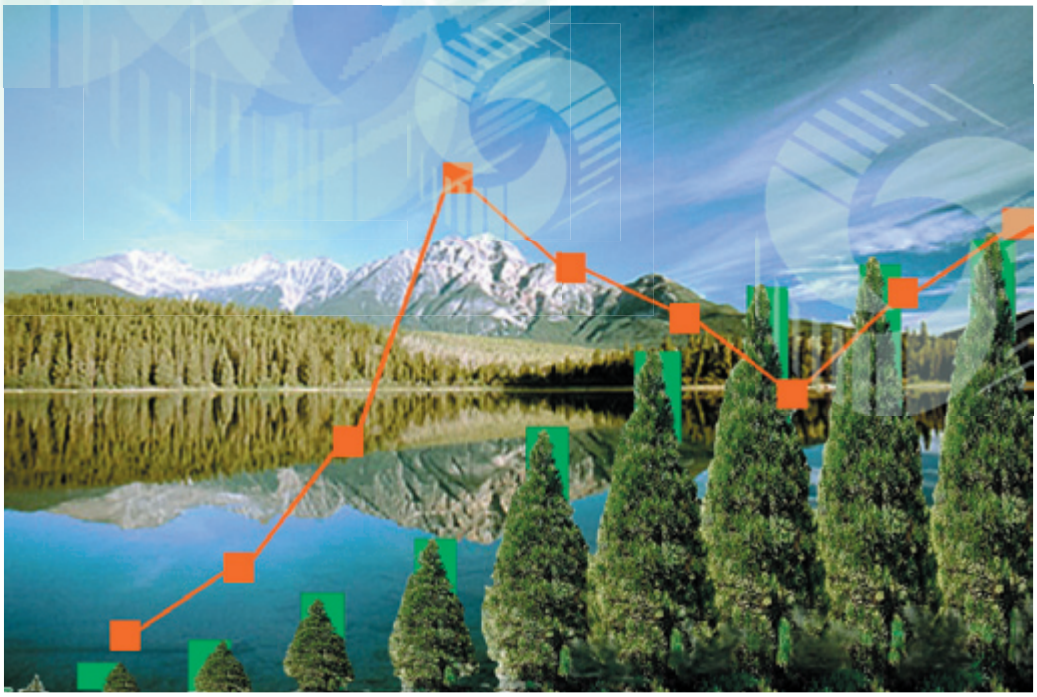
FRONTIER CENTRE FOR PUBLIC POLICY
FCPP POLICY SERIES NO. 63 • JUNE 2009
POLICY SERIES



The Environmental State of Canada— 30 Years of Progress

By Kenneth P. Green and Ben Eisen

About the Authors

Kenneth P. Green, D.Env., is a member of the Frontier Centre Advisory Board and Project Director of *The Environmental State of Canada-30 Years of Environmental Progress.* An environmental scientist by training, Mr. Green has authored numerous policy studies, magazine articles, newspaper columns, authored encyclopedia entries, book chapters, and a textbook for middle-school students entitled *Global Warming: Understanding the Debate.* Currently a Resident Scholar with the American Enterprise Institute, Mr. Green has studied environmental policy at the state level in California, and studied Canadian environmental policy for three years at The Fraser Institute.

Ben Eisen has recently joined the Frontier Centre for Public Policy as a Policy Analyst. His undergraduate degree is from the University of Toronto where he specialized in History and Political Science. Mr. Eisen also holds a Masters degree in Public Policy from the University of Toronto. His policy columns have been published in the *Winnipeg Free Press,* the *Calgary Herald,* and the *Toronto Sun.* Mr. Eisen has completed a public policy internship with the federal government and he has worked as a researcher for the CBC. Mr. Eisen is the co-author of *The Environmental State of Canada—30 Years of Environmental Progress.*

Date of First Issue: June, 2009.

Reproduced here with permission of the authors.

ISSN 1491-78

FRONTIER CENTRE
FOR PUBLIC POLICY
www.fcpp.org

MB: 203-2727 Portage Avenue,
Winnipeg, Manitoba Canada R3J 0R2
Tel: 204 957-1567 Fax: 204 957-1570

SK: 2353 McIntyre Street,
Regina, Saskatchewan Canada S4P 2S3
Tel: 306 352-2915 Fax: 306 352-2938

AB: Ste. 2000 – 444 5th Avenue SW
Calgary, Alberta Canada T2P 2T8
Tel: 403 230-2435

CELEBRATING 10 YEARS 1999-2009

FCPP Policy Series No. 63 • June 2009

The Environmental State of Canada— 30 Years of Progress

By Kenneth P. Green and Ben Eisen

Table of Contents

Executive Summary	5
Introduction	9
Conventional Air Pollutants	12
Greenhouse Gas Emissions	21
Freshwater Withdrawals	26
Freshwater Quality	32
Soil Quality	38
Ecosystem Conservation	44
Forestry	47
Conclusion	50
Sources and Endnotes	51
Further Reading	53

List of Charts

1.	The Environmental Transition Curve	10
2.	Sulphur Dioxide: One-hour Objectives	13
3.	Sulphur Dioxide: 24-hour Objectives	14
4.	PM2.5 Levels in 2003-2005 Compared with the 2010 CWS	15
5.	Actual National Ozone Level Compared with 2010 CWS	16
6.	Ozone Levels in 2003-2005 Compared with the 2010 CWS	17
7.	Trends in 24-hour Volatile Organic Carbon Levels	18
8.	Trends in One-hour NO and NO2 Levels	19
9.	National GHG Emissions 1990-2006	21
10.	Change in Total GHG Emission Levels by Country	22
11.	Change in Total GHG Emission Levels by Province	23
12.	National GHG Intensity 1990-2005	24
13.	Provincial GHG Intensity	26
14.	Percentage of Annual Renewable Freshwater Resources Withdrawn	27
15.	Status of freshwater quality at sites in Canada	32
16.	Water Quality by Country	33
17.	Water Quality: St. Lawrence Drainage Area	34
18.	Water Quality: Nelson Drainage Area	34
19.	Water Quality: Maritime Provinces Drainage Area	35
20.	Water Quality: Newfoundland and Labrador Drainage Area	35
21.	Water Quality: Pacific Drainage Area	35
22.	Untreated Waste Water in Canada	36
23.	Waste Water Treatment in Canada	37
24.	Share of Cropland in Different Soil Organic Carbon Change Classes	39
25.	Average Soil Organic Carbon Change Across Canada	41
26.	Percentage of Cropland at Very Low Risk of Erosion	42
27.	Share of Cropland at High Risk of Tillage Erosion	43
28.	Protected Area as a Share of Total Land	45
29.	Change in Protected area as a Share of Total Land 1989-2003	45
30.	Annual Allowable Cut and Actual Timber Harvests	47
31.	Forest Certification in Canada	49

Executive Summary

Canadians have much to celebrate concerning their natural environment. Over the past 30 years, Canada's air and water have become cleaner, ecosystems and timberlands have been preserved, and soils that feed not only Canadians but also many others around the world have been protected. This has happened while Canada's population and economy have grown strongly, which has propelled Canada, a country of only 33 million, to the status of an economic powerhouse with a standard of living that is the envy of much of the world. There is still more that can be done, but Canada is well on the way toward environmental sustainability.

Conventional Air Pollutants

The presence of a wide variety of pollutants influences air quality. No single indicator can be used as an adequate tool for analyzing overall air quality. For this reason, we examined the levels of four air pollutants in Canadian towns and cities that when taken together give a clear sense of the general trends in air quality.

- Of the four pollutants, two have dropped significantly in recent years, while two have remained virtually unchanged.
- Levels of sulphur dioxide and nitrogen dioxide are much lower in Canadian towns and cities than they were just a few decades ago. During the late 1970s, over 15 per cent of government monitoring stations reported concentrations of these pollutants that were above national air-quality objectives. By the early years of this decade, less than 1 per cent of stations reported unacceptable levels of nitrogen dioxide, and just 6 per cent recorded unacceptable concentrations of sulphur dioxide.
- For the third and fourth indicators, ground-level ozone and fine particulate matter, there has been neither a measurable drop nor a measurable increase since the early 1990s.

Due to these trends, a sizable majority of Canadian towns and cities now meet government-established quality standards for all four of these harmful pollutants. No community in Canada regularly exceeds quality standards for sulphur dioxide or nitrogen dioxide. Most communities that do not meet quality standards for fine particulate matter and ground level ozone are concentrated in Ontario and Quebec. Across the rest of the country, almost all cities meet government air-quality standards for all four pollutants.

Greenhouse Gas (GHG) Emissions

The theory of human induced global warming has provoked widespread concern in recent years. Due to the high level of interest in this issue, greenhouse gas emissions, thought by many to contribute to global warming, has become the single most highly publicized indicator of environmental sustainability. Overall, Canada's performance using this indicator is perceived as unimpressive, particularly when compared with its peer countries. Whereas many industrialized countries have achieved significant reductions in their total GHG emissions since 1990, Canada's emissions have increased by over 20 per cent during this period.

However, despite vocal criticism from some environmental activists, trends in Canada's GHG emissions are not uniformly troubling. For example, our analysis of the GHG intensity indicator (GHG emissions

per unit of GDP) suggests that Canada has made significant progress in this area when emissions per unit of economic activity are measured—a metric that is useful in a country where population and economic growth are the norm. Using inflation-adjusted dollars, GHG emissions per unit of economic productivity dropped 18 per cent between 1990 and 2005. Although some countries such as the United Kingdom have made even more-impressive strides according to this indicator, the widespread perception that Canada has made no progress toward controlling its GHG emissions is mistaken.

Freshwater Withdrawals

Given its rich supply of fresh water and its comparatively small population, Canada withdraws a small percentage of its freshwater resources each year. While Canada's NAFTA trading partners, the United States and Mexico, withdraw 17 per cent and 19 per cent respectively of their renewable fresh water each year, Canada withdraws just 1.6 per cent of its resources. These numbers suggest that Canada could safely withdraw several multiples more annually than it does now without straining its freshwater resources or having any measurable impact on their sustainability.

In the future, countries that have abundant fresh water will have the opportunity to help the water-poor countries of the world while promoting their own economic development through freshwater exports. Canadian governments should carefully oversee large-scale water exports to ensure that Canada's freshwater resources are not overused. While depletion of these resources should obviously not be permitted, the economic opportunities presented by Canada's renewable fresh water should not be wasted. The extent to which Canadians benefit from the country's natural endowment of fresh water would be significantly enhanced by policy changes that permit more water exports to Canada's NAFTA trading partners.

Although water is abundant in Canada, wasting such a valuable resource is undesirable. Canadians are among the heaviest users of water in the world. A major reason for this high level of water use is that many Canadians pay less than the market price for their water, and in many cases, they pay significantly less than the cost of water processing and delivery. This situation promotes waste and the inefficient use of water. By promoting arrangements in which the cost of water is driven by how much water consumers actually use, governments can improve the efficiency of water use, thereby creating circumstances under which Canada's freshwater resources will be put to the best possible use.

Freshwater Quality

Canada is blessed with abundant freshwater resources. The utility and value of fresh water, however, depends largely on its cleanliness. Due to the large number of factors that influence water quality, the federal government created a Water Quality Index to obtain an overall picture of freshwater quality. Based on their WQI scores, all monitored freshwater sites are given a rating on a five-tiered scale that runs from poor on one end to excellent on the other.

This indicator suggests that water quality throughout Canada is quite good.

- More than twice as many monitored sites fell into one of the top two designations, good and excellent, than fell into one of the bottom two designations, marginal and poor.
- Canada's record in this area is also strong compared with its peer countries. According to the Environmental Protection Index, Canada has the second-highest level of water quality among G8 countries, behind only Italy.

Steps have been taken to further improve the quality of Canadian water in the years ahead, notably, dramatic improvements in the quality of waste water treatment. In 1983, 28.3 per cent of sewers in Canada received no waste water treatment.

By 1999, all but 3.4 per cent of sewers received some level of treatment. The percentage of sewers that received sophisticated secondary and tertiary treatments also grew during this period, from 55.8 per cent in the early 1980s to 77.7 per cent by the late 1990s. Waste water discharges are a major source of water pollution, and the rapid improvement over recent years in the quality of waste water treatment will help ensure that water pollution levels continue to remain low.

"According to the Environmental Protection Index, Canada has the second-highest level of water quality among G8 countries..."

Soil Quality

A number of measurement tools have been developed to provide useful indicators of soil health. One such indicator is the Soil Organic Carbon Change Indicator which estimates changes in organic carbon levels in agricultural soil over time. According to this indicator, Canadian soil quality has improved dramatically in recent years. Whereas in the early 1980s, Canada experienced a significant annual net loss in soil organic carbon, by the early 2000s, Canada enjoyed large annual net gains.

This report examines the extent to which farmland is seen by the Government of Canada to be at risk of wind, soil and tillage erosion. Canada has experienced a significant improvement according to these three indicators. The percentage of cropland designated by the federal government as being at very low risk of wind erosion (the lowest possible designation) reached 86 per cent in 2001, up from 72 per cent in 1981, i.e., more land than ever is mostly safe from erosion. Similarly, the percentage of cropland deemed to be at very low risk of tillage erosion increased by over 30 per cent during this period.

Farm productivity, overall crop quality and variety, and total cash income from agriculture and agricultural exports have all risen in recent decades, partially due to the improvements in soil quality. This growth in farm productivity and the improvements in soil quality suggest that Canadian agricultural practices have become markedly more productive and sustainable over the course of the past 20 years.

Ecosystem Conservation

Canada contains a wide variety of ecosystems, each of which supports different types of animal and plant life. To ensure Canada's continued economic success while preserving these diverse ecosystems, governments should identify both the areas that can safely be used for economic activity as well as the areas that for ecological purposes should be left strictly undisturbed.

One primary tool governments can use to accomplish this is the ability to demarcate protected areas where large-scale commercial development is banned. In 1989, just three per cent of Canada's land area was protected by legislation. By 2003, that number rose to 8.4 per cent. Some provinces have been particularly aggressive in expanding their protected areas. Manitoba, British Columbia and Nova Scotia are among the provinces that have significantly expanded their total protected land area since the late 1980s.

> ***"Manitoba, British Columbia and Nova Scotia are among the provinces that have significantly expanded their total protected land area..."***

Forestry

The challenge facing governments in forest management is how to ensure Canadians maximize the opportunities for economic activity that are provided by the forests while also ensuring that the forests are sustainably managed. To achieve these objectives, Canadian governments regulate the amount of wood harvested each year. These regulations are generally specified as an Annual Allowable Cut (AAC). Ideally, actual annual forest harvests would be perfectly aligned with the AAC. For this reason, one indicator of success in forest management is the degree of alignment between the AAC and the actual quantity of harvested timber. Throughout the past decade, the actual timber harvest across Canada has been consistently significantly below the permitted AAC. This is especially true in the case of hardwood lumber. In 2006, the hardwood harvest was 35-million cubic metres, which is less than 60 per cent of that year's AAC, which was set at 60-million cubic metres. In the case of softwood lumber, harvests have consistently been approximately 20 per cent below the aggregate national AAC throughout the past 10 years—though it should be noted that there were other factors contributing to that lower level of harvesting including softwood lumber disputes with the United States and the mountain pine beetle epidemic.

Although this means the forest harvests have been sustainable, it also means opportunities for sustainable economic activity have been foregone even though they would not be environmentally problematic under current allowable cut levels. That Canada's forests are currently well managed is further attested to by a second indicator—trends in the total area of forest cover in Canada. Throughout the past decade, Canada's total forest cover has held steadily at approximately 310-million acres, 34 per cent of Canada's land mass.

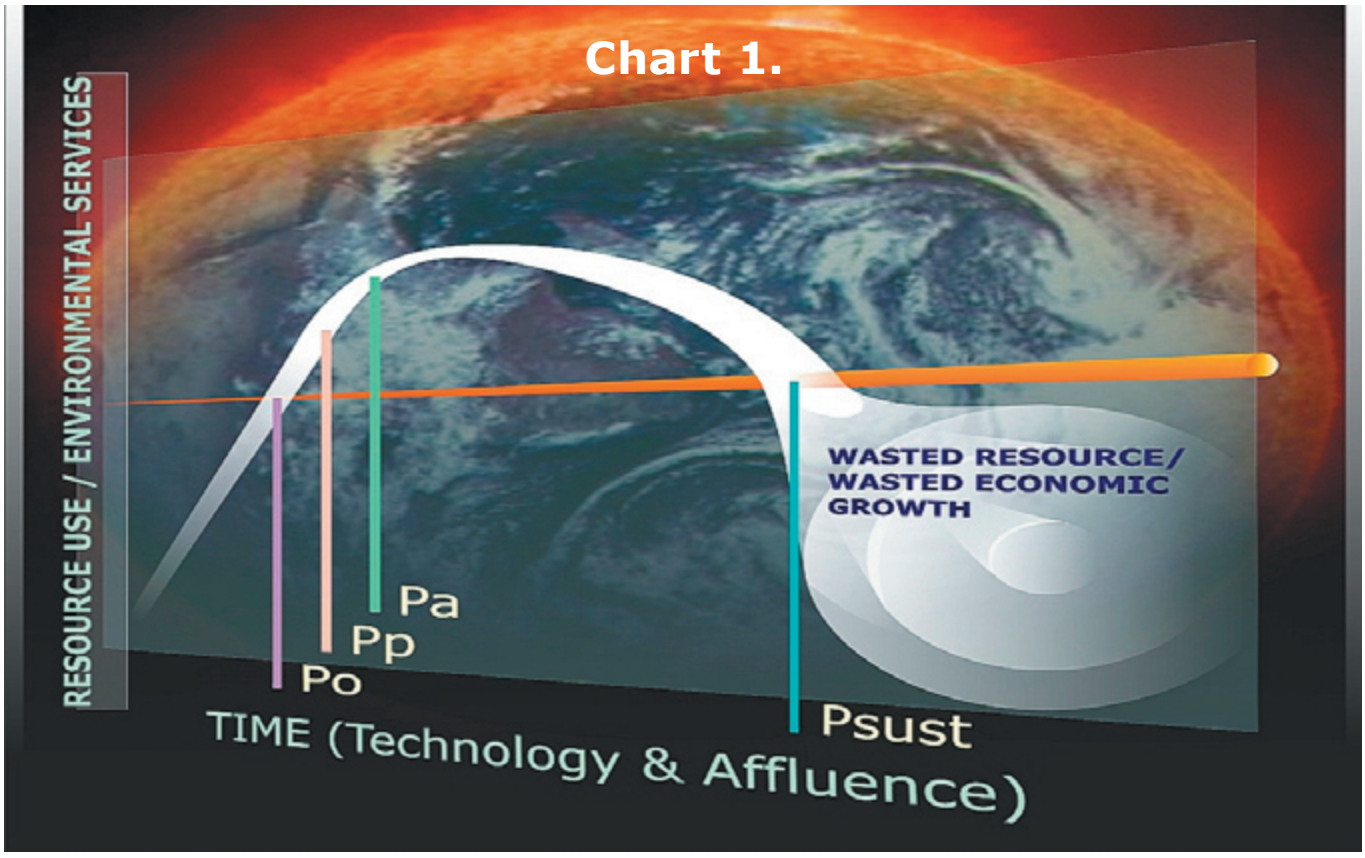
Introduction

Canadians care deeply about the quality of the environment and the protection of nature. A 2007 Decima poll showed that Canadians were more concerned about the environment than about healthcare.[1] A 2009 poll from Nanos found that in the context of the potential prosperity from oil sands versus the potential environmental harm, most Canadians put environmental protection above economic prosperity.[2] Even the current recession has not dampened Canadians' ardour for environmental protection: An Ipsos-Reid poll in February 2009 found that 57 per cent of the public favoured aggressive actions on climate change despite the economic situation.[3]

Canadians have a great deal to celebrate when it concerns their environment. Over the past 30 years, Canada has cleaned up its air and water, preserved ecosystems and timberlands and protected the soils that feed not only its people but also many others worldwide. This has occurred while Canada's population and economy has grown strongly, and it has propelled Canada, a country of only 33 million, to the status of a global economic powerhouse with a standard of living that is the envy of much of the world. Of course, there is still more that can be done to protect and optimize the use of Canada's mighty environmental endowment, but Canada is well on the way toward environmental sustainability.

