st Waste
- 8th Energy + Building
- 4th Innovation



Nova Scotia

Strengths

Leads all provinces in waste management, mixing the most efficient levels of waste disposal per capita with a high diversion rate. National parks within provincial boundaries have the greatest ecological integrity, and cumulative species status score is high as well. Residential energy use per capita is tied for second in efficiency, and the province is home to greatest percentage of new green certified housing starts. It also maintains the third-largest number of cleantech companies per capita.

Weaknesses

Nova Scotia has third-lowest air and climate score, due to GHG emissions growing 10.5 per cent since 1990, low levels of GHG efficiency, and elevated sulphur oxide levels. Energy ranking was affected by small amount of electricity generation, 12 per cent, being derived from renewables. Municipal wastewater treatment levels are low in the province, with only 31 per cent of residents living in areas with secondary wastewater treatment facilities or better.



Ranked 3rd

B+

- 2nd Air + Climate
- 3rd Water
- 8th Nature
- 5th Transportation
- n/a Waste
- 5th Energy + Building
- 3rd Innovation

P.E.I.

Strengths

Rates third on air and climate, with low GHG emissions per capita. The province has reduced its GHG emissions by 3.4 per cent since 1990. By treating 100 per cent of municipal wastewater and releasing no lead, cadmium or mercury, it is ranked third on its water score as well. Prince Edward Island is tied with Manitoba in generating the most energy, 99 per cent, from renewable sources, though this is largely because other sources of energy are bought from neighbouring provinces.

Weaknesses

The province is ranked third from the bottom on nature, with smallest amount of protected area set aside, and the second-lowest cumulative species status score. Transportation category is affected by significant use of the least fuel-efficient heavy vehicles in the country. Water quality is poor, tied with Manitoba for the second-lowest rating after Quebec. Cleantech position is lowered because P.E.I. is one of only two provinces that has received no venture capital investments since 2002.

Newfoundland & Labrador

Strengths

Competitive in several nature categories, maintaining the strongest levels of ecological integrity in national parks, the second-highest score in species protection, and a high volume of Parks Canada visitation. In the transportation category, heavy vehicles in Newfoundland are second in fuel efficiency. They are driven rarely, at an average of 437 km per capita. The 97 per cent of electricity generation coming from renewables boosts its energy ranking.

Weaknesses

Newfoundland has the lowest innovation score due to the lack of venture capital investment over the past decade, as well as containing the smallest number of cleantech companies per capita of any province. Water quality and treatment is low, as only 7.9 per cent of the population has secondary wastewater treatment or better. The province's nature indicators suffer as a result of no FSC certified forests, and just 4.6 per cent of land being designated as a protected area.



Ranked 6th

C+

- 5th Air + Climate
- 7th Water
- 7th Nature
- 4th Transportation
- 6th Waste
- 7th Energy + Building
- 10th Innovation





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EDMONTON

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ALBERTA

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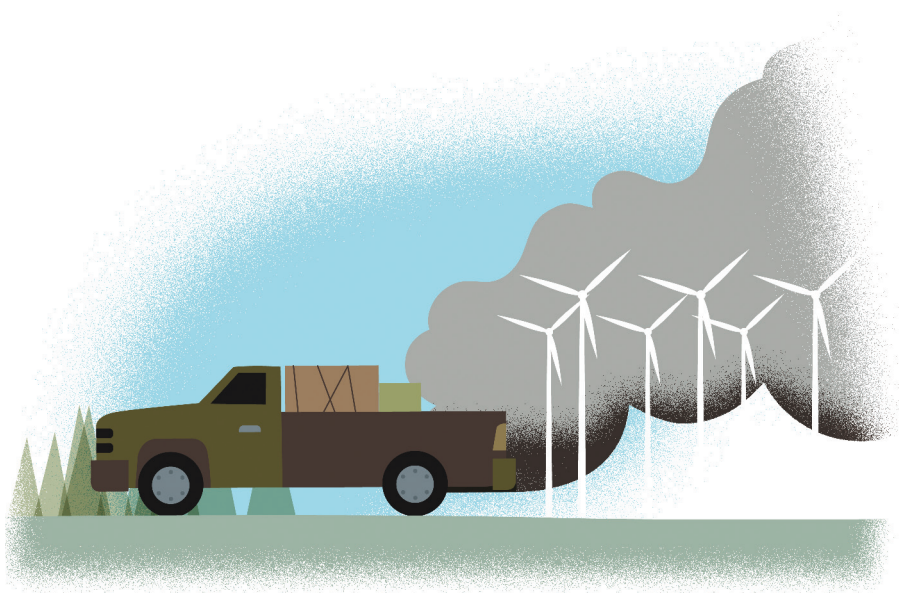
Visit www.airmilesforsocialchange.com for more information.