Some environmentalists tend to downplay this progress and focus instead on particular metrics such as per capita metrics in order to maintain a sense of urgency and to support ever-stronger regulatory regimes. However, per capita metrics are the ultimate in one-size-fits-all thinking that ignores geography, natural resource endowment, cultural history, technological capability and the like. With regard to Canada, per capita metrics are particularly absurd: Canada is a large, cold-weather country with a population spread across a vast land area. The Canadian economy is also a powerhouse, ranking ninth in the world on the 2007 World Bank and IMF rankings of world economies. It is hardly appropriate to compare the per capita energy use of a person living in Edmonton with one living in say, Belgium or China or India for that matter. The per capita focus of many environmentalists reflects a deep-ecology view wherein the underlying goal is a rock-bottom utilization of the environment by a human population kept as low as possible and whose wealth is distributed communally.

There is a better way to look at environmental progress. It acknowledges that human beings live in very different environments with different-sized populations and different cultural traditions, social institutions and available technology. It is a way that recognizes that human beings act to fulfill what psychologist Abraham Maslow called the "hierarchy of needs", which includes the need for food, safety, family, esteem and self-actualization. In meeting these needs, societies first despoil, then clean up, and ultimately optimize their use of environmental resources in terms of physical resources such as timber, minerals and petrochemicals and in terms of using the environment's ability to absorb waste such as air and water pollution. This is often called the *environmental transition paradigm* or sometimes the *environmental Kuznets curve.*



It has long been recognized that as countries develop, they pass through a series of environmental transitions in which one or another element of the environment is utilized, then over-utilized, and ultimately brought into a level of sustainable use. Chart 1 (above) is a graphic representation of this environmental transition curve. The bottom axis is economic growth, and the upright axis represents environmental use of a natural resource such as timber, water or soil. The upright axis might also represent the use of environmental services such as diluting waste products in the air or the service one gets from a river's ability to break down a certain quantity of waste in a manner that harms neither fish nor people.

As Chart 2 (next page) shows, for that any given environmental resource, society passes through a series of phases. As countries develop, they use natural resources and environmental waste-management services to build wealth with which the people satisfy their basic needs for housing, food, education, healthcare, mobility, and so on. If a country grows large enough, a society will often use more than its local environment can sustain. That is the point marked on the graph above as Po, the point where over-utilization of a resource commences. The orange bar represents the sustainable-use level of the resource, which should be understood as a dynamic capacity that changes over time, as populations change and as climates fluctuate. It must be evaluated on an ongoing basis.

The point of perception, Pp, where people notice they are over-utilizing a resource, quickly follows, and people take steps to reduce their overuse, both as individuals and as a society. This is the point of action or Pa. Finally, and usually in relatively short order, the overuse ends, and resource use is reduced, hopefully, to the maximum sustainable level, which is indicated on the chart at Psust.

> ***Canada has passed the environmental transition for virtually all forms of environmental pollution and resource over-utilization...***

We say "hopefully" because, too often, the drive by deep-ecology environmentalists is for perfection, for the non-use of resources that would leave a great deal of potential wealth untapped and resources underutilized. This potential wealth could contribute to Canada's growing quality of life as well as improve the quality of life for millions of others around the globe.

Caveats apply, of course—some economists argue that the environmental transition curve is flawed and that while it might work for local-area pollutants and resource protection, it will not work for global problems. They think that some rich countries might bring pollution to other parts of the world, as various businesses are forced to relocate to remain competitive. That may well be true, but it does not negate the idea of an environmental transition, it simply lengthens the time it takes to turn things around for certain global pollutants, because remediation then becomes dependent upon other countries passing through their own environmental transitions.

In only about 30 years, Canada has passed the environmental transition for virtually all forms of environmental pollution and resource over-utilization within its borders. The exceptions are greenhouse gases (which have only recently breached the point of perception at the global level) and ground-level ozone in a few eastern regions, which has proven more stubborn to control than most other forms of air pollution.

We will make note of Canada's great achievement in protecting its environment; however, we will also show where Canada as a whole and some provinces can improve. In addition, we will show where we may overshoot the sustainability mark, leaving resources unused that could enrich the lives of Canadians and others around the world.

Conventional Air Pollutants

The quality of the air we breathe can significantly affect our health. Research has shown that prolonged exposure to high levels of certain types of air pollution can cause higher instances of respiratory problems such as bronchitis and emphysema.[4] In the area of environmental policy, reducing air pollution in urban centres where air quality problems are concentrated has long been recognized as one of the governments' highest priorities.

Fortunately, there has been a dramatic improvement in urban air quality over the past 30 years. Despite significant population growth and economic growth in the urban centres, recent decades have seen dramatic declines in the ambient levels of many different air pollutants.

For example, the last 30 years have seen substantial decreases in the ambient levels of sulphur dioxide and nitrogen dioxide in the urban centres. High levels of these air pollutants were, until quite recently, among the most serious environmental problems facing the country. These pollutants can cause a range of respiratory problems, particularly for vulnerable individuals such as small children and the elderly.

Furthermore, high ambient levels of sulphur dioxide and nitrogen dioxide contribute to acid rain, which, at high levels, can cause harm to both humans and animals.[5]

Thirty years ago, the air in many Canadian cities had high levels of both these toxins. Today, levels of both have been reduced such that *not a single Canadian city* has ambient levels of sulphur dioxide or nitrogen oxide that regularly exceed government-set national air-quality objectives.

Canada's tremendous progress in this area can best be understood by examining the extent to which the air in the cities now meets the federal government's national air-quality objectives. National Ambient Air Quality Objectives (NAAQOs), which define ambient levels of particular pollutants harmful to human health and the environment, were developed during the 1970s and consist of multiple tiers that describe ranges of air quality with specific levels of effect on human health.

The government currently uses two tiers for sulphur dioxide and nitrogen dioxide. It has established a maximum acceptable level for these pollutants as well as a more stringent maximum desirable level. For both pollutants, the maximum desirable level, as measured in micrograms per cubic metre of air, is approximately one-half of the maximum acceptable level.

To determine whether air quality meets these objectives, the government places air-quality monitoring stations in cities and towns across the country. These stations measure the ambient levels of a variety of pollutants including sulphur dioxide and nitrogen dioxide and average the concentration measured over one-hour and 24-hour periods. By examining the number of times these averages exceed national air-quality objectives each year, we can get a good sense of the extent to which the air in Canada's cities has consistently met the country's air-quality objectives.

Throughout Canada, the number of readings that exceeded both the maximum acceptable and the maximum desirable government standards has dropped significantly over the past three decades.

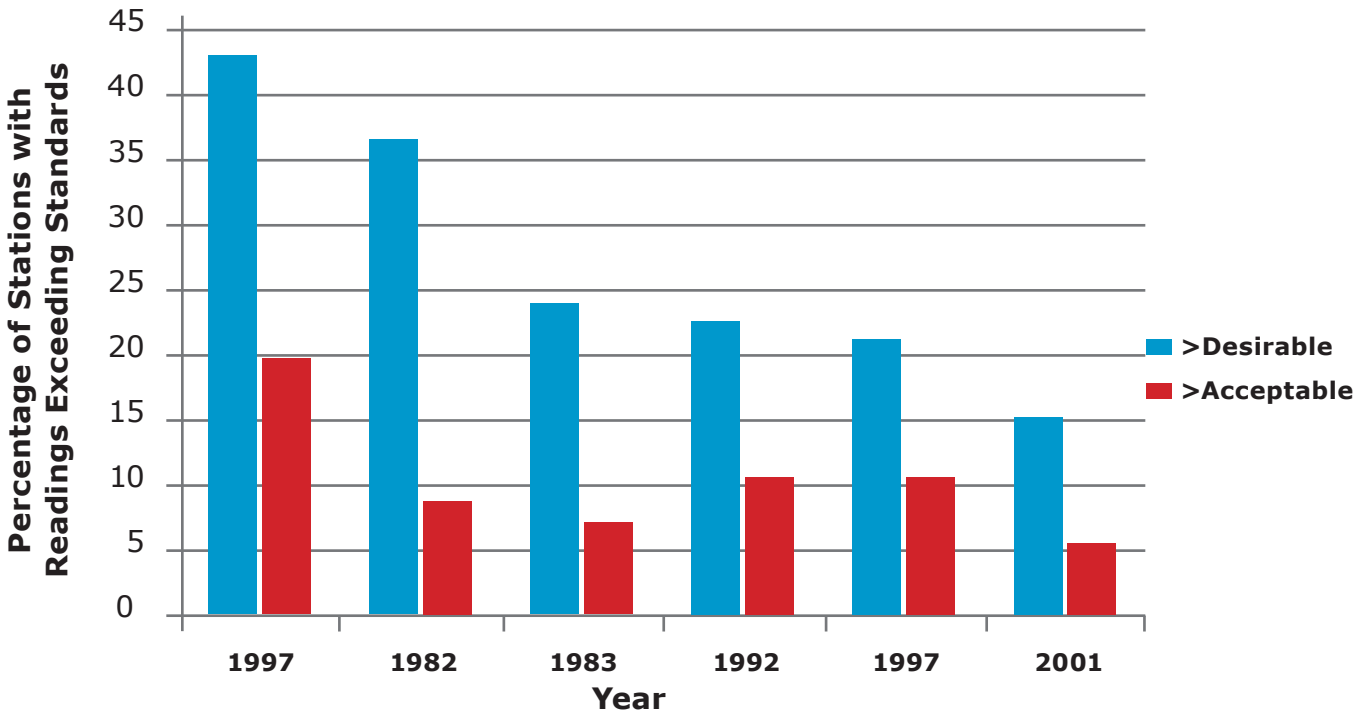
> ***...almost no monitoring stations** have recently collected readings that exceed the government's maximum acceptable objective.*

Large reductions in the ambient levels of nitrogen dioxide during the 1980s brought its levels down such that almost no monitoring stations have recently collected readings that exceed the government's maximum acceptable objective.[6] In other words, since the late 1980s, all Canadian towns and cities have consistently maintained ambient nitrogen dioxide levels that meet the federal government's air-quality objectives.

Similarly, as the Charts 2 (below) and 3 (next page) illustrate, there has been a substantial drop in ambient sulphur dioxide in cities and towns across Canada. Whereas in 1977 over 40 per cent of monitoring stations collected readings with one-hour averages above the government's maximum desirable standard, that number was reduced to under 15 per cent in 2001.

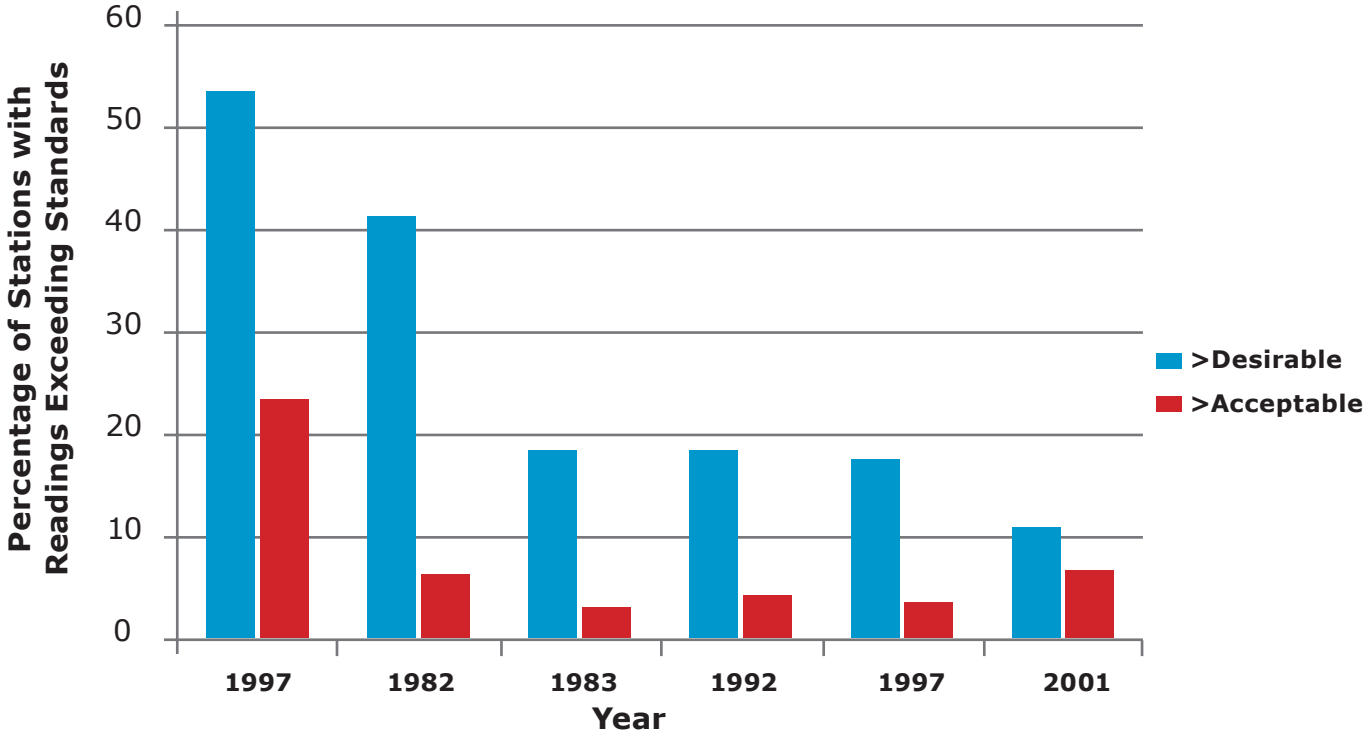
Using the less-stringent maximum acceptable standard, approximately 5 per cent of monitoring stations collected one-hour averages that exceeded the government's air quality objective in 2001.

Chart 2: Sulphur Dioxide One-hour Objective



Source: Jeremy Brown, Kenneth Green, Steven Hansen and Liv Frederickson, *Environmental Indicators: Sixth Edition* (2004).

Chart 3. Sulphur Dioxide: 24-hour Objectives



Source: Jeremy Brown, Kenneth Green, Steven Hansen and Liv Frederickson, *Environmental Indicators: Sixth Edition* (2004).

As these statistics demonstrate, ambient levels of nitrogen dioxide and sulphur dioxide have dropped dramatically since the late 1970s. Although the presence of these pollutants was once an environmental problem that posed serious health threats to Canadians, the amount of these two toxins in the air has been reduced such that almost all Canadian towns and cities have levels well below government-established air-quality objectives.

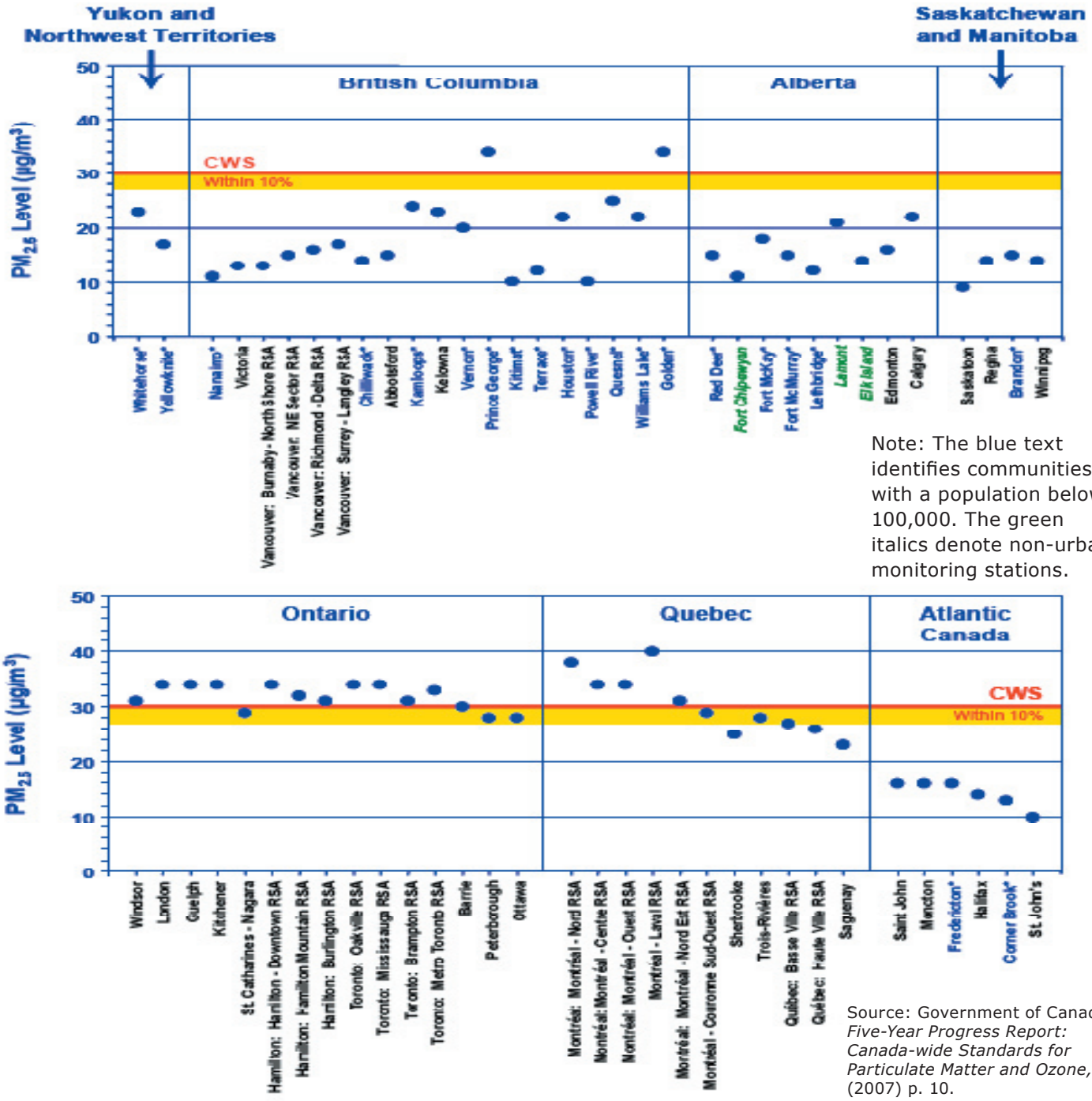
Canada has achieved such significant progress in reducing ambient levels of sulphur dioxide and nitrogen dioxide that they are no longer a primary area of concern in government efforts to monitor air quality. Instead, monitoring of air quality is focused on two other components of urban smog, fine particulate matter and ground-level ozone. Exposure to high levels of these pollutants is linked to adverse health effects in humans.

Fine particulate matter refers to small liquid and solid particles that are suspended in the air. Of particular interest is $PM_{2.5}$, small particles that have a diameter of 2.5 micrometres or less. These especially small particles are of concern because they are small enough to enter deeply into human lungs.[7]

In 2001, the federal government introduced a Canada-wide standard for ambient levels of fine particulate matter, which is to be reached countrywide by 2010. In 2006, the government released a five-year progress report that assessed the country's progress towards meeting the 2010 targets for both fine particulate matter and ground-level ozone. From data gathered between 2003 and 2005, the report showed that a large majority of Canadian municipalities had already achieved ambient levels of fine particulate matter below the standard.

Although several large cities, mostly in southern Ontario and in Quebec, had ambient levels of PM2.5 that were above the standard, a large majority of communities, which together held approximately 70 per cent of the country's population, had already achieved the 2010 target by 2005.[8] Chart 4 (below) shows ambient PM2.5 levels in medium and large cities across the country compared with the CWS.

Chart 4: PM2.5 Levels in 2003–2005 Compared with the 2010 Canada-Wide Standard



Note: The blue text identifies communities with a population below 100,000. The green italics denote non-urban monitoring stations.

Source: Government of Canada, *Five-Year Progress Report: Canada-wide Standards for Particulate Matter and Ozone*, (2007) p. 10.