This illustration depicts incentives that have been offered and may continue to be offered.

Canada's Pickup Province

Bigger vehicles, longer drives mean low transportation grade for Alberta

By Tyler Hamilton



It's not difficult to look around Alberta and find innovative initiatives that are helping to green up the province. Calgary's light-rail transit system, the CTrain, is the first in Canada to get all of its electricity from wind power. The Town of Okotoks became the first community in North America to heat a neighbourhood with a solar district heating system. Edmonton, meanwhile, is poised to become the first municipality in Canada to produce ethanol at a commercial scale from its municipal solid waste.

But isolated initiatives such as these are lost within Alberta's larger environmental footprint. The oil sands are an obvious target, as well as the province's power system, which generates 75 per cent of its electricity from coal. Less discussed is the love affair Albertans – along with their neighbours in Saskatchewan – have with their vehicles.

Alberta ranks near the bottom in the transportation category of our Green Provincial Report Card. Consider the following data from Transport Canada and Natural Resources Canada:

- The number of vehicles in Alberta grew by 36 per cent between 2000 and 2009, by far the highest growth rate of any province.
- Alberta has the highest number of light-duty vehicles per household and per capita of any province.
- Alberta and Saskatchewan are the only two provinces that have more vans, SUVs and pickup trucks on the road than cars and station wagons. Specifically, Alberta has 1.46 million vans, SUVs and pickup trucks compared to 1.12 million cars and station wagons.
- The amount of energy used for transportation in Alberta grew by 38 per cent between 2000 and 2009, the second-highest growth rate in the country after Saskatchewan.
- Heavy-duty vehicles in Alberta drive more kilometres per capita than any other province – more than double compared to Ontario and triple compared to Quebec.

Looking ahead, don't expect electric vehicles to save the day. "In a more fossil fuel intensive grid, such as Alberta's, the benefits of battery electric and plug-in hybrid EVs is undermined by a reliance on coal for electricity production," according to the Pembina Institute, an energy and environmental think tank based in Calgary.

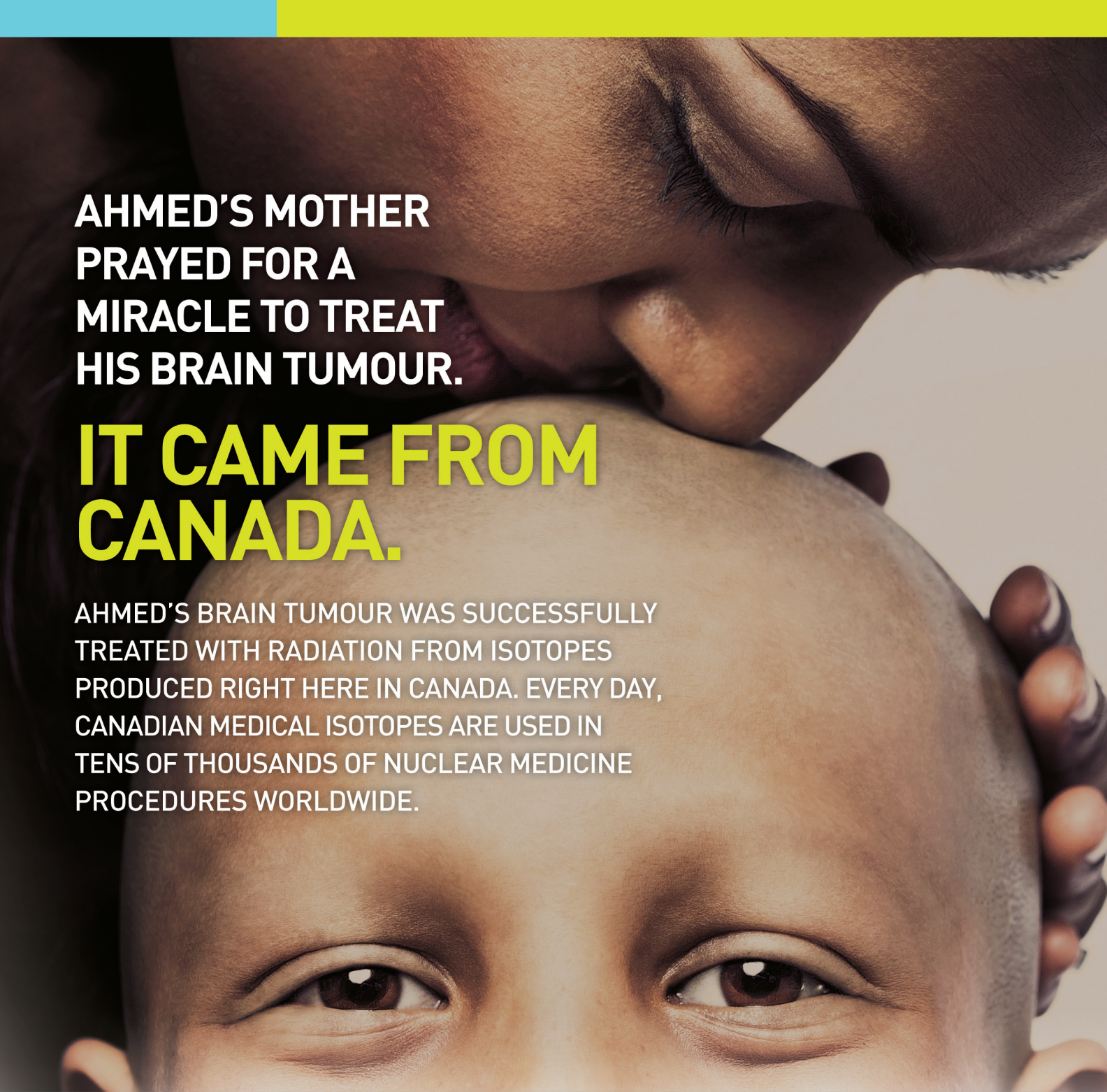
Alberta has the highest number of light-duty vehicles per household and per capita of any province.