As those charts show, municipalities that exceeded the 2010 standard for ambient $PM_{2.5}$ are concentrated in southern Ontario and in Quebec. Cities in Atlantic Canada, the Prairies and most of British Columbia were already well below the 2010 standard during the monitoring period.

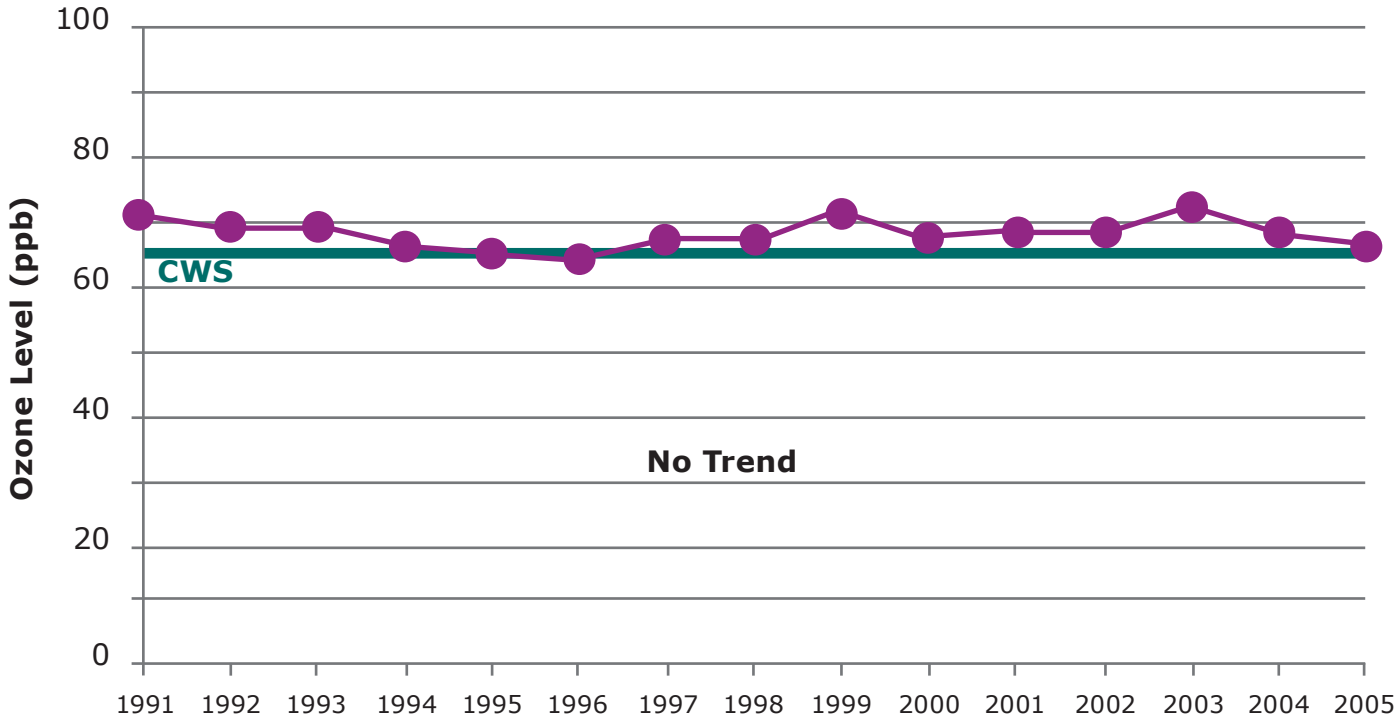
Although many cities in Ontario and Quebec were above the standard between 2003 and 2005, these cities generally exceeded it by very small amounts. With a few exceptions, these communities had average readings of fewer than 35 micrograms per cubic metre, which is just five micrograms above the Canada-wide Standard.

Although minor reductions in $PM_{2.5}$ levels in these cities are desirable so that they comply with the standard by 2010, the vast majority of Canadian municipalities are already in compliance with the standard. Most that are not need only modest reductions in ambient $PM_{2.5}$ levels to meet the government objective.

When the federal government created the standard for fine particulate matter in 2001, it simultaneously released a new standard for ground-level ozone, a target also meant to be achieved by 2010. Ground-level ozone is a component of urban smog, and it is linked to adverse health effects in humans, particularly a variety of respiratory problems.

Overall, ozone levels in Canada's urban centres have remained stable in recent years. Chart 5 (below) shows the national average level of ground-level ozone between 1991 and 2005. This average is based on the results from 59 monitoring stations located in large urban centres, eight stations located in small urban centres and 32 stations in agricultural areas.

Chart 5: Actual National Ozone Level Compared with 2010 CWS Target



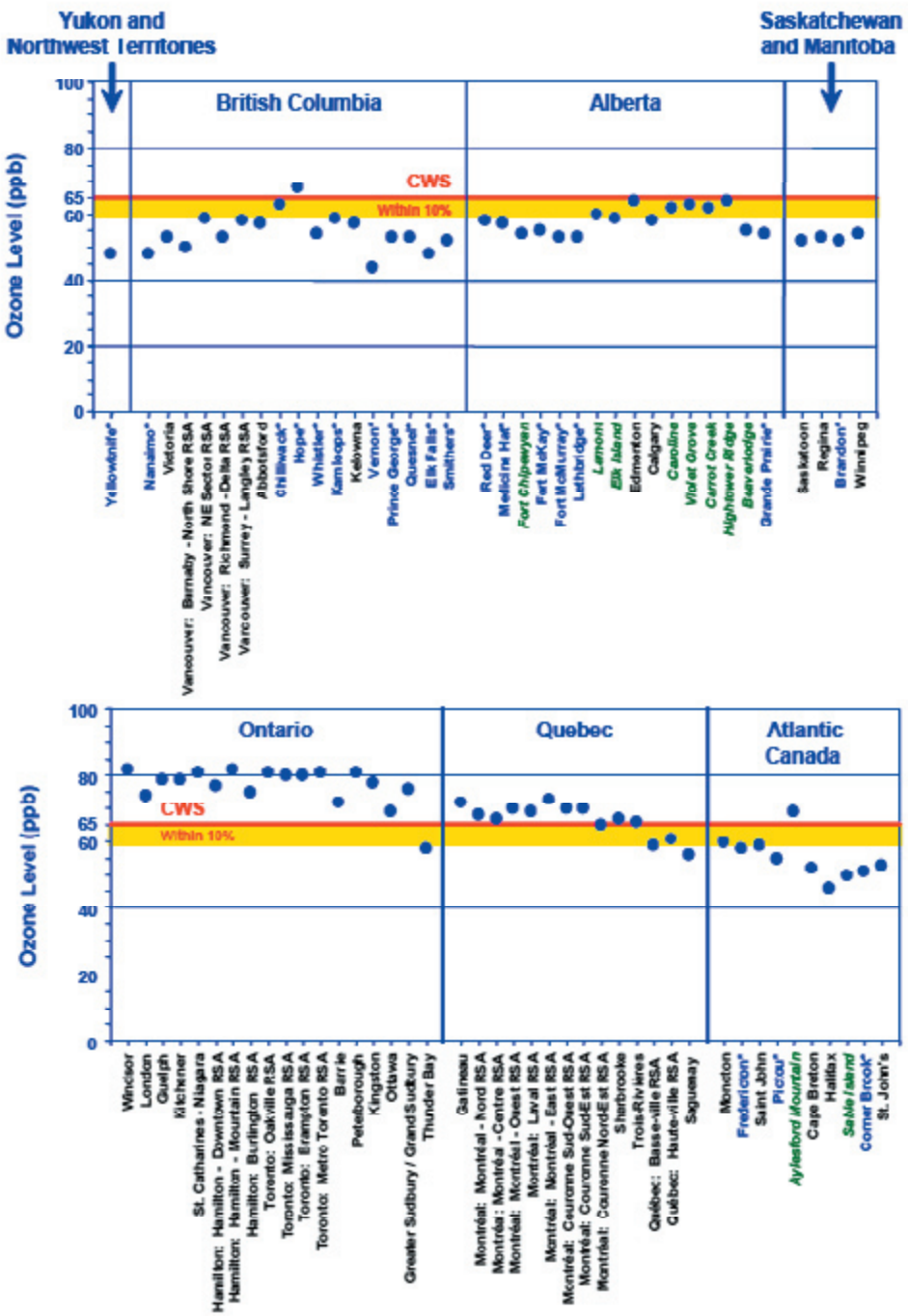
Source: Government of Canada, *Five-Year Progress Report: Canada-wide Standards for Particulate Matter and Ozone,* (2007) p. 20.

As Chart 5's plot suggests, nationally averaged ground-level ozone has remained roughly constant and quite close to, but slightly above, the Canada-wide Standard since 1991. This does not denote a lack of progress, however. To understand this in context, one must recognize that Canada's population and level of economic activity have expanded dramatically since the early 1990s, and it is a noteworthy achievement that this growth has been accomplished *without a statistically significant increase in the national level of ambient ground-level ozone.* In addition, ozone control is more complex than is the case for some other pollutants. Ozone forms in the atmosphere when certain precursor chemicals are exposed to sunlight. One of these precursors—volatile organic carbon—has a large natural component that varies regionally, and the ratio of the precursors must be carefully controlled to obtain reductions in ozone levels.

As was the case with fine particulate matter, cities and towns with levels of ground-level ozone that do not comply with the Canada-wide Standard are concentrated in southern Ontario and southwest Quebec.

As Chart 6 (below) shows, the overwhelming majority of towns and municipalities in other parts of the country already have

Chart 6: Ozone Levels in 2003-2005 Compared with the 2010 CWS



Note: The blue text identifies communities with a population below 100,000. The green italics denote non-urban monitoring stations.

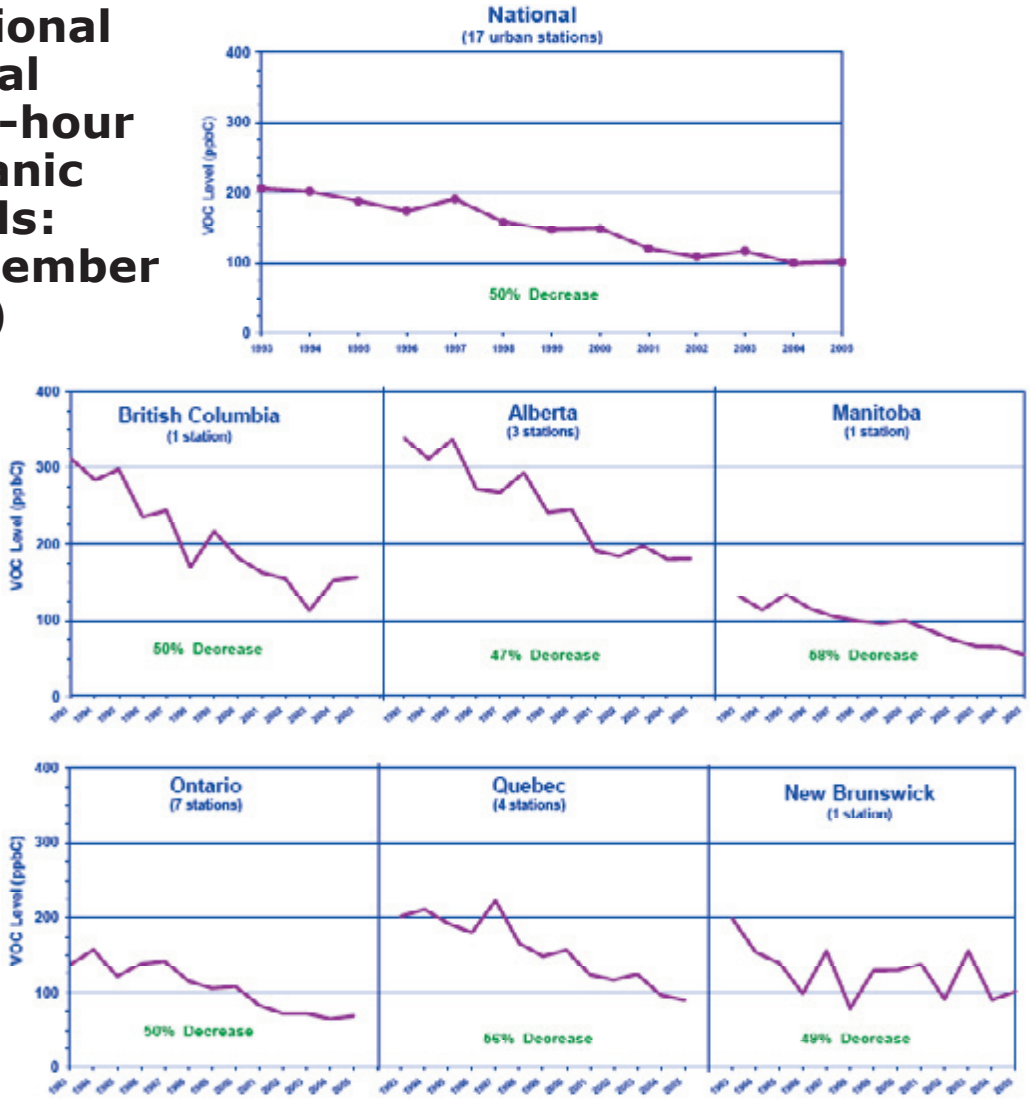
Source: Government of Canada, *Five-Year Progress Report: Canada-wide Standards for Particulate Matter and Ozone,* (2007) p. 13.

ambient levels of ground-level ozone below the CWS target for 2010.

Certainly, it would be desirable for those communities in Ontario and Quebec that currently exceed the Canada-wide Standard to reduce their ambient ground-level ozone in order to meet the target by 2010. There is significant evidence that such reductions are likely to occur in the coming years. Environment Canada's five-year progress report (which evaluated progress toward meeting the new Canada-wide Standards for air quality) also examined trends in the ambient levels of ozone precursors such as nitrogen oxides and volatile organic compounds. Large quantities of these pollutants are thought to contribute over time to the formation of ground-level ozone; thus, reductions in these ozone precursors are likely to contribute to lower levels of ozone in the future.[9]

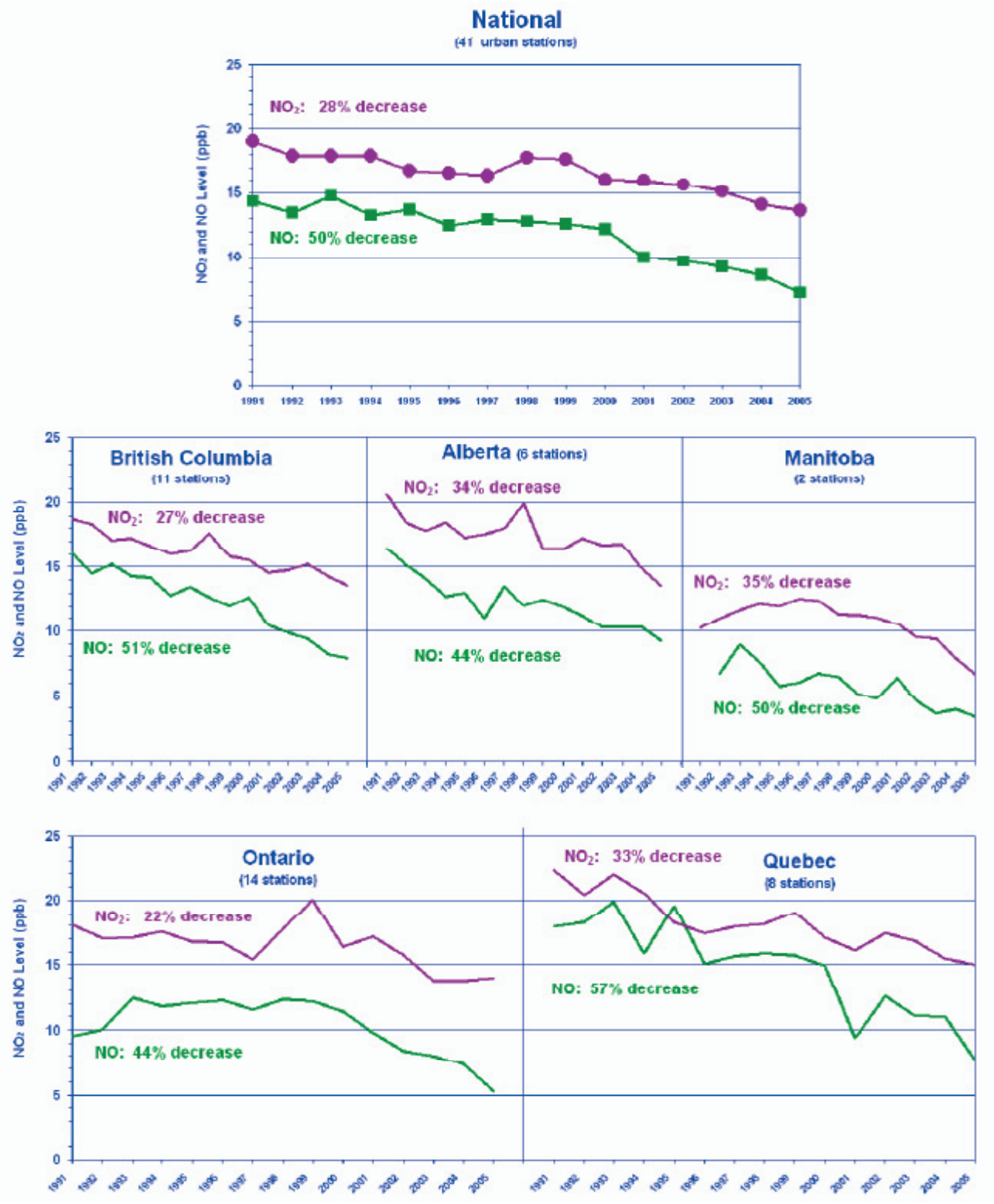
As the following charts indicate, there have been large decreases in the ambient levels of both pollutants over the past 15 years. Of particular importance are the very large decreases in both pollutants in Ontario and Quebec, the two provinces where ozone levels exceeding the CWS are concentrated.

Chart 7: National and Provincial Trends in 24-hour Volatile Organic Carbon Levels: April to September (1993–2005)



Source: Government of Canada, *Five-Year Progress Report: Canada-wide Standards for Particulate Matter and Ozone,* (2007) p. 24.

Chart 8: National and Provincial Trends in One-hour NO2 and NO Levels: April to September (1991-2005)



Source: Government of Canada, *Five-Year Progress Report: Canada-wide Standards for Particulate Matter and Ozone,* (2007) p. 22.

These dramatic reductions in ambient ozone precursors are likely to act as a force against the formation of ground-level ozone. Significant reductions in these precursors in Ontario and Quebec are particularly important, as they may help prevent the formation of new ground-level ozone in the years ahead. This will, hopefully, help these provinces lower their urban levels of ground-level ozone in order to meet the Canada-wide Standard by 2010 or shortly thereafter.

Conclusion

The air that Canadians breathe now is much cleaner and healthier than the air was just three decades ago. This section showed that Canada's urban centres have seen rapid reductions in sulphur dioxide and nitrogen dioxide in recent years and that, due to these reductions, cities and towns across the country have ambient levels of these pollutants that are below the allowable standards established by the country's air-quality objectives.

Many cities in Ontario and Quebec have not yet achieved the 2010 standard for fine particulate matter and ground-level ozone. However, there is still hope for these provinces in terms of their likelihood of meeting the targets in the near future. Fine particulate matter levels are generally very close to the Canada-wide Standards, and in almost all cities, the reductions required to meet the CWS are quite small. Furthermore, ambient levels of ozone precursors have dropped significantly in recent years in both Ontario and Quebec, which may well lead to lower levels of ground-level ozone formation in the coming years.

This dramatic improvement in Canadian air quality seems even more impressive in light of the remarkable growth that has taken place in Canadian cities over the past several decades. Canada's cities and towns have grown rapidly over the past 30 years due to natural population growth and the significant urbanization of the population over the same period. In addition to the growing populations, cities and towns have enjoyed significant per person economic growth. Together, these trends mean that urban centres in Canada are both more populous and more economically productive than they were during the 1970s. Despite rapid urbanization, population growth and economic growth, the air in Canadian cities is much cleaner than it was 30 years ago, and this should be recognized as a significant achievement.