It points out that driving a plug-in electric vehicle in Alberta would reduce carbon dioxide (or equivalent) emissions by only four grams per kilometre, or 1.1 per cent, compared to a conventional gasoline-powered vehicle. This could improve if the province, with its strong wind, geothermal and country-leading solar resources, moved to make renewable energy sources and natural gas a larger part of its power mix.

Nicholas Rivers, Canada Research Chair in Climate and Energy Policy at the University of Ottawa, said cheap natural gas and renewables – particularly wind – represent a potent combination for moving away from coal. "If 'fast' emissions reductions were really a priority then this would be one way to achieve it," he said. Electric vehicles would then make more sense.

Aggressively converting Alberta's fleet of about 218,000 medium- and heavy-duty diesel trucks to run on compressed (CNG) or liquefied natural gas (LNG) could also have a near-term impact. A study by the consultancy ICF Marbek estimates that switching to CNG or LNG from diesel would reduce greenhouse-gas emissions by 19 per cent and 23 per cent respectively.

Other alternatives? Use smaller, more fuel-efficient vehicles. Carpool and car share. Invest in and encourage transit use. It's a hard sell in wild rose country, where pickup trucks rule the roads and roughly a quarter of provincial gross domestic product comes from the oil and gas sector. But Albertans are also a tough bunch, bursting with innovation, and never ones to walk away from a challenge. 🚚



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Burn After Reading

Garbage incineration may not sound pretty, but it's gotten a lot cleaner, and may be our best bet for combatting a growing municipal waste problem.

By Jeremy Runnalls

From the top of Amagerforbrænding, the largest of three garbage incineration plants located in downtown Copenhagen, is an idyllic panorama of the waterfront. A newly constructed opera house, donated by shipping magnate Maersk Mc-Kinney Møller, casts a shadow over the water several kilometres away. A new island, built by the municipality and covered with imported sand to act as a beachfront during the summer, is within walking distance. The plant has been embraced by the general public, with nearby residents so accustomed to it that the city council is currently considering a proposal for retrofitting the facility to include a fully functioning ski hill on top.

In Denmark, the burning of waste has been an accepted practice for over 40 years. Jan Gehl, a well-known Danish urban design architect, believes that this originally stemmed from space constraints in a country 38 times more densely populated than Canada. "We've never had the luxuries that North Americans enjoy, where you can easily find an inexpensive location for large-scale garbage disposal out of sight and out of mind. In the 1970s, we simply ran out of

room, and this was our only option."

But the Danes quickly realized the combustion of waste had other benefits, such as the production of electricity and heat. Incineration now falls more broadly into the waste-to-energy category. Countries such as Denmark and Japan have located their incinerators in urban centres so that the steam can be used to power or heat nearby homes.