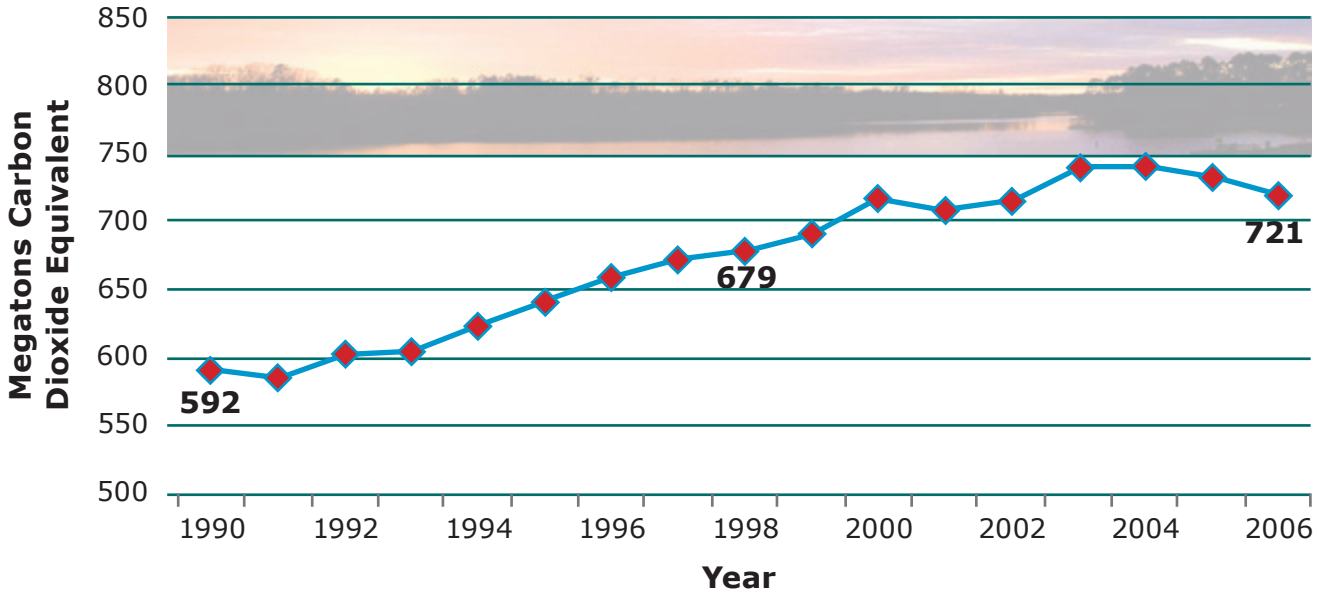
"This dramatic improvement in Canadian air quality seems even more impressive in light of the remarkable growth that has taken place in Canadian cities..."

Greenhouse Gas (GHG) Emissions

In recent decades, there has been a slight increase in average global temperatures. Many scientists think that some of this change is caused by the actions of human beings, specifically, the emission of greenhouse gasses (GHG) into the atmosphere.[10] Furthermore, some scientists warn that computer models suggest that if GHG emissions continue to rise, this warming trend may accelerate and pose a serious threat to the well-being of both people and wildlife.[11] Other scientists dispute this and suggest that the sensitivity of the climate to greenhouse gases is not terribly high. Therefore, only modest warming (or slight suppression of cyclical cooling trends) should be expected.[12] Still others view recently observed climate change as a natural emergence from an ice age that ended around 1800 combined with a 30-year cycle of warming and cooling that is driven by ocean currents.[13]

Those who view climate change as a real but modest long-term environmental challenge will not be overly alarmed by Canada's GHG trends and will take comfort in its progress in emitting fewer greenhouse gases per unit of production or GDP. Those who take the more-alarmist view, however, will find disappointment in Canada's GHG trends. Throughout the past 20 years, Canada has significantly increased its total GHG emissions. Despite the federal government's ratification of the Kyoto Protocol, which committed the country to reducing its overall GHG emissions by six per cent from 1990 levels, Canada has increased its total emissions by over 20 per cent from the 1990 baseline. Although Canada has experienced modest emission reductions during the middle of this decade, the general trend for this indicator has been a substantial increase in total emissions.

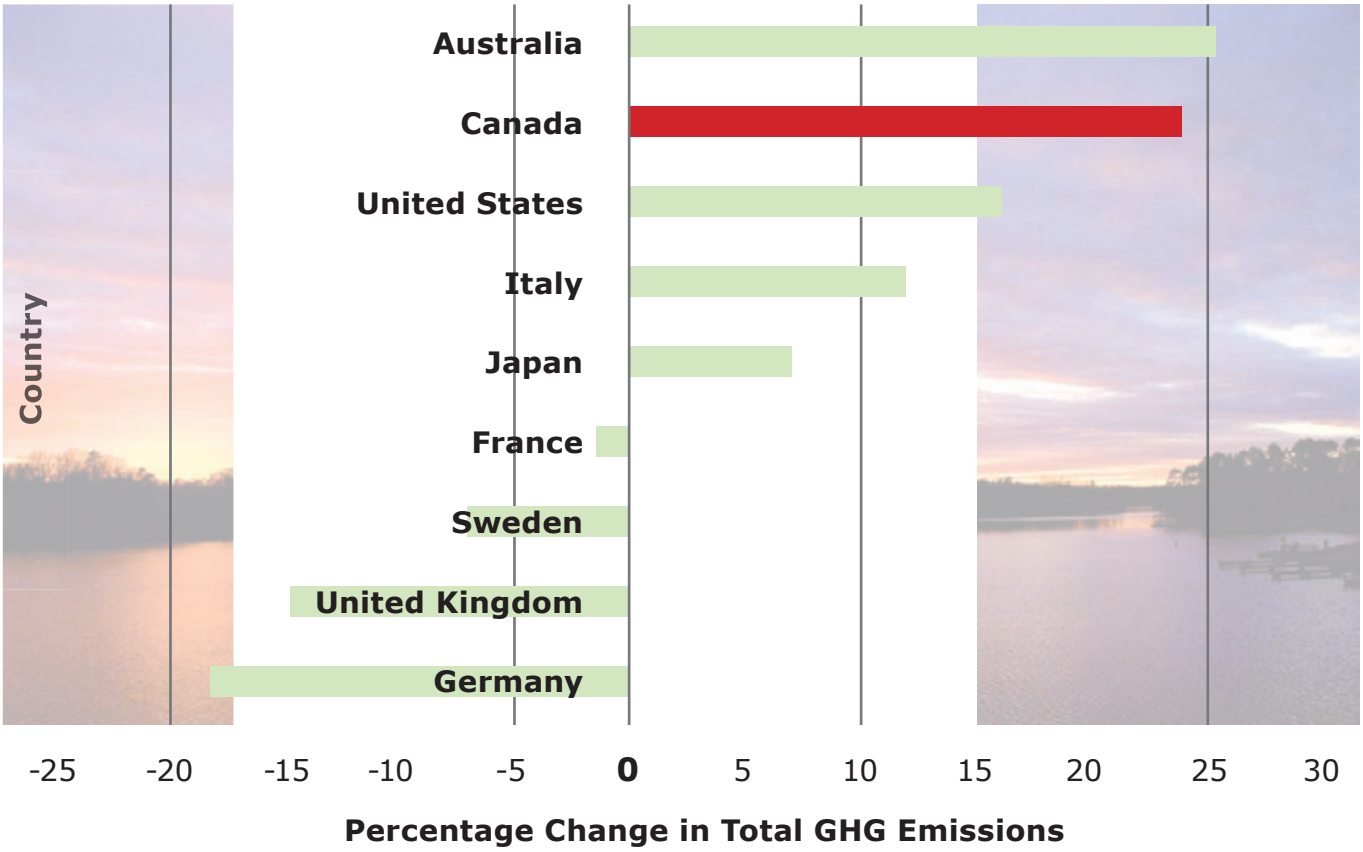
Chart 9: National GHG Emissions (1990-2006)



Source: Environment Canada, *The National Inventory Report 1990-2006: Greenhouse Gas Sources and Sinks in Canada* (2008).

Over the past 20 years, several of Canada's peer countries have achieved significant GHG emissions reductions; therefore, this increase in GHG emissions stands out. There are many compelling reasons why it has been especially difficult for Canada to reduce its emissions: rapid population growth, an unusually cold climate relative to other nations and large transport distances between population centres. This is the reality, but it is nonetheless a source of consternation that Canada's GHG emissions have continued to rise in recent years while many other industrialized countries have succeeded in reducing theirs.

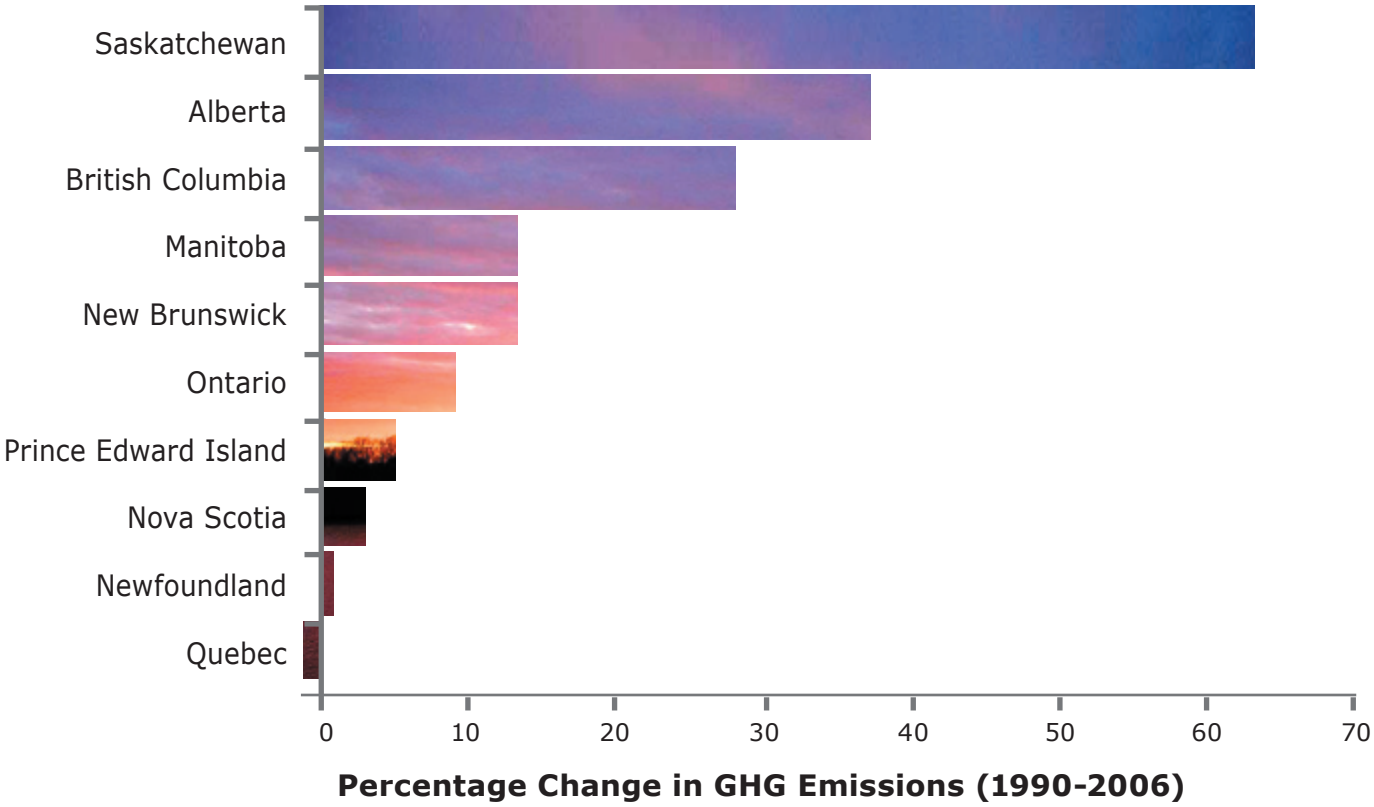
Chart 10: Change in Total GHG Emission Level (1990-2006)



Source: Environment Canada, *Canada's Greenhouse Gas Emissions: Understanding the Trends 1990–2005* (2008).

Although Canada as a whole has experienced GHG emission increases since 1990, there are significant variations among regions of the country in terms of their emissions trends. While some provinces, particularly those with large amounts of oil and gas resources, have experienced rapid emissions growth in recent years, other provinces that possess other sources of energy such as hydroelectric power have not significantly escalated their GHG emissions from 1990 levels. For example, Prince Edward Island and Nova Scotia have not experienced large increases, and there has been no increase at all in GHG emissions for Quebec and Newfoundland.

Chart 11: Change in Total GHG Emissions Levels by Province (1990-2006)



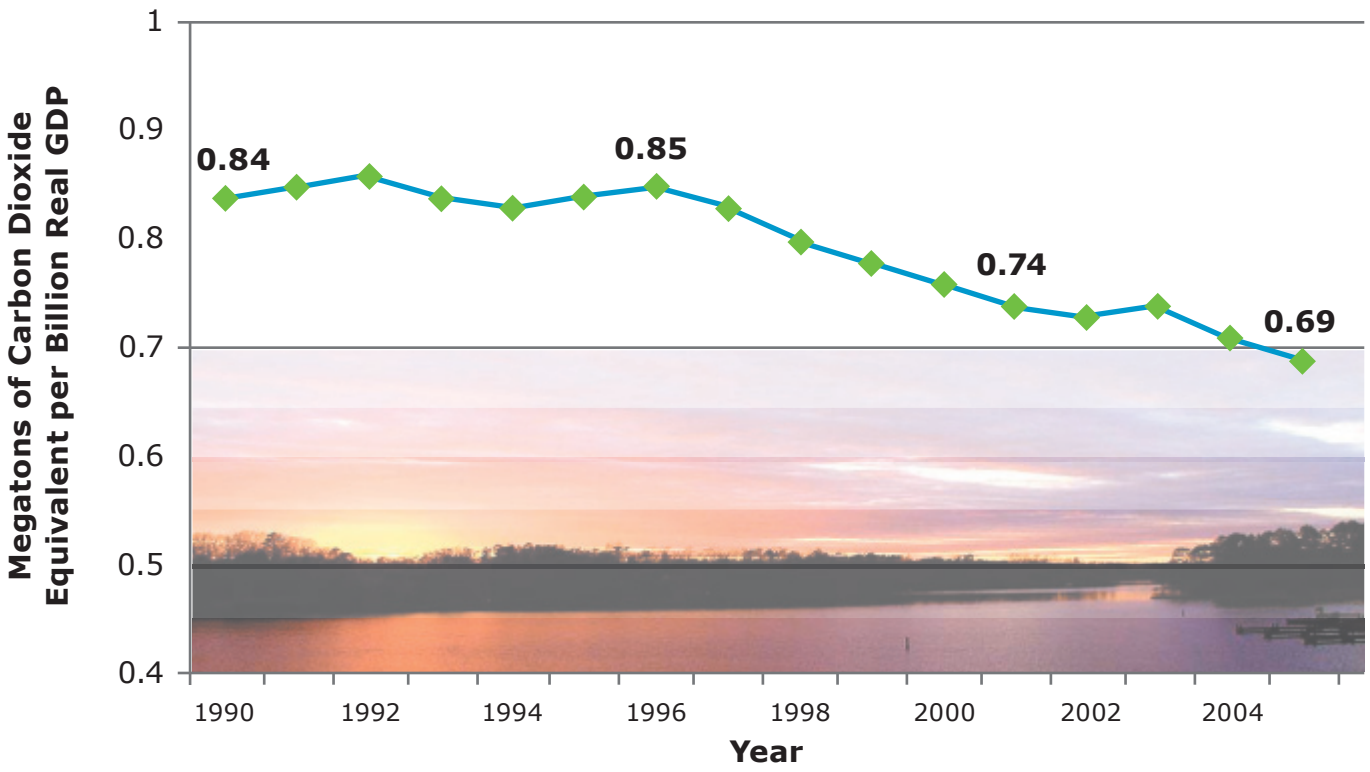
Source: Environment Canada, *Canada's Greenhouse Gas Emissions: Understanding the Trends 1990–2005* (2008).

Although some provinces have experienced little or no emission escalation, the large increases in other provinces have caused Canada's national GHG emission levels to grow throughout the past 20 years.

However, despite the vocal complaints of some environmental activists, the story is not uniformly bleak. In recent years, Canada has made significant progress toward a successful transition to an economy with lower greenhouse gas emissions. This progress can be measured by looking at the efficiency of energy use in Canada. The best indicator for this trend is GHG emissions per unit of gross domestic product. This indicator measures the GHG emission intensity of economic activity in a country by comparing the total amount of economic activity that takes place during a specific period with the total amount of GHG emitted during that period. This statistic is particularly valuable because it provides an indicator of GHG emission trends in a way that does not punish countries that experience growth.

As the chart below indicates, Canada has made significant strides in reducing the GHG emission intensity of its economic activities in recent years. Measuring GHG emission intensity per unit of inflation-adjusted economic activity, Canada's emission intensity has dropped approximately 18 per cent since 1990. This means that many more goods were produced and much economic activity occurred for each tonne of GHG emitted in 2005 as compared to 1990.[14]

Chart 12: National GHG Intensity (1990-2005)



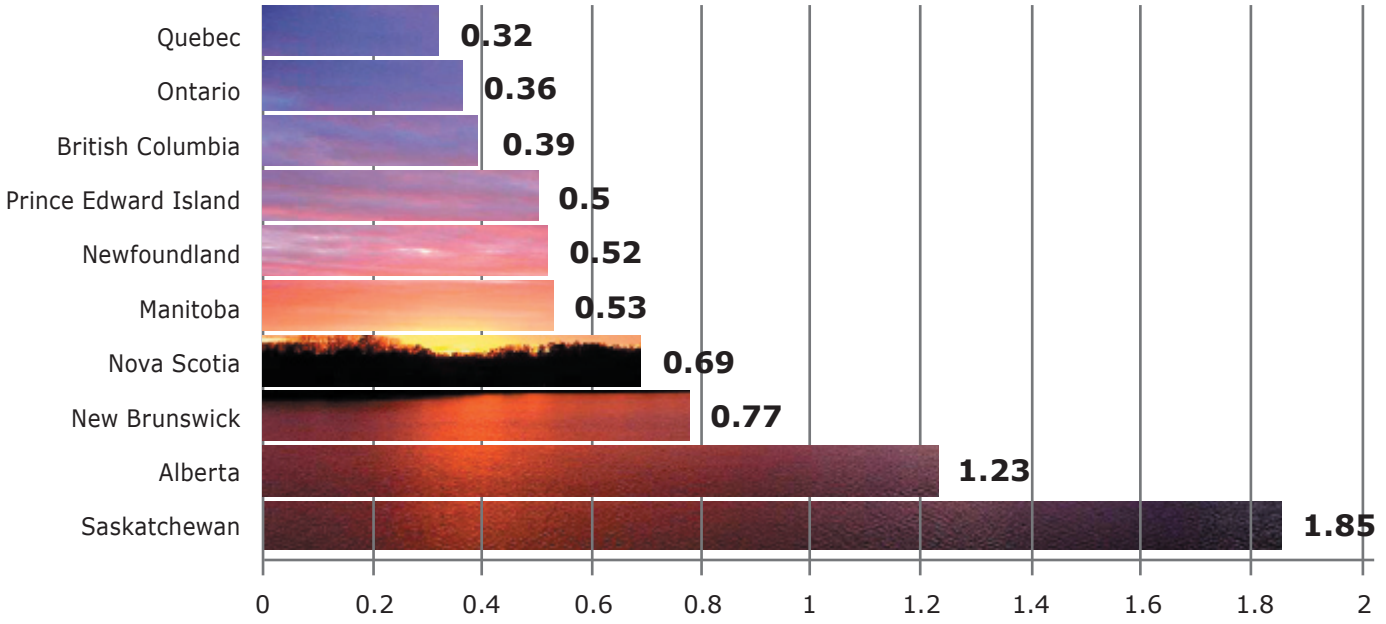
Note: GDP is in 1997 constant dollars. Source: Human Resources and Skill Development Canada, *Indicators of Well-Being in Canada: Greenhouse Gasses* (2009).