Even as incineration facilities have proliferated throughout Europe and Asia over the past several decades, North America has been reluctant to embrace them. No new incinerators have been built in Canada or the United States for the past 15 years, due to well-organized public opposition. According to the Canadian Energy-from-Waste Coalition, only eight facilities exist in Canada, processing 3 per cent of the country's municipal solid waste. Denmark, a country of just 5.5 million people, diverts 54 per cent of its waste to 29 incineration plants, many of them using the most advanced technologies on the market.

With Canada's municipal waste volumes rising steadily on a per capita basis since 1980, there has been a growing need to find alternative waste disposal

methods. Local opponents to new landfills, who express strong concern about soil and water contamination, have effectively convinced municipalities over the past decade to continue operating existing facilities that are rapidly filling up. To meet existing demand, Ontario alone maintains 32 large landfill sites, along with 958 smaller ones. Over 2,000 sites have been retired over the past century, according to the Ontario Ministry of the Environment.

As Canada struggles to meet its goal of reducing greenhouse-gas emissions 17 per cent below 2005 levels by 2020, leading sources of methane expulsion have faced greater scrutiny. Environment Canada reported that Canadian landfills in 2010 accounted for 20 per cent of national methane emissions. This is one area where utilities and private companies have been active in waste-to-energy, by setting up systems to capture and combust methane emitted from the breakdown of organic materials. The introduction of methane capture technology at 42 disposal sites in Canada has resulted in 25 per cent of methane emissions being transformed into energy. Methane capture systems have grown in popularity in Canada over the past decade compared to garbage incineration plants. They are less expensive to install, face muted community opposition and have received federal tax incentives and funding from pools of money, such as the Green Infrastructure Fund.

So is it better to burn or bury waste for clean electricity generation? The U.S. Environmental Protection Agency analyzed this question in a comprehensive life-cycle report published in conjunction with North Carolina State University in 2009. They determined that, if paired with a high diversion rate, the newest incineration technologies generate significantly more energy, while reducing the greenhouse-gas emissions and habitat loss that come from traditional landfills.

More than a decade since the last Canadian incinerators were built, municipalities are beginning to consider new waste-to-energy systems as part of their overall waste management strategy. Proposed facilities in Vancouver and Durham/York County, north of Toronto, each received city council approval last July. Since then, however, they have become ground zero for local opposition.



Artist's rendering of proposed ski hill in downtown Copenhagen that would be built atop current incinerator.

Denmark, a country of just 5.5 million people, diverts 54 per cent of its waste to 29 incineration plants



Waterfront view from roof of Amagerforbrænding.

Resistance falls into two camps. The incinerators that the Canadian public has previously been exposed to, like the Algonquin energy-from-waste facility in central Ontario, are decades old and outfitted with obsolete technology. Residents of Vancouver and Durham/York fear these plants will bring about similarly-reduced air quality. Former Canadian Idol contestant Shane Wiebe has even written a protest song about it, called “landfill in the sky.”

University of Victoria climate scientist Andrew Weaver, however, says the science doesn't support those fears. He states that most of the particulate matter, which used to be released by incinerators, is now captured by scrubbers and filters before being released into the air. Christian Nobel, a specialist in waste management at the Danish environmental consultancy Veksebo, points out that similar facilities easily pass Danish

emissions standards, which are some of the strictest in the world. “Compared to other sources of air pollution human activities create, concerned citizens should not be focused on dioxins.”

The other suspicion, shared by many opponents of incineration, is that modern waste-to-energy plants undercut municipal recycling and diversion programs by creating a constant need for waste. Former Toronto mayor David Miller, a vocal opponent who instituted a ban on incineration within Toronto and fought the proposed Durham/York waste-to-energy plant while in office, describes incineration as “expensive and polluting, but most of all damaging to recycling efforts.”

Nobel, however, disputes this claim. Danish municipalities have placed diversion at the top of their list, recycling 54 per cent of their waste, and burning 42 per cent. What can't be burned safely is diverted to one of only two landfills in the country, and chemicals, paint and electronics are processed at special facilities.

A strong recycling system, explains Matt McCulloch, director of corporate consulting at the Pembina Institute, is paramount to constructing successful incineration facilities within Canada. “Waste-to-energy is not an excuse to ignore or sideline community recycling systems. Carefully sorting through waste to recycle as much as possible, while diverting the rest to waste-to-energy facilities, is the optimal scenario



The author inspects mechanical claws used to manage the constant stream of waste entering into the facility.

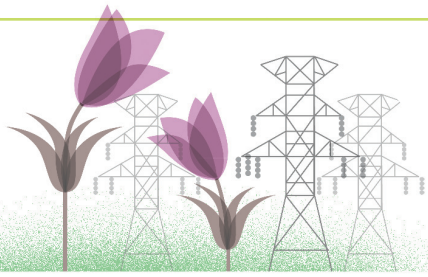
for Canadian municipalities.”

Several other projects have been developed or are in the works within Canada that produce energy in a different manner from combustion or methane capture. A plasma gasification facility in Ottawa, run by Plasco Energy Group, recently signed a new deal with the city to continue processing unprocessed and unsorted solid waste. A proposed waste-to-ethanol plant in Edmonton, run by Montreal-based Enerkem has received provincial funding and is currently under construction.

The private sector has grown more enthusiastic about Canadian waste-to-energy opportunities as well, led by industry leader Waste Management of Houston, Texas. While continuing to invest in methane capture throughout North America, the company set up a venture capital arm about five years ago to invest in startups focused on expanding recycling and managing waste. It has spent hundreds of millions since then, including the purchase of an 11 per cent stake in Enerkem in 2010. More recently, it invested \$8.5 million directly into Enerkem's waste-to-ethanol facility in Edmonton.

“We're really focused on finding those technologies and processes that can help us efficiently segregate materials that are in our waste streams,” says Joe Vaillancourt, managing director in the organic growth group at Waste Management. Once segregated, some materials can be recycled, some turned into green chemicals, some into energy. “We've got about 40 investments so far,” he says.

With enthusiasm for new landfills waning and utilities hungry for further energy generation, more cities are sure to follow Vancouver's and Ottawa's lead in considering incineration in the years ahead. But it promises to be a tough haul. 🗑️



The Nature Effect

How green space can improve a province's bottom line

By Faisal Moola

In the early 1990s the Clinton administration put a stop to logging in huge swaths of old growth forest in the U.S. to protect a small, non-descript brown bird that was facing extinction: the northern spotted owl. Many people predicted that forestry-dependent communities in Oregon and Washington State would be eviscerated by the decision to protect “owls over jobs.” That fear was exploited by George Bush Sr., who attacked Clinton’s Northwest Forest Plan with the claim that “We’ll be up to our necks in owls and every mill worker will be out of a job.”

Bush’s prediction that environmental protection would cause an economic apocalypse in the region proved to be unfounded. Rather, job losses in the forestry sector were more than offset by a boom in new types of employment. Economic growth was driven by the arrival and expansion of high-tech firms, like Sony and Hewlett-Packard, and federal programs that retrained former loggers and mill workers for diverse new employment opportunities, including in the high-tech manufacturing sector.

Every socioeconomic indicator showed that, far from facing economic ruin, former resource-dependent communities responded positively to increased nature conservation. Over the following decade, the region’s graduation rates increased, income levels rose, poverty fell, and the unemployment rate remained unchanged despite a 91 per cent reduction in logging on public lands. Today, despite being the historical timberbasket of the U.S., Oregon now credits high-tech manufacturing with producing 10 per cent of its economic output – more than eight times the national average.

To the north, in the Chilliwack Forest District of southwestern British Columbia, resource-dependent towns that were built on logging and milling ancient forests into two-by-fours now support a far more diversified employment base as well. The proportion of employment from logging in the region

now represents less than 1 per cent, compared to growing film production (2 per cent), high-tech (8 per cent), and tourism (10 per cent).

This shift in employment patterns is partly because many former resource-dependent communities located near larger urban areas have been successful in attracting diversified businesses – drawing city people who want to shift gears and enjoy the benefits of living in a community more connected with nature.

For many firms, the motivation to establish workplaces in communities like Eugene and Portland in Oregon and Victoria, B.C., or nearby bucolic bedroom communities, is a recognition that employees benefit from access to nature and improved quality of life. As the mayor of the mill town of Springfield, Oregon, told the *New York Times* shortly after logging restrictions came into effect to protect the spotted owl, “It wasn’t blind, dumb luck that helped us land Sony; the company wanted a pristine place on the river.”

Indeed, many of today’s most successful companies are recognizing the importance of quality of life for their employees – at work and at home. Many are willing to locate their operations closer to nature, and to green their own workplaces. Thus we have seen a boom in the number of green roofs, green walls and rain gardens integrated into the design of office complexes.

This green wave in the workplace has been bolstered by the many positive benefits of green time over screen time. Over the last decade, researchers from fields as diverse as biology, psychiatry, ecology, horticulture and medicine have come to the conclusion that spending time in nature is good for our own health and well-being. Their research has shown that access to natural assets like parks and green spaces can improve our physical and mental health while enhancing community.