Despite this significant improvement in recent years, Canada's emission intensity per unit of GDP is still relatively high when compared with its peers in the Organisation for Economic Cooperation and Development (OECD). Some of the reasons, such as Canada's cold weather and large geographic size, were noted earlier. However, the fact that Canada's GHG emission intensity has dropped significantly since the 1990s shows that the image of Canada that is put forward by some activists as making no progress in this area is misleading.

Although some countries such as the United Kingdom and Germany have reduced their GHG emission intensity more rapidly than has Canada in recent years, other large OECD economies such as Italy and Japan have not reduced their emission intensity as substantially as Canada has since 1990.[15] This indicator shows that rather than being the laggard some suggest, Canada has participated in a trend that has prevailed across the OECD toward lower levels of GHG emission intensity. While some countries reduced their emission intensity more than Canada has, others reduced their intensity level less. In short, Canada's progress in this area has not been unusually slow when compared with its OECD peers.[16]

Although Canada's overall level of GHG emission intensity has been reduced in recent years, GHG emissions and emission intensity are not distributed evenly across Canada. As Chart 13 (next page) indicates, some Canadian provinces such as Alberta and Saskatchewan have very high levels of GHG emission intensity whereas other provinces such as Quebec and Ontario emit far less GHG per unit of economic activity.

Chart 13: Provincial GHG Intensity



Source: Environment Canada, *Canada's Greenhouse Gas Emissions: Understanding the Trends 1990–2005* (2008).

These provincial differences are not necessarily signs that a province is more wasteful or less environmentally conscious than are those where emission intensity is low. The differences in emission intensity among the provinces are largely driven by the types of economic activity that prevail in the regions and the nature of the energy sources that are available in them. For example, Alberta has experienced tremendous economic growth in recent decades due to a boom in its oil and gas sector. However, because Alberta lacks substantial quantities of alternative energy sources, the province is heavily reliant on carbon-based energy sources, which lead to high levels of emission intensity. In contrast, Quebec possesses large sources of hydroelectricity and is therefore able to meet its energy needs with the use of fewer carbon-intensive fossil fuels.[17] The difference in the types of abundant energy in each region and differences in the economic structures of the regions are the primary drivers of provincial variation in GHG emission intensity.

Conclusion

While Canada's greenhouse gas emissions continue to rise, strides have been made toward cresting the transition curve for GHG emissions.

Canada has dramatically reduced its GHG emission intensity by almost 20 per cent since 1990. Although some countries have managed to achieve more-impressive reductions, Canada's record in this area is not unusually poor when compared with its peer countries, particularly in light of the unique circumstances facing it that necessitate GHG emissions, including its cold climate and the vast distances between population centres.

Freshwater Withdrawals

Canada is blessed with enormous natural stores of fresh water. While many governments around the world struggle to provide access to clean, fresh water for their citizens, Canada is in the fortunate position of possessing more than enough freshwater resources to support the needs of its population. Despite having a population of only 33.5-million people, about one-half of one per cent of the world's population, Canada contains 20 per cent of the world's fresh water. Canada also contains seven per cent of the world's renewable freshwater resources. Only two countries in the world, Brazil and Russia, have more renewable fresh water than Canada does.[18] Renewable freshwater resources are the total volume of river runoff and groundwater generated under natural conditions by precipitation over land and the actual flow of rivers and groundwater coming from neighbouring countries.[19] In other words, a country's renewable fresh water is the water that is replenished each year by the natural processes of the biosphere. The processes of precipitation and river runoff that naturally replenish freshwater supplies do not replace fresh water such as fossil water that is retained in lakes and glaciers.

Canada's tremendous supply of fresh water combined with its relatively small population puts very little strain on this resource: consumption of fresh water is a small percentage of our total renewable supply of fresh water.

The most frequently used indicator of a country's water consumption is its total freshwater withdrawals. This indicator provides the annual quantity of water removed from available sources for any purpose.[20] By comparing Canada's total freshwater withdrawals with its supply of renewable fresh water, one can determine whether Canada's current level of water withdrawal places any stress on its freshwater resources.

A conservative estimate places Canada's total renewable freshwater flows at 2,850-billion cubic metres per year. Canada's annual freshwater withdrawals, relatively constant since the early 1990s, are approximately 46-billion cubic metres per year.[21] This means Canada currently withdraws approximately 1.6 per cent of its renewable freshwater flows annually. This number represents Canada's total freshwater withdrawals and includes all fresh water that is extracted for agricultural, industrial and domestic purposes.

Canada's 1.6 per cent is exceptionally low in comparison with other countries. It is, by almost all accounts, well below the level that Canada can safely withdraw. A few relevant international comparisons will serve to illustrate the very low level of stress Canada's freshwater supplies are under.

Our largest trading partner, the United States, has roughly the same amount of renewable fresh water as Canada does. However, due to its larger population of roughly 10 times that of Canada's, the United States withdraws 10 times more of its renewable water each year than does Canada. Total U.S. freshwater withdrawals are approximately 17 per cent of their annual renewable freshwater resources.

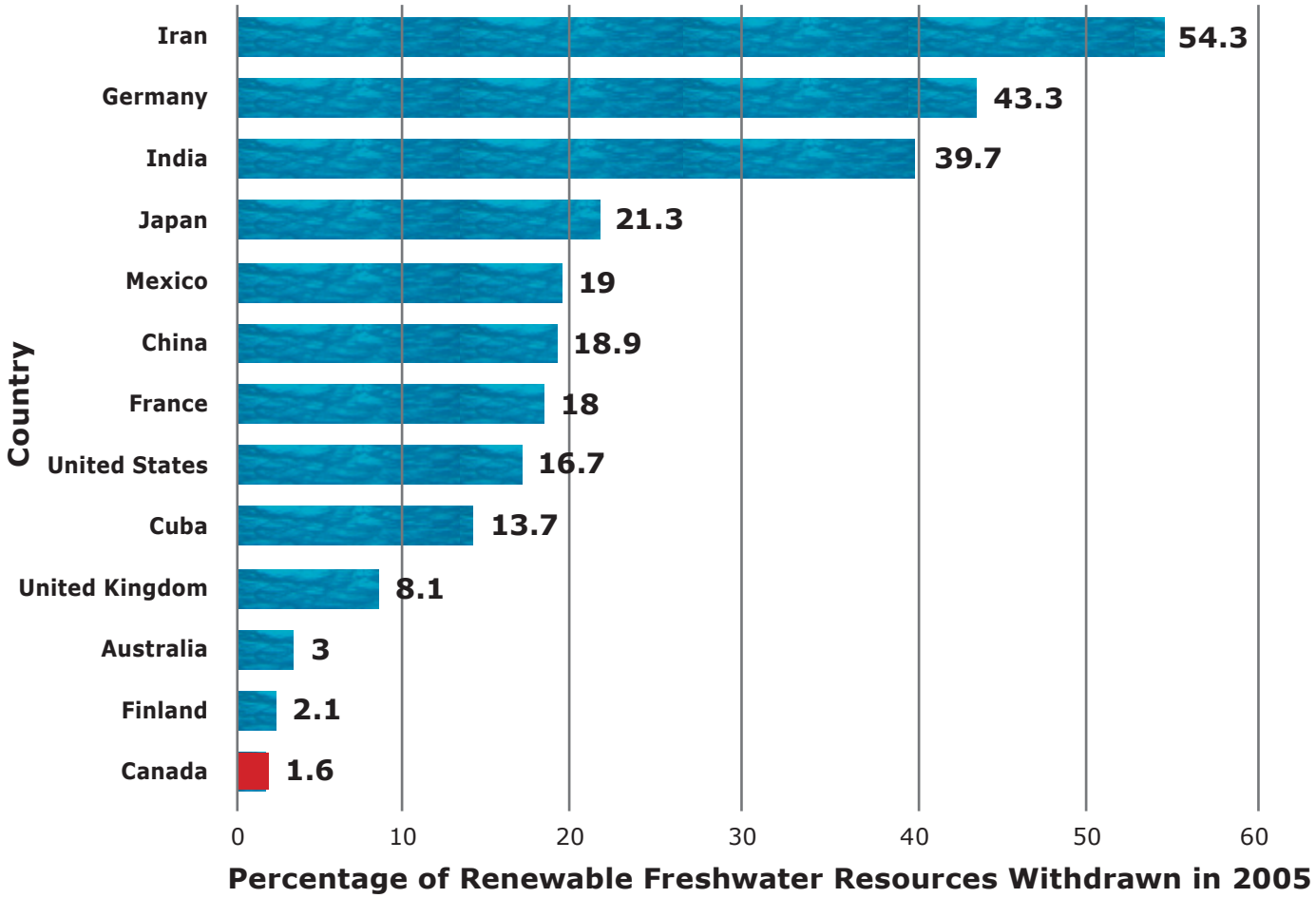
Canada's other NAFTA trading partner, Mexico, has significantly fewer freshwater resources than either Canada or the United States. For this reason, despite a relatively low level of water consumption, Mexico is

forced to withdraw approximately 19 per cent of its renewable freshwater resources each year to meet the water needs of its population.[22]

Although Mexico is relatively poor in freshwater resources when compared with Canada and the United States, many large and populous countries around the world are in an even worse position than is Mexico. These countries lack sufficient freshwater resources to meet the needs of their populations without causing long-term harm to the quality and quantity of fresh water available for future generations. To give one example, India's large population combined with the relative scarcity of fresh water has caused India to reach freshwater withdrawal levels in recent years of about 40 per cent of the country's renewable freshwater flows. Similarly, in Iran, scarce renewable freshwater resources cause the country to withdraw 54.3 per cent of annual renewable freshwater flows despite a relatively low level of per capita water consumption.[23]

As these examples illustrate and Chart 14 (below) confirms, the percentage of renewable fresh water that Canada withdraws each year is low in comparison with almost all other countries. Although there is some dispute within the scientific community concerning precisely how great a percentage

Chart 14: Percentage of Renewable Freshwater Resources Withdrawn (2005)



Source: World Bank, *World Development Indicators 2005* (2005).

of renewable fresh water can be extracted annually without ecological damage, Canada's current withdrawal levels are well below even cautious estimates. In other words, due to its abundant supply of fresh water, Canada could safely withdraw significantly more fresh water than it does currently without placing stress on its freshwater resources.

The state of the world's freshwater resources

Although Canada has more renewable fresh water than it needs, many parts of the world have insufficient freshwater resources to meet the needs of the local populations. Rapid population growth and economic development around the world in recent decades have led to a steady and sustained demand for new water supplies. As a result, global demand for water has more than tripled over the past 50 years.[24] Because of this growing demand and the inadequate local supplies of fresh water, huge numbers of people around the globe lack access to adequate amounts of clean water.

According to recent World Health Organization estimates, more than one-billion people lack access to clean water supplies, and almost 2.5 billion lack access to basic sanitation.[25] This widespread lack of access to adequate fresh water should be viewed as a serious humanitarian concern primarily because of the severe health repercussions associated with it. These include serious infections, diarrhoea, intestinal worms and the premature deaths of many thousands of people each year.[26] In addition to causing severe hardships in the lives of billions of people, the competition for scarce fresh water also contributes to tension between nations in some regions of the world.

Despite these depressing realities, the biosphere produces more than enough renewable fresh water annually to meet the needs of the world's population. The problems described in the preceding paragraphs do not exist because there is not enough clean, fresh water in the world; they exist because fresh water is distributed unevenly around the world. Whereas some nations such as Iran and India do not have adequate fresh water to meet the needs of their populations, others such as Canada and Brazil possess far more than they can realistically use.

Until recently, this problem appeared to be a difficult one to address, as the movement of large quantities of water across great distances was technologically unfeasible. However, new technologies are being developed that many people think will make the bulk transport of fresh water across large distances viable. These innovations include improved pipeline-construction techniques and remodelled tanker ships and, most recently, the development of large floating membranes, a technology that may become economically viable within a few years.[27]

As these technologies are being developed, tools are being created that could help people throughout the world gain access to clean, fresh water. The uneven distribution of water makes it clear that this objective can only be met by transferring freshwater resources from regions where they are abundant to regions where they are scarce. For countries such as India and Mexico, this represents an opportunity to obtain much-needed freshwater resources. For countries such as Canada and Brazil, it represents an opportunity for economic development, as it will allow the export of excess renewable fresh water, thereby making more-efficient use of currently underutilized natural resources.

> ***Selling only one per cent of the renewable fresh water that currently pours into James Bay and Hudson's Bay each year could create annual revenue of almost $1.5-billion in excess of the costs…***

It is unlikely that in the near future technology will make it possible for Canada to export large amounts of water to distant water-poor regions of the world. However, as the technology for the long-distance movement of fresh water evolves, large regions in North America that frequently experience water shortages, particularly Mexico and the American southwest, will be a large potential market for Canadian fresh water. The magnitude of the economic potential that Canada's freshwater resources are likely to create in coming years is significant. For example, a recent study examined the possibility of constructing a pipeline that would send water from northern Manitoba to the United States. The study found that selling only one per cent of the renewable fresh water that currently pours into James Bay and Hudson's Bay each year could create annual revenue of *almost $1.5-billion* in excess of the costs that would be associated with building and maintaining the pipeline.[28] One can begin to understand the potential impact of exporting this one per cent to the United States by considering that Manitoba's 2007 provincial budget was just $9.3-billion. In other words, a relatively modest withdrawal of freshwater resources from the far north may produce net revenue that is equivalent to 20 per cent of Manitoba's provincial budget. Since such a project would represent the withdrawal of only a small percentage of the water flowing down the rivers in the region, it would likely have no measurable effect on the surrounding ecosystem or on the long-term sustainability of the system's freshwater supplies. Many provinces have similarly significant supplies of renewable fresh water that modern technology will now or soon allow them to generate enormous amounts of economic activity by pursuing bulk water exports to the United States and Mexico without posing a threat to the long-term sustainability of their water.

The idea that Canada could pursue economic development by exporting fresh water to the United States and Mexico is not new and it has many staunch opponents. They fear that bulk water transfers to the United States will inevitably lead to the exploitation of Canada's fresh water; they believe the desire for profit will drive firms to remove more fresh water from Canadian watersheds than is sustainable. This general mindset has informed Canadian policy making in this area for some time, and Canadian law places severe restrictions on the export of water to the United States. Although a very small amount of water is sent to the United States in the form of expensive bottled water (itself a controversial source of environmental degradation), large-scale water exports are currently not permitted.[29]

While the sustainability of our freshwater supplies should be the primary concern of governments in this area of environmental policy, the evidence is strong that some large-scale water exports could be undertaken in a way that would do little or no damage to Canada's ecosystems. The danger of overuse can be mitigated by government oversight and regulation. These parameters and the limiting of bulk water transfers to a level that does not place any strain on the renewable supplies

would allow Canada to pursue opportunities for economic development without causing any measurable damage to ecosystems or to the long-term supply of fresh water.

While reckless exploitation of Canada's freshwater resources without regard for future generations would be foolish, a stance of strict opposition to all large-scale water exports to the United States and Mexico seems equally misguided. If Canada continues to oppose bulk water exports to its NAFTA trading partners, governments and potential beneficiaries such as future employees of water-export companies in the private or public sector will miss the opportunity to capitalize on the win-win situation that renewable natural resources provide. In the years ahead, Canada's economic development can be furthered significantly through the export of fresh water to the United States and Mexico with little or no adverse effects on long-term sustainability.

Although this report has stressed the abundance of Canadian water, wasting such a precious resource is undesirable. As noted earlier, Canadians are among the heaviest users of water in the world. Water consumption per capita in Canada is approximately twice as high as the average level in our 16 "peer group" countries as identified by the Conference Board of Canada. A major reason for this high level of water use is that many Canadians pay less than the market price for their water, and in many cases, they pay significantly less than the cost of water processing and delivery.[30] This situation promotes waste and the inefficient use of water and is particularly evident in the cities. Approximately 40 per cent of household water users pay a flat rate for water, regardless of how much they use. An additional 12 per cent pay a declining block rate in which the price of water drops as water use increases.[31]

"Water consumption per capita in Canada is approximately twice as high as the average level in our 16 "peer group" countries…"

At present, it does not appear that even such anti-conservation pricing will cause us to exhaust or even seriously strain our total water supplies—largely because Canada possesses a vast supply of fresh water. Nonetheless, the importance of water conservation becomes apparent when we consider the water's opportunity cost or the value of other potential uses for it. Bearing in mind the enormous economic benefits that could be achieved through the export of fresh water, significant opportunity costs are associated with inefficient domestic water use.

Keeping the price of water artificially low promotes inefficient usage. Consumers use more water than they would use if they were required to pay the full price of processing and delivery. This in turn creates economic inefficiencies and prevents Canadians from maximizing the potential benefits of the freshwater resources. There is a limit to the amount of fresh water that can safely be withdrawn; fortunately, Canada is nowhere near it. In order to maximize the benefits or utility created by Canada's freshwater resources, an appropriate amount should be withdrawn for domestic consumption and an appropriate amount should be used for exports. The inefficient and wasteful domestic use of water leads to excessive water consumption and therefore lost potential utility that these resources could provide. It is akin to governments subsidizing the per litre price of gasoline so that it costs only 20 cents per litre; more

gasoline would be used within Canada and less oil would be available for export.

The problem of domestic overuse of water can be largely and easily resolved if Canadian governments ensure that Canadians do not pay artificially low prices for water. Increasing the cost of water to the market price is a simple way to stimulate conservation and promote the efficient use of water.[32] By ensuring that more Canadians pay full price for the water they use, governments can eliminate a market distortion that leads to the inefficient use of Canada's freshwater resources. While this would be a hardship for some low-income consumers, the remedy to this problem is to subsidize those individual consumers, not all consumers regardless of whether they are rich or poor, the current misguided practice in most jurisdictions.

Since Canadians have so much fresh water available, there is no critical need for individuals to limit their levels of water consumption in order to preserve the freshwater resources. Similarly, there is no need for governments to ration water or pursue ineffective public awareness campaigns designed to tell Canadians how much water they should use. However, Canadians should not waste water either as people tend to do when something is free or under-priced. Instead, Canadians should feel free to use exactly as much water as they wish to and are willing to pay for at market rates. By promoting arrangements in which the cost of water is driven by how much water consumers actually use, governments can improve the efficiency of water use thereby creating circumstances under which Canada's freshwater resources will be put to the best possible use.

Conclusion

Although there is enough renewable fresh water in the world to provide for the needs of all human beings, over one-billion people do not have consistent access to clean drinking water. The primary reason is that water is unevenly distributed around the world. Countries such as Canada, which have rich supplies of fresh water, will, in the years ahead, have the opportunity to help water-poor countries and regions meet the needs of their populations while promoting the development of their own economies through the export of some renewable freshwater supplies. Due to the uneven freshwater distribution, it is only sensible, as we gain the technology, to do so; it is laudable to remove some water from areas of abundance and deliver supplies to areas of scarcity. Such activities will improve the lot of water-poor countries while allowing water-rich countries to profit from their large supply of water resources in an environmentally sustainable fashion.

Canada's enormous freshwater supplies would enable it to generate enormous economic opportunities for Canadians without threatening the sustainability of its resources. It would be a mistake for Canada to horde all of its freshwater supplies out of a reflexive anti-Americanism or an irrational fear that commercial activity would necessarily lead to environmental despoliation.

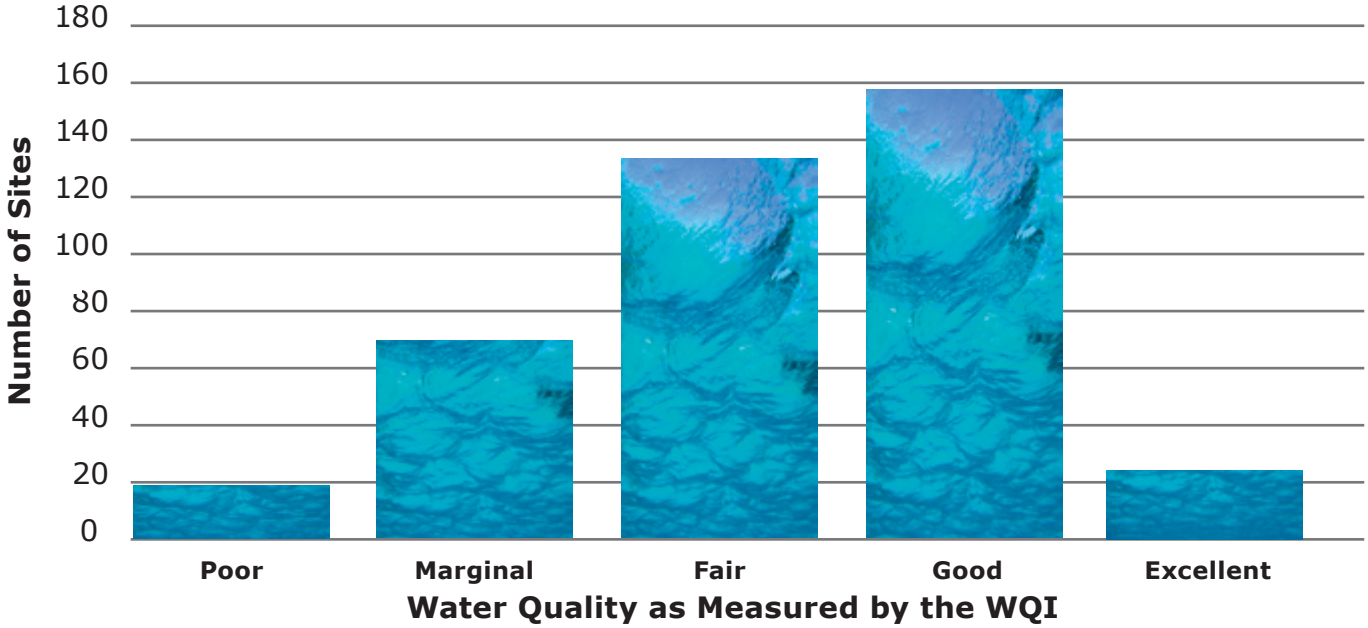
Freshwater Quality

The utility and value of fresh water depend largely upon its cleanliness. Many types of water pollution can render freshwater resources virtually useless; such pollution can have negative health effects on humans and on animal life. For example, the release of large amounts of plant nutrients such as phosphorus and nitrogen can create potentially toxic algal blooms in fresh water. Similarly, large concentrations of toxic substances such as mercury and industrial chemicals can have negative effects on human life and threaten the survival of marine life.[33]

Due to the large number of factors to be considered when water quality is addressed, the federal government uses a Water Quality Index (WQI) to obtain an overall picture of water quality in Canada. The WQI is a composite measure that allows experts to convert a wide variety of complex water-quality data into a single rating for a particular freshwater site.[34] The WQI provides a simple snapshot of freshwater quality by measuring how often the pollutant levels exceed the guidelines and by what amount. The WQI is used to rate freshwater sites as excellent, good, fair, marginal or poor. High ratings (excellent and good) indicate that pollutant measurements rarely exceed the water-quality guidelines and on the infrequent occasions when they do, it is generally by a narrow margin.[35]

Nationally, Environment Canada rates the overwhelming majority of monitored freshwater sites as either good or fair. As the chart below illustrates, approximately 50 per cent of monitored sites fall into the good range, making it by far the most common designation.

Chart 15: Status of Freshwater Quality at Sites in Canada (2003-2005)



Source: Government of Canada, *Canadian Environmental Sustainability Indicators 2007* (2008).

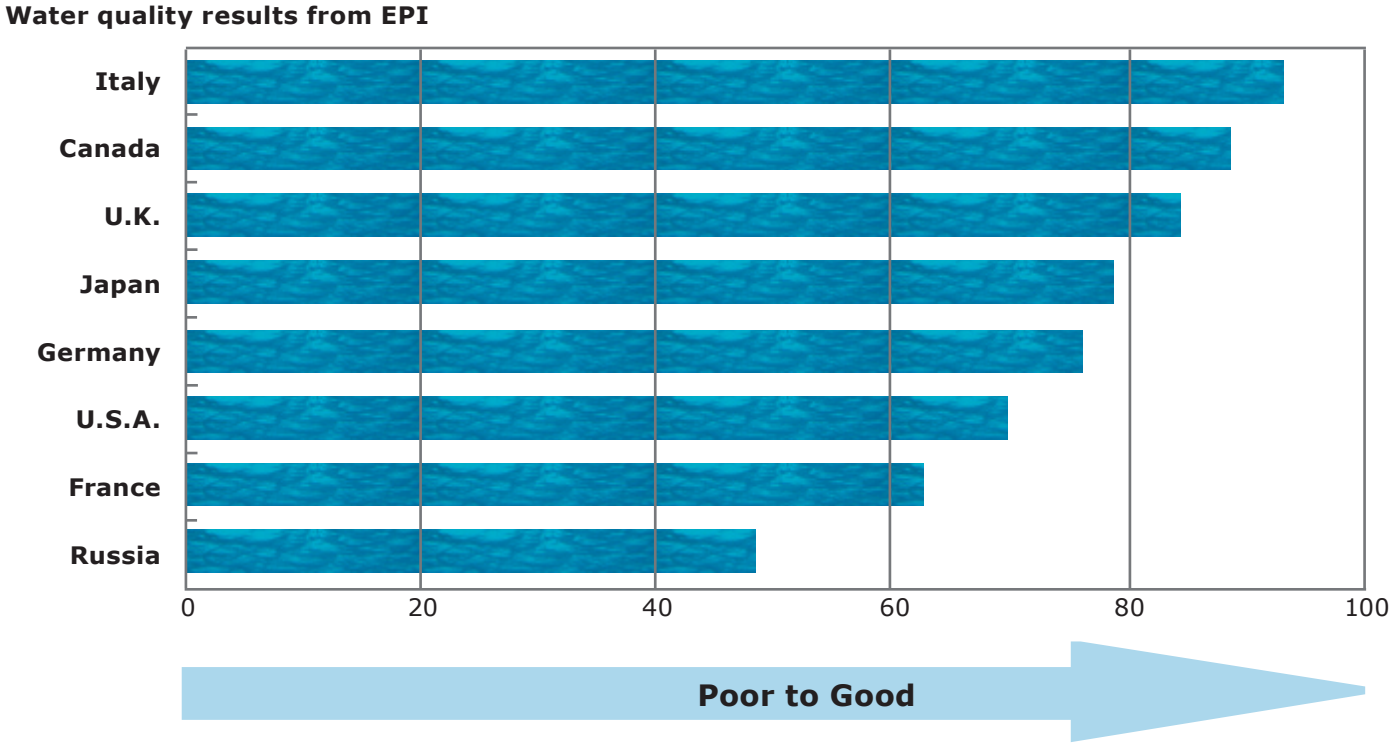
Overall, these statistics should be understood as suggesting that freshwater quality in Canada is quite good. More than twice as many freshwater sites fall into Environment Canada's top two designations, good and excellent, than fall into the bottom two, marginal and poor.

It is also useful to note that government monitoring stations are concentrated in heavily populated parts of the country. For this reason, Environment Canada cautions that this indicator should not be viewed as representative of all fresh water in Canada, but, instead, water quality in heavily settled areas of concern.[36]

Since very few monitoring stations are located in remote areas where large amounts of water are likely pristine, the overall state of fresh water is probably better than is suggested by Environment Canada's monitoring.

Due to the complexity of measuring water pollution and the difficulty in interpreting broad ratings such as those used by the Canadian government, the consideration of international data is useful in understanding how Canada compares with peer countries in terms of freshwater quality. One of the most frequently cited measures used in the cross-country analysis of water quality is the Environmental Performance Index of Water Quality (EPI). The EPI was developed as part of a project conducted by academics at Yale and Columbia universities. The EPI assigns each country that it monitors a rating based on measurements from water sites.[37] As the Chart 16 (below) illustrates, the quality of fresh water in Canada as measured by the EPI is among the best in the world. Among its G8 peers, Canada has the second-highest EPI rating and trails only Italy.

Chart 16: Water Quality by Country



Source: Government of Canada, *Canadian Environmental Sustainability Indicators Highlight Report 2008,* (2009) p. 7.

Although it is difficult to define freshwater quality due to the complexity of the scientific issues involved, it can safely be said that Canada is a world leader in this area of environmental policy. Despite the generally high level of water quality in Canada, however, the quality of fresh water is not consistent across the country. Charts 17–21 (below-next page) show the WQI results of all the monitoring stations in several of Canada's major drainage areas. Environment Canada cautions against using this information to directly compare water quality among the drainage areas because the locations of the monitoring stations were not intended to be fully representative. Nonetheless, the data seem to suggest that while the quality of fresh water is not identical across Canada, water quality is consistently high, as none of our major drainage areas contains large numbers of monitored sites at which water quality is judged poor or marginal.

Chart 17: St. Lawrence Drainage Area

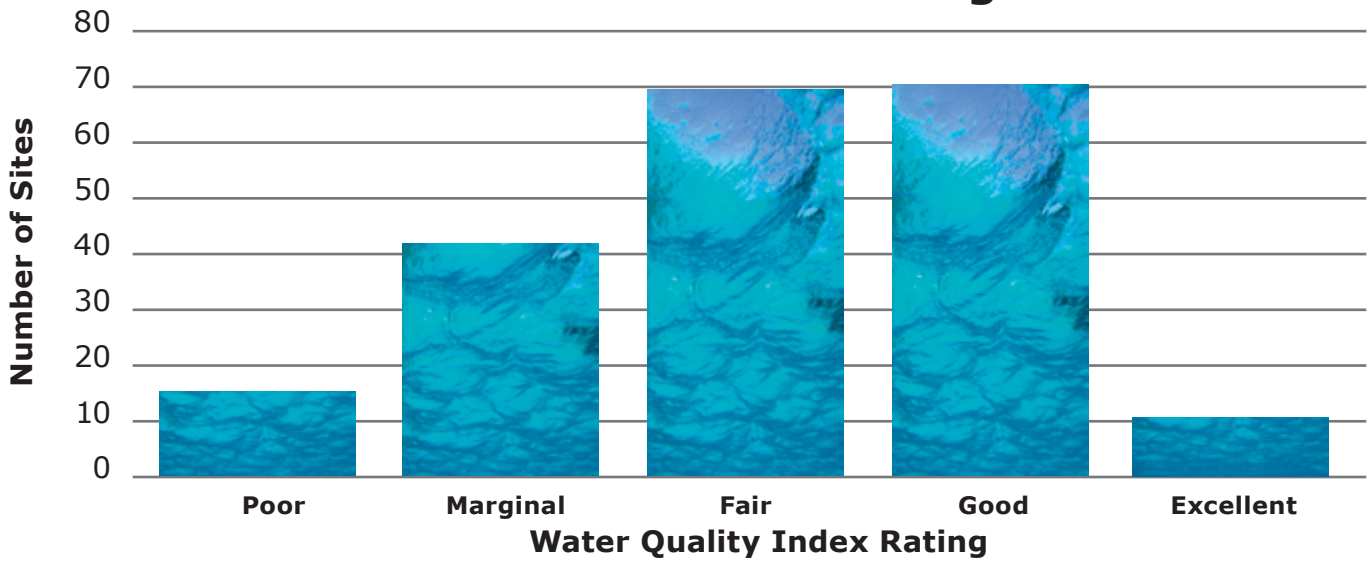


Chart 18: Nelson Drainage Area

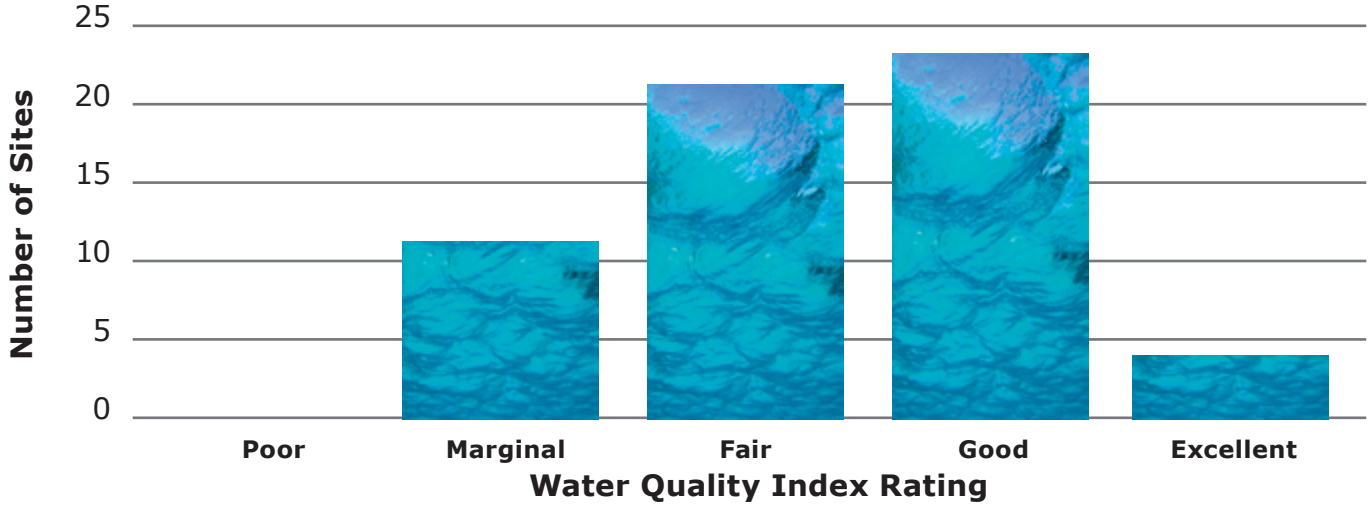


Chart 19: Maritime Provinces Drainage Area

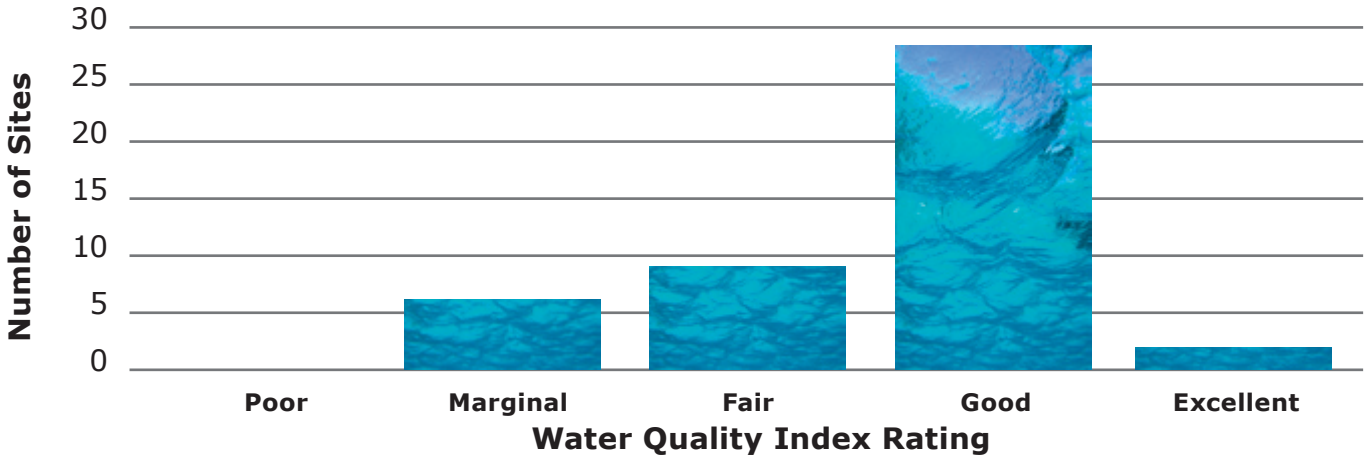


Chart 20: Newfoundland and Labrador Drainage Area

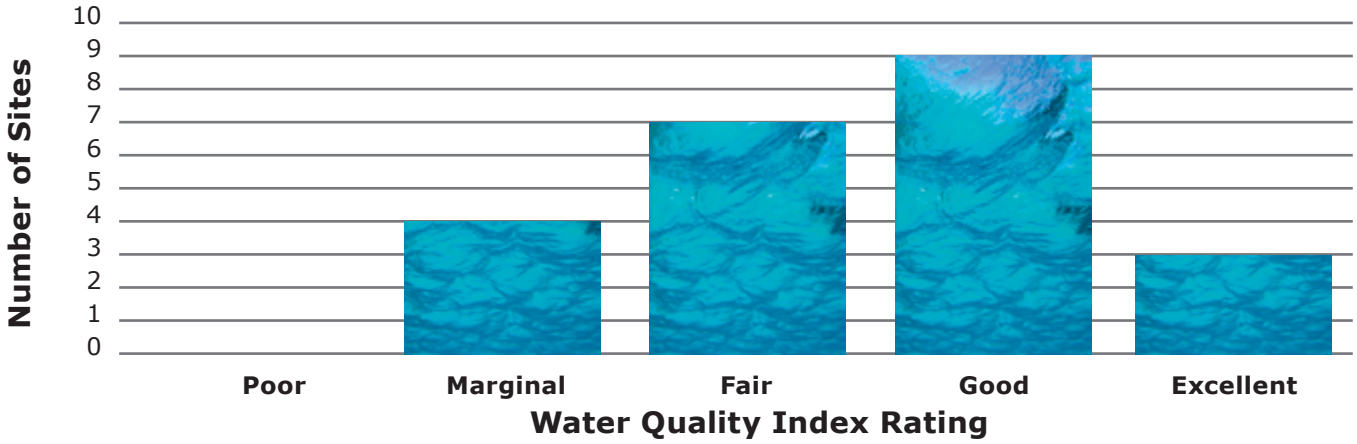
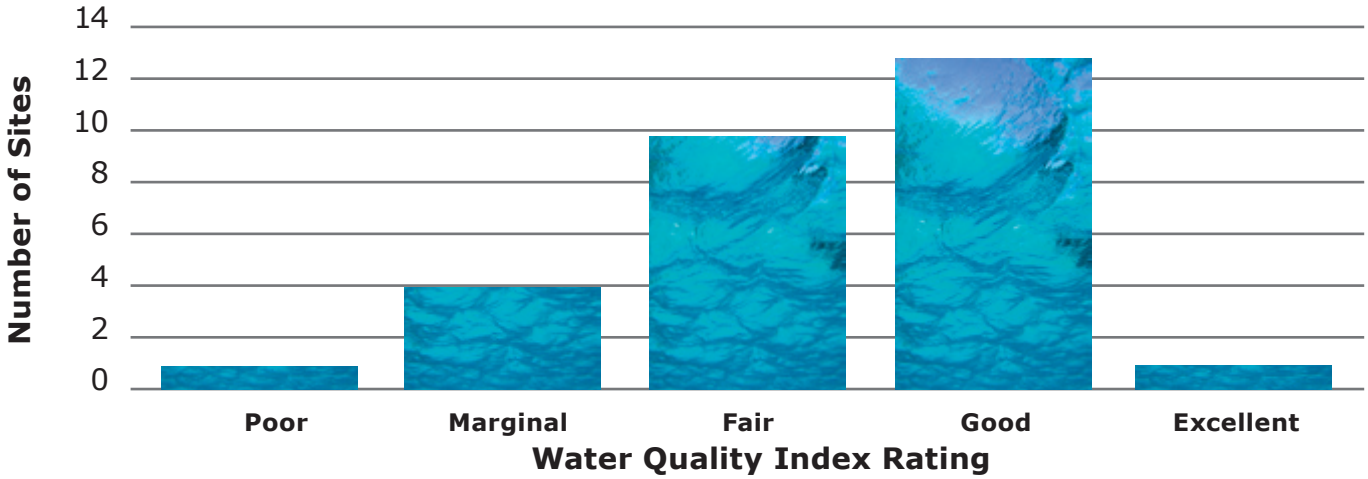