University of Illinois researcher Frances Kuo has documented that access to nature close to where people live

and work can result in less stress and more job satisfaction among employees, as well as increased productivity and reduced absenteeism and employee turnover.

In addition to health benefits, nature also provides a myriad of non-market economic benefits, according to research by the David Suzuki Foundation and others. These benefits come in the form of services provided by the community’s natural ecosystems, or natural capital. Forests purify the air and keep the city cool in summer. Wetlands filter drinking water and protect communities from floods. Fields and farms provide local food and habitat for pollinators and other wildlife.

The benefits of easier access to nature have not been lost on governments. Ontario has permanently protected more than 700,000 hectares of near-urban green space and farmland through its internationally renowned Greenbelt. Quebec recently announced its plan to wrap Montreal and Quebec City in protected greenbelts as well, and the federal government plans to create Canada’s first urban National Park, in the Rouge Watershed in the heart of the Greater Toronto Area.

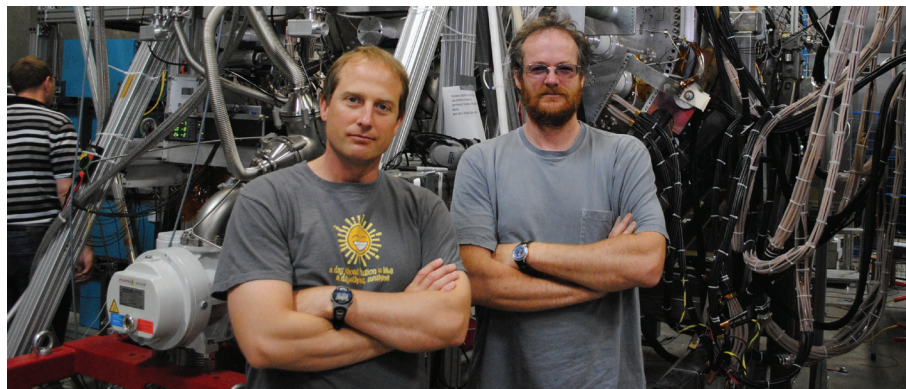
These initiatives to protect nature, literally in the backyards of millions of people, are happening at a time when fewer Canadians are visiting our existing system of far-flung wilderness parks. Visits to the National Parks system are down 7 per cent across Canada as a whole, down 10 per cent in Quebec and Ontario, and 18 per cent lower in the Maritimes. Parks Canada officials are now openly talking about the creation of the new Rouge National Park as a “gateway park” for the Canadian public, with the hope that citizens will become better connected with nature in their backyards and more likely to visit Canada’s cherished wild spaces.

The fact is, nature is clearly worth much more than we think. It provides essential services and produces health and economic benefits that far exceed the short-term gains obtained from its destruction. 🌿

Different Shades of Green Innovation

B.C., Ontario and Quebec earn top grades as nurturers of clean technologies

By Paul Brent



Nuclear fusion startup General Fusion of Vancouver exemplifies B.C.'s culture of cleantech innovation.

Canada's clean technology industry, like the country itself, comes with regional strengths and needs – with each province's policies and programs, unique geographies, and mix of universities and industries having a direct influence on green innovation.

Across the country, roughly 700 companies make up the \$9-billion cleantech sector. Most are in British Columbia, Ontario and Quebec, which also fetch a lion's share of venture capital. The number of companies and venture investment per capita in each province is one way to measure each jurisdiction's support for green innovation.

B.C. is home to 160 cleantech companies, representing 23 per cent of Canada's total, according to Ottawa's Analytica Advisors. The province's green innovation strengths lie in transportation, renewable energy, fuel cells and smart grid technologies, reflecting the influence of utility B.C. Hydro and fuel-cell pioneer Ballard Power.

"B.C. companies have a long history in power management, including power conditioning and battery storage, while the province's diverse geography and historic forestry industry support a range of alternative generation technologies such as wind, solar, biomass and tidal energy," according to consultancy KPMG.

Celine Bak, a partner with Analytica, said long-term public investment in

green innovations developed and spun out of B.C. universities has also played a major role. Another boost has come from the B.C. government's Innovative Clean Energy (ICE) Fund, which since 2008 has contributed more than \$72 million to 56 clean energy projects. In addition, the introduction of a provincial carbon tax in 2008 created opportunities for firms such as Nexterra, which helps industries reduce their carbon footprint by generating electricity from biomass.

Ontario, with 221 companies (31 per cent of the total), may lead the country in absolute numbers but still lags B.C. when measured per capita. Even so, it has been most successful at attracting venture capital for its green-themed startups.

Cleantech firms by province, 2011

Prov.	Companies per 1,000,000 people	Number of Companies
PE	49.93	7
BC	36.36	160
NS	27.12	25
AB	24.14	88
SK	20.32	21
QB	19.23	152
ON	17.20	221
NB	14.64	11
MB	14.07	17
NL	13.60	7


Instead of a carbon tax, Ontario's landmark Green Energy Act and feed-in-tariff program – and its ambitious commitment to phase out coal-fired generation by 2014 – have established the province as one of the best places on the continent to develop renewable energy and smart grid innovations focused on energy management, storage and efficiency. A relatively new Water Opportunities Act aims to make Ontario a leader in water conservation and treatment technologies.

Government funds aimed at green innovation development and smart grid technologies, as well as support for community power, have added to the province's allure. The MaRS Discovery District in Toronto has become one of the nation's leading incubators for clean technology innovation, while several universities in southern Ontario – including University of Waterloo, University of Ontario Institute of Technology and Queen's University – are generating both green innovations and entrepreneurs with the right business skills to take clean technologies to market.

"You can't take a great technology developer and expect them to be a wonderful business developer," said Vicky Sharpe, chief executive of Sustainable Development Technology Canada, the federal agency that gives grants to cleantech demonstration projects. You need both, she said.

Quebec, with 152 companies (21 per cent), has traditionally been strong in industrial manufacturing, water and waste management technologies. Bak attributes this strength to its having "a regulatory framework that is very smart and very proactive in terms of recycling." Rather than setting up a dedicated government fund to support development and commercialization, Quebec recently decided to invest in the sector through venture capital firm Cycle Capital Management.

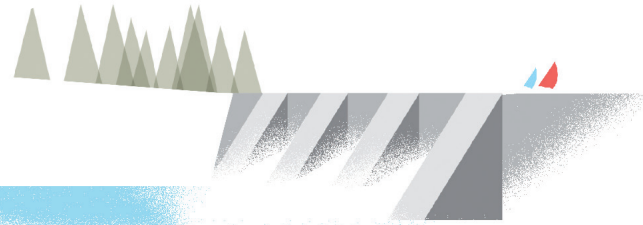
Nova Scotia, with 50 companies, stands out on the East Coast for its strength around green chemistry, biofuels and renewable energy, such as wind and tidal power. In the prairies, Alberta's 88 companies, operating in a province known for its oil sands resources, are largely focused on soil, water and emissions remediation technologies, such as carbon capture and sequestration.

Said Bak: "Each province or region is taking a slightly different approach." 

Provincial Power

It's time to turn energy vision into action

By Marlo Reynolds



Talking about a “national energy strategy” is very much in vogue these days, almost the way we talked about “climate change strategies” for the first decade of the new millennium. Industry associations, provinces, think tanks, unions, energy companies, non-governmental organizations – all are calling for a cross-country approach to managing and transitioning our energy system. But, can we move these conversations to practical action? What will it really take to make the necessary transitions in how we produce energy and consume energy services?

To start with, we need a coherent vision of what we, as a nation, want to be when we grow up given our world-scale abundance of energy resources.

Last year, environmental action group Tides Canada conducted a series of workshops resulting in a document called “A New Energy Vision for Canada.” It outlines the broadly accepted vision for a national energy strategy that:

- Provides accessible, fair and efficient energy services to citizens with minimal risk to future generations;
- Leverages our considerable renewable resources and existing institutions to increase our share of the global market for low-carbon goods and services, spurring new jobs, investment and innovations;
- Reduces the risk of climate disruption by lowering carbon emissions to a level, and at a pace, recommended by the global scientific community;
- Protects and restores air, land and water resources by setting hard caps on cumulative ecosystem and atmospheric impacts; and
- Encourages local stewardship over low-carbon energy production and resources.

Though there is no shortage of chatter about the shape and scope of a Canadian energy strategy, these are really the minimum specifications of any plan, provincially or nationwide, that could set us up for truly long-term prosperity by sparking an incredible wave of innovation.

Even with a national vision, however, it is the provinces that hold the jurisdictional power and responsibility to deliver. And the biggest mistake our provinces could make is to focus on “resource development” as opposed to focusing on the “energy services” we need. To state it bluntly, people don’t really care about energy resources; we care about the services they bring us, such as mobility, light, warm homes, electronics and cold beer. These desired services won’t change much, but the resources that make them possible will.

Take mobility. During the preceding century, petroleum overwhelmingly provided this service. We continue to use barrels of oil as a metric of future energy demand and often point to the growing demand for oil in China. But China does not really care about oil; it cares about mobility. If and when that economy can provide its people with mobility by another means that is cheaper, cleaner, domestically produced, more accessible and higher performance, it will do so rather quickly. In other words, meet the electric car.