Chart 21: Pacific Drainage Area

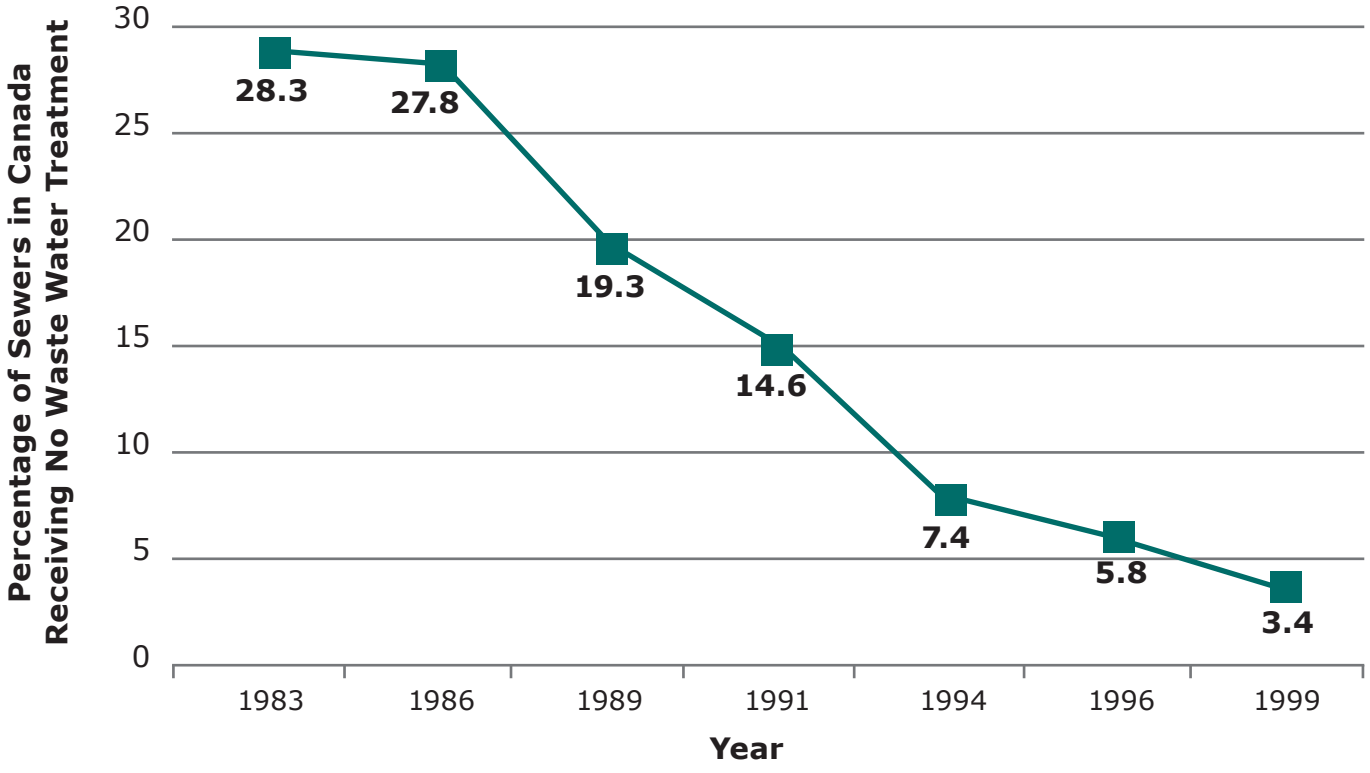


Source: Government of Canada, *Canadian Environmental Sustainability Indicators 2007* (2008).

Canada's overall freshwater quality is very good when compared with its peer countries, and water quality is excellent in some major drainage areas. A high percentage of sites in the Newfoundland and Labrador drainage area and the Maritimes drainage area are rated either good or excellent. None of the major drainage areas has a high concentration of sites that are rated poor or marginal by Environment Canada. Although there does seem to be some variation in water quality across the country, Canada's major drainage areas are all quite good in terms of water quality, and none have large numbers of monitoring stations that register high levels of pollution.

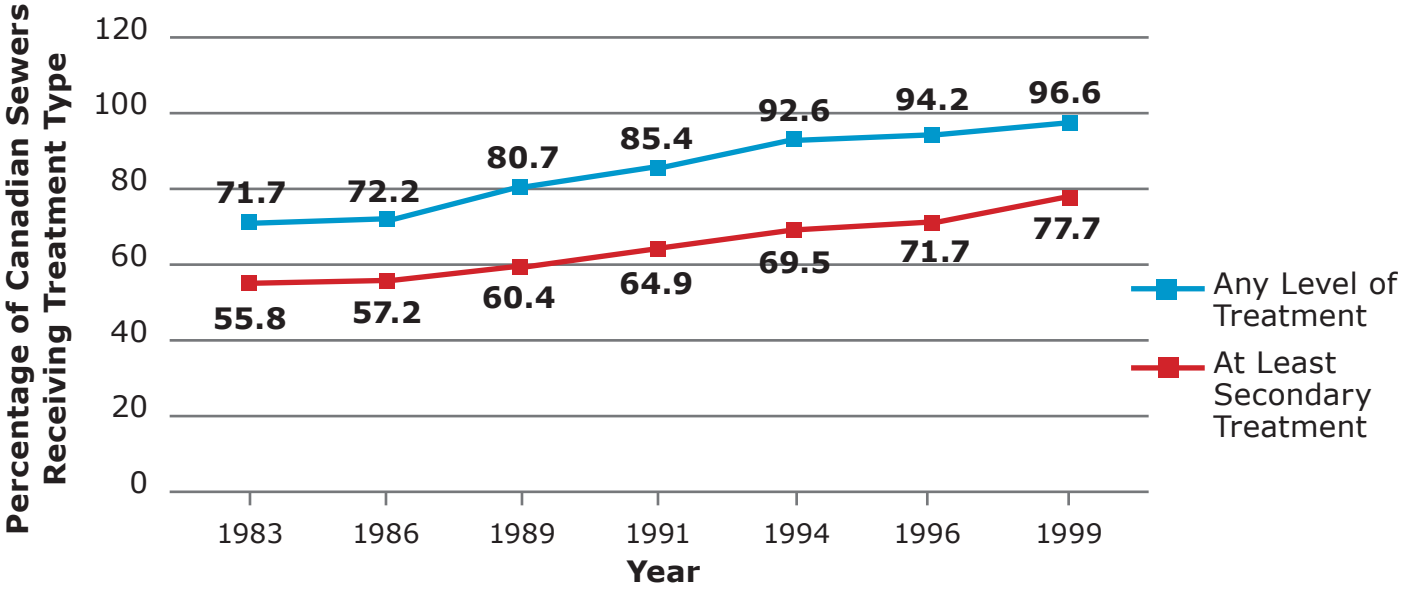
Although Canada's freshwater quality is very good, Canada has recently taken measures that will likely contribute to further improvements in water quality. Of particular importance are the significant increases in the number of Canadians served by waste water treatment. Municipal waste water discharges are a major source of water pollution in Canada. Municipal waste water consists of sanitary sewage and storm water and usually contains debris, suspended solids, harmful pathogens, organic waste and various chemicals.[38] Sophisticated waste water treatment can substantially reduce the danger that waste water discharges pose to water quality. There are different levels of waste water treatment, and as the graph below indicates, the quality of sewer treatment in Canada has improved substantially in recent years, as more cities and towns have upgraded their treatment facilities.

Chart 22: Untreated Waste Water in Canada



Source: The Conference Board of Canada, *How Canada Performs: A Report Card on Canada* (2008).

Chart 23: Waste Water Treatment in Canada



Source: The Conference Board of Canada, *How Canada Performs: A Report Card on Canada* (2008).

In 1983, 28 per cent of municipal sewers in Canada received no treatment, but by 1999 that number was reduced to 3.4 per cent. While the number of untreated sewers declined swiftly, there was a marked increase in the number of sewers that received advanced secondary and tertiary treatments. In 1983, approximately 55 per cent of sewers received at least secondary treatment, and by 1999 that number increased to 78 per cent. These trends toward superior wastewater treatment contributed to improvements in the quality of Canada's fresh water in recent decades, and they are likely to continue to do so in the years ahead.[39]

Conclusion

Canada is blessed with enormously abundant freshwater resources and it is a world leader in terms of freshwater quality. Among G8 countries, Canada has the second-cleanest level of freshwater in the world and trails only Italy. In addition, water quality is high across Canada, as none of its major drainage areas contains large numbers of sites that are poor or marginal in quality.

While the status of Canada's fresh water is very good by international standards, there is reason to hope the quality of Canadian water will continue to improve. Significant steps have been taken to reduce the harmful impact of municipal waste water discharge, a major source of water pollution. As more of Canada's municipal waste water systems receive superior treatment, the potential for serious harm to water quality from municipal waste water discharges continues to decline. Canadians should view the preservation of the abundant fresh water as one of the most important ways of ensuring the continued well-being and environmental sustainability of the country and indeed the planet. Canada's strong record in this area indicates that its fresh water is protected from pollution in a way that will ensure the continued quality and utility of its fresh-water resources for future generations of Canadians.

Soil Quality

Despite the urbanization that has occurred in Canada over the past several decades, agriculture remains a significant component of Canadian economic activity. Approximately 2.5 per cent of the workforce is employed in the agricultural sector of the economy. Furthermore, agricultural products constitute a large share of Canada's exports.

Due to the country's large geographic size, relatively small population and highly productive farms, Canada is able to export large quantities of agricultural goods to other countries. Canada is a significant player in world markets for agricultural goods and is the fourth-largest exporter of agricultural and agri-food products, behind the European Union, the United States and Brazil. In 2006, Canadian export sales of agricultural goods reached a new peak of $28-billion.[40] Clearly, the environmental sustainability of agricultural practices is necessary to ensure the long-term viability of this vibrant sector of the economy.

Although many factors determine the environmental well-being of Canadian agriculture, several indicators that are related to the quality of the soil used for agricultural activities are the most relevant. Soil quality is a key determinant of agricultural productivity. Where soil quality is low, the yields and profitability of agricultural land can be substantially degraded. Examining trends surrounding soil quality provides us with a great deal of information about the sustainability of Canadian agricultural activity.

The measurement of soil quality, like the measurement of water quality, is complex. However, a number of tools provide useful indicators of general soil health. One such tool is the Soil Organic Carbon Change Indicator (SOCCI). Organic carbon matter in soil affects many aspects of soil quality, and high levels of organic matter are needed for good soil health and productivity.

The SOCCI uses scenarios of past and current land-use and management practices to estimate changes in organic carbon levels in agricultural soil over time, and it provides an estimate of the current levels of soil organic carbon. Although no single indicator can provide a complete picture of soil quality, Agriculture and Agri-Food Canada uses the SOCCI as a primary tool in assessing the quality of Canadian soil.[41] Although the development of the indicator is convoluted, its interpretation is relatively simple: Net gains in soil organic carbon indicate likely improvements in soil quality whereas net losses indicate likely deterioration in soil quality.

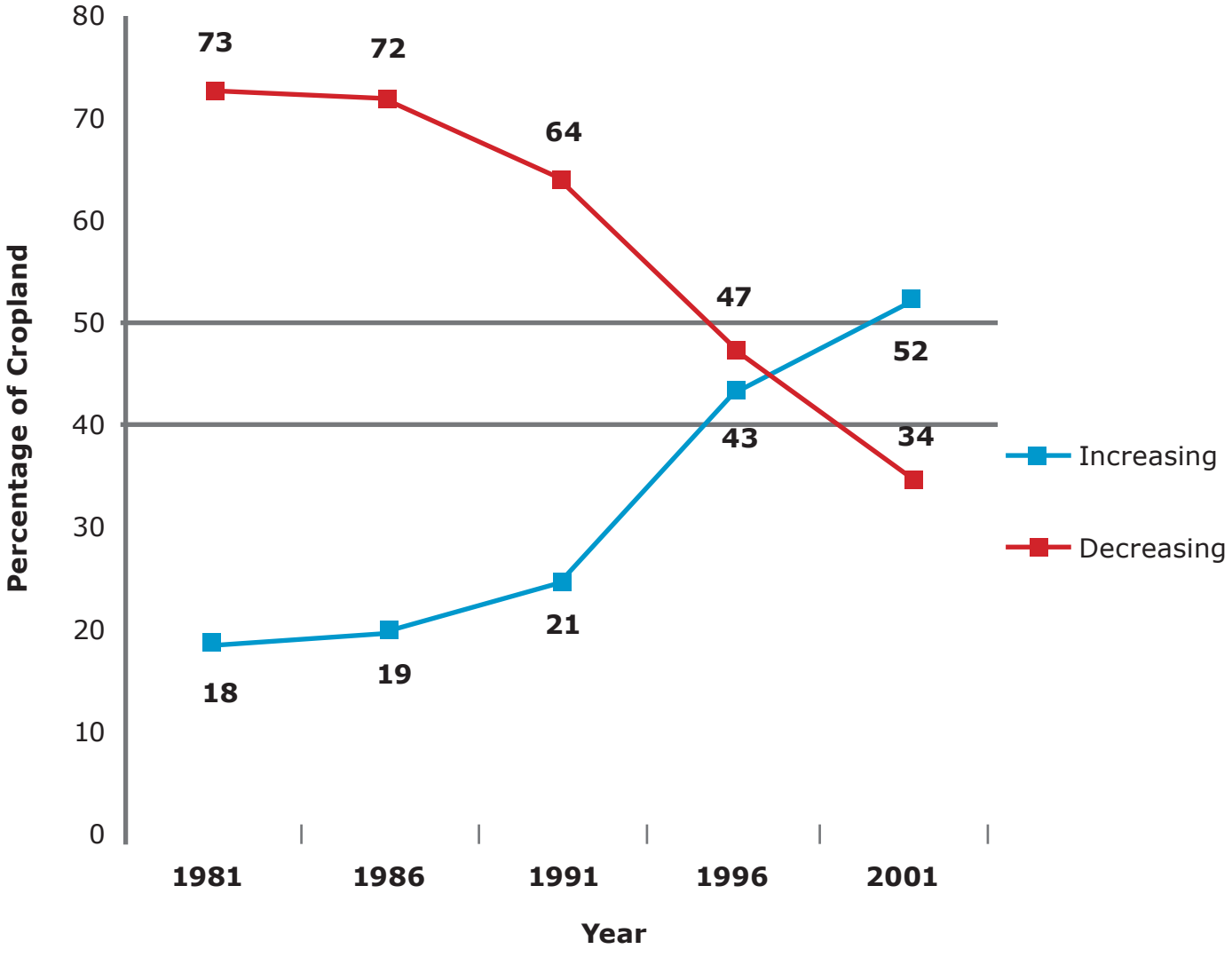
Agriculture and Agri-Food Canada further simplifies the interpretation of the SOCCI by using a five-tiered rating system to categorize particular parcels of agricultural land in Canada as experiencing a large increase, a moderate increase, negligible change, moderate decrease or large decrease in its level of soil organic carbon. Areas classified as experiencing a large increase in soil organic carbon are likely benefiting from soil improvement whereas areas in which a large decrease is taking place are likely experiencing a decline in soil quality.

According to this indicator, Canada has dramatically improved its performance in ensuring growing levels of soil organic carbon over the past few decades. On average, Canada experienced a dramatic

shift from a net loss in soil organic carbon during the 1980s to a large net gain in 2001. Agriculture Canada estimates that in 1981, 73 per cent of Canada's cropland experienced measurable net soil organic carbon losses. By 2001, only 34 per cent of Canadian cropland experienced net losses. Similarly, whereas in 1981 over half of Canadian farmland experienced large decreases in soil organic carbon, the percentage of farmland in that category decreased to just 15 per cent in 2001.

Conversely, there has been a dramatic increase in the percentage of Canadian farmland experiencing large increases in soil organic carbon levels. In 1981, just six per cent of farmland experienced large increases. Currently, 30 per cent of farmland is undergoing large increases.[42] As Chart 24 (below) illustrates, there has been a sustained and rapid improvement in the quality of Canadian soil in recent decades.

Chart 24: Share of Cropland in Different Soil Organic Carbon Change Classes (1981-2001)



Source: Agriculture and Agri-Food Canada, *Environmental Sustainability of Canadian Agriculture: Agri-Environmental Indicator Report Series Report #2* (2005).

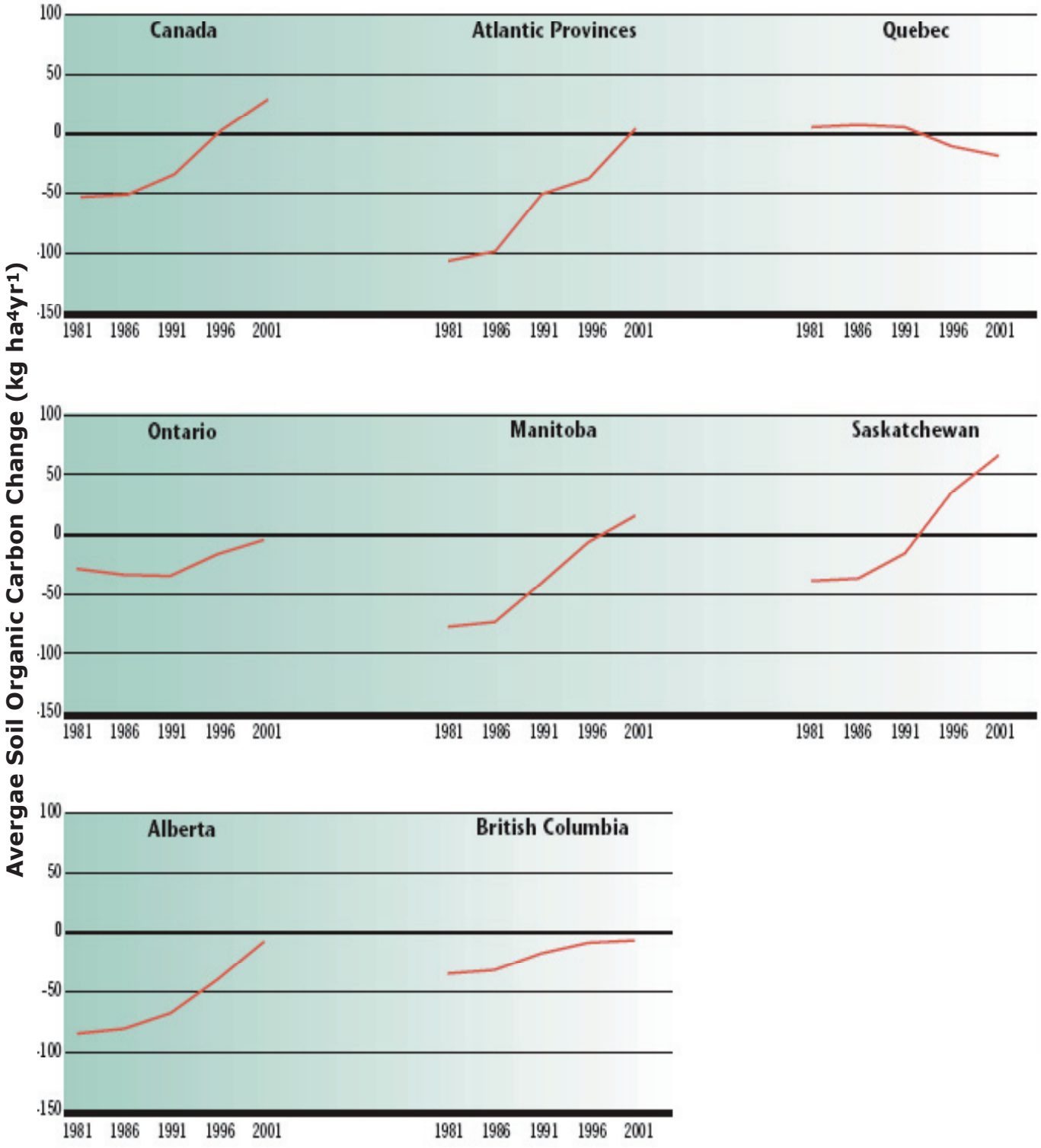
Although general improvement is the norm in levels of soil organic carbon, some provinces made particularly impressive strides in this area. The Prairies experienced dramatic increases in the percentage of their agricultural land that had large increases in soil organic carbon and large, simultaneous reductions in the percentage of agricultural land that experienced large decreases in SOC. For example, in 1981, 47 per cent of agricultural land in Saskatchewan experienced a large decrease in SOC. In 2001, that number was reduced to only two per cent. In Manitoba, the percentage of farmland that experienced a large increase in SOC grew from 11 per cent in 1981 to 44 per cent in 2001.[43]

Despite these generally positive pan-Canadian trends, some regions of Canada have not significantly improved their soil quality. Quebec is the only province that has experienced a negative trend in soil organic carbon since 1981. Significantly more farmland is now classified as undergoing a large decrease in SOC than was the case in the 1980s and 1990s. In 1981, 41 per cent of Quebec's farmland was suffering from large decreases in SOC; by 2001, that percentage rose to 66 per cent. While Quebec is the only province to have a lower overall level of SOC than it did in 1981, other provinces have experienced significantly fewer improvements than did the Prairies according to this indicator of soil quality. Chart 25 (next page) illustrates this point by showing the average soil organic carbon change thought to have taken place in Canada overall and in the provinces between 1981 and 2001.