Today, Canada is a powerhouse in the last century’s dominant energy currency. But as times change we need to adapt and be positioned to be a competitive player in this century’s emerging energy technologies. This means each province must ask itself: How are we going to compete in an “energy-technology” focused global economy? Where should we start?

Different priorities will exist for each province, but across the country each should focus on: pricing pollution, steadily reducing limits on total pollution, properly valuing the benefits of re-

newable energy, and investing in energy efficiency.

First, each province should put a fiscal incentive in place to reduce and eventually eliminate environmental impacts. Translation: tax carbon. Look to British Columbia for a strong model to build from. Use the levies from pollution to reduce income taxes, protect low-income energy consumers and further invest in energy efficiency. The sooner each province sends the signal that it costs to pollute our environment, the faster we will innovate and implement cleaner solutions.

Next, impose progressively stricter pollution standards on all sources of energy-related emissions. Use these performance-based standards to drive innovation that will in turn purge pollution from the energy sector. A good example is regulations on coal power plants – regulations that force utilities to either eliminate emissions or shut the plants down. For my home province of Alberta, the priority should be setting scientifically informed limits on total cumulative environmental impacts of the oil sands.

Third, renewable energy reduces pollution yet is rewarded for doing so in very few jurisdictions. When politicians don’t have the guts to price pollution

% of in-province electricity generation from renewables

Prov.	% electricity from renewables
MB	99.48%
PE	99.18%
QB	97.02%
NL	96.93%
BC	89.03%
NB	33.20%
ON	23.74%
SK	21.43%
NS	11.87%
AB	5.72%

To state it bluntly, people don't really care about energy resources; we care about the services they bring us, such as mobility, light, warm homes, electronics and cold beer.

Energy productivity


Prov.	\$M GDP/terajoule of energy used
ON	0.22
BC	0.18
NS	0.18
PE	0.18
QB	0.18
MB	0.17
NL	0.16
NB	0.14
AB	0.11
SK	0.09

Source: 2009, Environment Canada

properly, their only option for levelling the playing field for non-polluting energy sources is to fiscally recognize their added environmental benefits. The best example of this is Ontario's feed-in-tariff (FIT) program, which very transparently presents to energy consumers the value of cutting pollution.

Finally, provinces should use a combination of standards, incentives, pricing, community planning and education

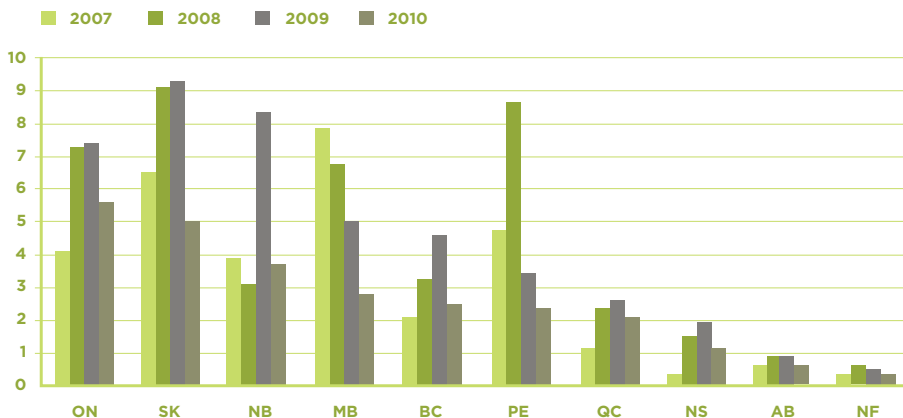
to capitalize on the incredible opportunities in energy efficiency across all energy services – home heating, mobility, entertainment, and more. Look to Manitoba for a portfolio of leading efforts on energy efficiency.

Each province can tweak these actions to suit its particular political realities but if we Canadians want our fair share of the rapidly growing trillion-dollar cleantech sector, we need to act like the future matters to us. As global population grows, resource constraints increase and pollution threatens us all, one thing is certain: societies that create and market clean energy solutions will thrive. This is our best chance to make a positive contribution to global challenges, and along the way regain respect on the world stage. 

Marlo Reynolds is a senior advisor to the Tides Canada Energy Initiative and the Pembina Institute (pembina.org). He is currently living in France on a sabbatical. This article represents his views and not necessarily those of any organization to which he is associated.

Use of "geothermal" heat pumps

Number of Units Per 10 Inhabitants by Province



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