Although progress has been more dramatic in some regions than in others, most regions have experienced marked improvements in their soil's level of organic carbon since 1981. Canadian soil, overall, went from a net loss of SOC in 1981 to a substantial net gain in 2001. This change, primarily brought about by improvements in cropland management, suggests that farming practices in Canada have become substantially more environmentally sustainable over the past few decades. In addition, other indicators such as the salinity of soil similarly suggest that Canadian soil is considerably healthier than it was during the 1980s and early 1990s.[44]

Another set of indicators that provides information about the sustainability of agricultural practices pertains to soil erosion. Soil erosion is the movement of soil from one area to another, and it occurs mainly through three processes: wind erosion, water erosion and tillage erosion. Wind and water erosion are natural processes that can be accelerated by certain types of farming practices. Tillage erosion is caused by the farming practice of tillage itself. All three types of soil erosion are threats to agricultural sustainability, because they remove fertile topsoil, reduce organic matter in soil and cause the breakdown of soil structure.[45] The result is often reductions in soil fertility, crop yields and agricultural productivity. For these reasons, soil erosion is considered one of the most serious threats to soil quality, and trends in erosion are amongst the best indicators of the sustainability of agriculture in Canada.

Chart 25: Average Soil Organic Carbon Change across Canada



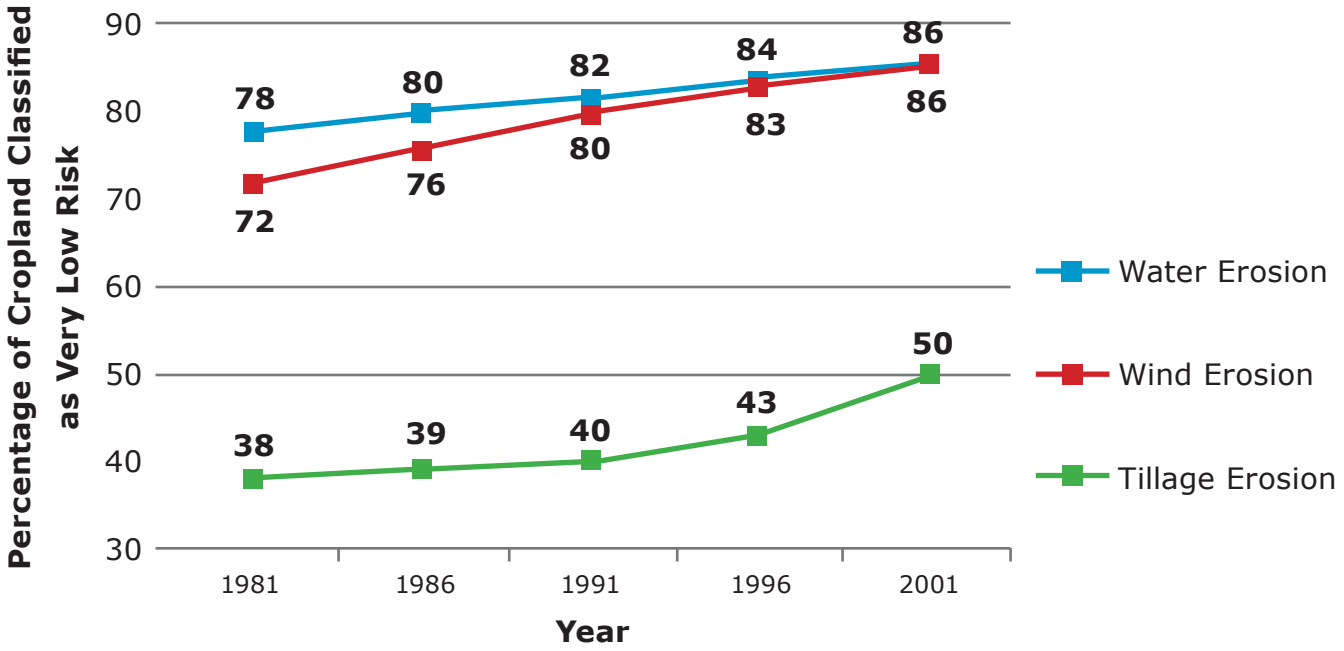
Source: Agriculture and Agri-Food Canada, *Environmental Sustainability of Canadian Agriculture: Agri-Environmental Indicator Report Series Report #2,* (2005) p. 111.

Agriculture and Agri-food Canada studies the threat posed by soil erosion by identifying areas at risk of significant erosion and analyzing how this risk changes over time. This analysis is done separately for water, wind and tillage erosion. The level of risk is expressed in five categories that range from very low risk to very high risk. Agriculture and Agri-food Canada measures performance on these indicators primarily by the percentage of cropland classified as very low risk, as the other four classes represent potentially unsustainable conditions, with each of the four categories representing a different degree of risk.

Since 1981, Canada has made marked progress in reducing the risk that all three types of erosion pose to agricultural sustainability. As Chart 26 (below) illustrates, the percentage of cropland that falls into the very low risk classification has risen dramatically for all three types of erosion since 1981. For example, in the case of water erosion, 86 per cent of cropland is considered to be at very low risk, up from 78 per cent in 1981.

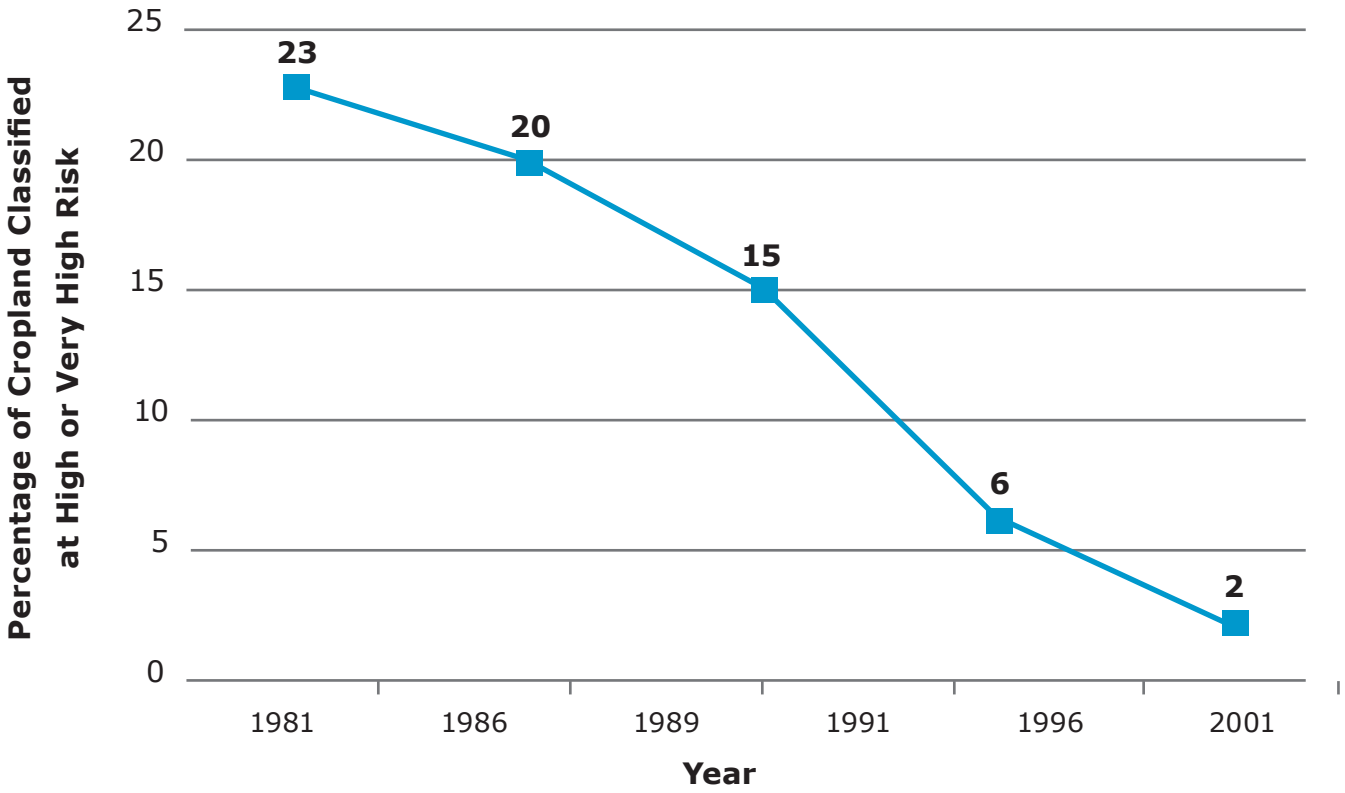
For wind erosion, 72 per cent of cropland was considered to be at very low risk in 1981, a percentage that rose to 86 per cent in 2001. For tillage erosion, the percentage of cropland considered to be at very low risk rose from 38 per cent to 50 per cent during this same period. Another improvement in tillage erosion was the dramatic reduction in cropland considered to be at high or very high risk. Only two per cent of cropland currently falls into these two bottom categories compared with 23 per cent in 1981. Although much of this cropland is still exposed to a moderate risk of tillage erosion, the fact that almost no cropland is exposed to a high level of risk of tillage erosion is a substantial improvement and one that has positive implications for the sustainability of Canadian agriculture.

Chart 26: Percentage of Cropland at Very Low Risk of Erosion



Source: Agriculture and Agri-Food Canada, *Environmental Sustainability of Canadian Agriculture: Agri-Environmental Indicator Report Series Report #2* (2005).

Chart 27: Share of Cropland at High Risk of Tillage Erosion



Source: Agriculture and Agri-Food Canada, *Environmental Sustainability of Canadian Agriculture: Agri-Environmental Indicator Report Series Report #2* (2005).

Conclusion

The quality of agricultural soil in Canada has improved dramatically in recent decades. Agriculture Canada's analysis shows that soil-quality indicators such as soil organic carbon and soil salinity have improved and that there has been a dramatic reduction in the farmland that is vulnerable to erosion. This progress toward superior agricultural environmental sustainability has been accompanied by significant improvements in farm productivity. Because of this improvement in soil quality and recent technological innovations, farm productivity has risen substantially along with overall crop quantity, variety and total cash income from agriculture and agricultural exports.[46]

Although Canada is a highly urbanized country, agriculture remains a significant component of the economy and ensuring its sustainability is an important element of environmental policy. That farm productivity has risen while the major indicators of soil quality have improved suggests that substantial progress has taken place in the sustainability of Canadian agricultural practices.

> ***"Because of this improvement in soil quality and recent technological innovations, farm productivity has risen substantially..."***

Ecosystem Conservation

Canada contains numerous types of ecosystems, each of which supports a diverse variety of animal and plant life. Each also contains natural resources that historically have improved the lives of Canadians by contributing to economic growth. Ensuring Canada's continued economic success while preserving these diverse ecosystems requires governments to identify areas that can and cannot be used safely for economic activity.

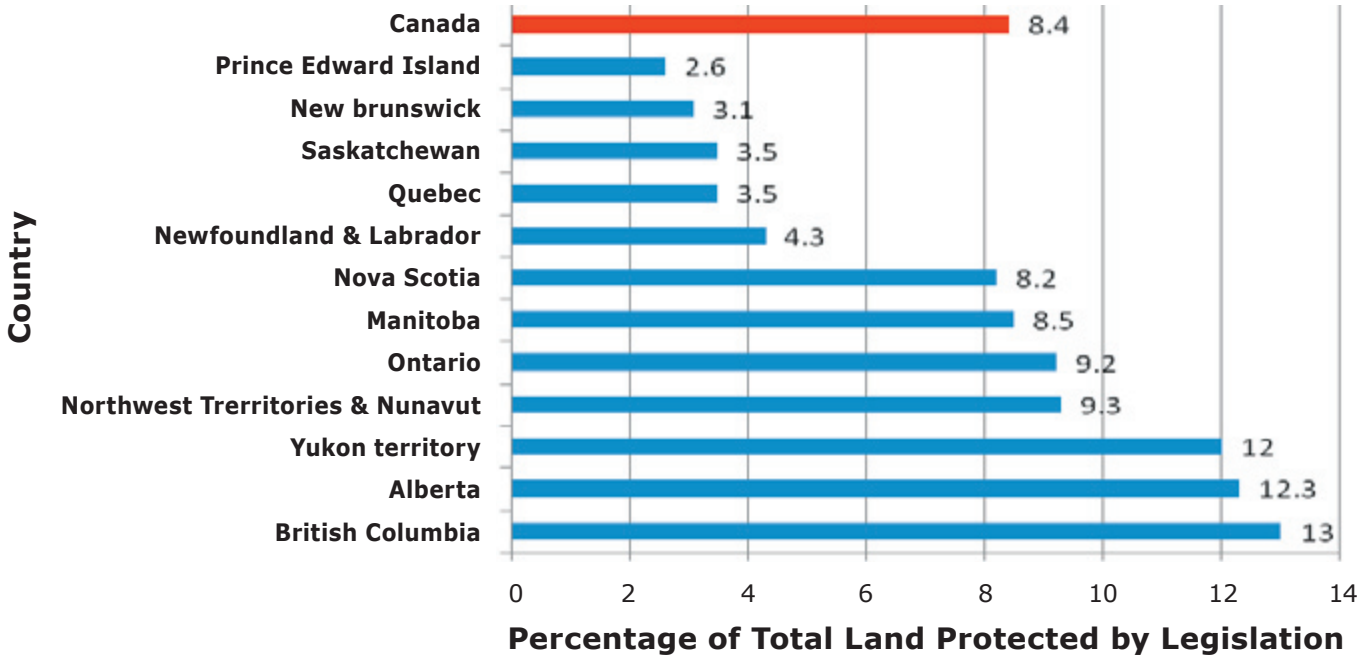
For this reason, the federal government and the provinces identify areas that are unsuitable for commercial activity and designate them through legislation as protected areas. Large-scale commercial development such as logging, mining, hydroelectric development and oil and gas exploration are prohibited.[47] One common reason governments may designate an area as protected is that it is a vital wildlife habitat, the loss of which would directly affect the population of one or more wild species. Canada has a large and diverse wildlife population and the protected-area system in part ensures that suitable habitats for these species are preserved.

The identification of protected areas should be seen as serving a dual purpose. First, the process identifies ecosystems and habitats that, for conservation purposes, should not be disturbed by commercial activity. Second, the process should be viewed as implicitly identifying areas where it is safe, ecologically, to pursue economic activity and to make use of Canada's abundant natural resources to enhance the quality of life for Canadians. The clear demarcation of areas that should not be used for economic activity is a task that, if done diligently, helps ensure that Canada continues its long-term trajectory of environmentally sustainable economic growth.

For this reason, the sizable expansion of protected areas that has occurred in recent years is a positive development that helps to identify more clearly the areas that must be conserved as well as those that can safely be used for environmentally sustainable economic activity. Since the late 1980s, there has been significant growth in the land area that falls under government protection through the protected-areas system. Whereas in 1989 only three per cent of Canada's land area (approximately 30-million hectares) was protected, that amount rose to approximately 82-million hectares in 2003, representing 8.4 per cent of Canada's land area.[48]

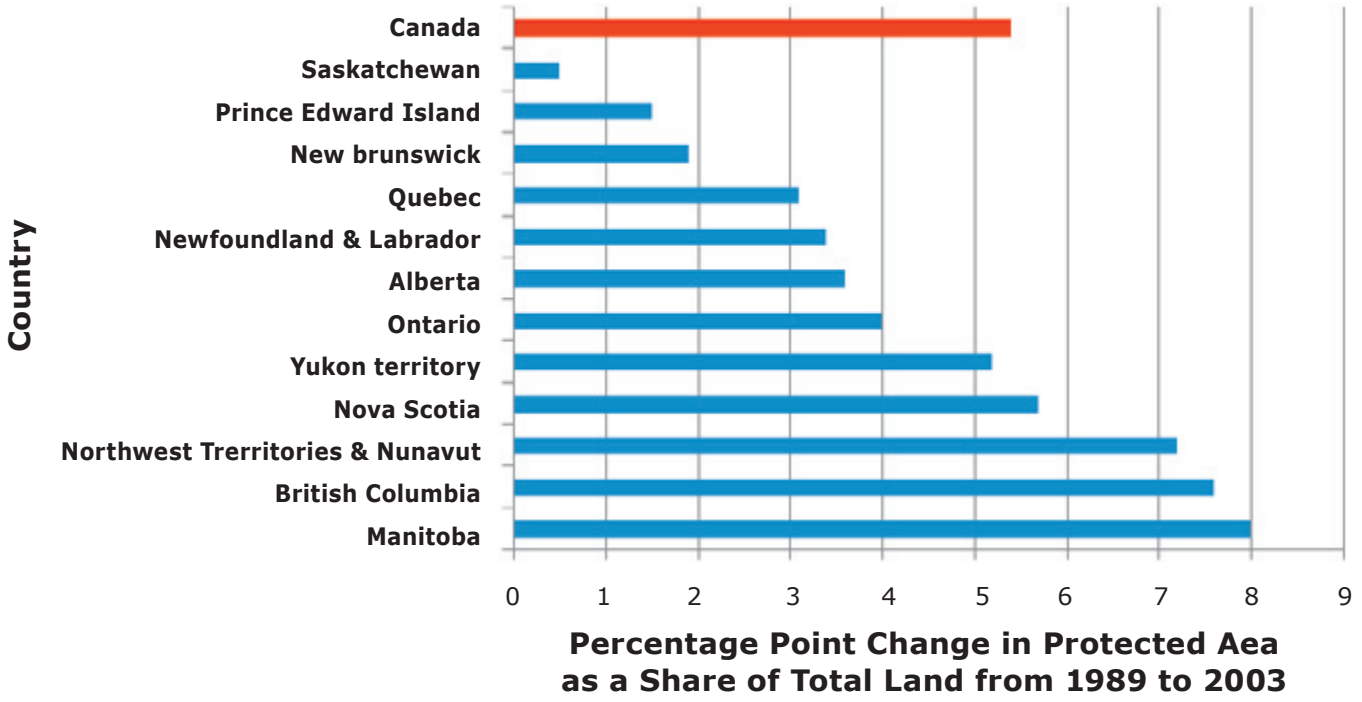
Both federal and provincial governments have the power to designate an area as protected. Although every province expanded its total amount of protected land between 1989 and 2003, there was substantial variation depending upon the province. As Chart 28 (next page) illustrates, Manitoba and British Columbia were particularly aggressive in expanding their protected areas whereas Saskatchewan and Prince Edward Island were significantly less aggressive.

Chart 28: Protected Area as a Share of Total Land



Source: Statistics Canada, *Human Activity and the Environment* (2006).

Chart 29: Change in Protected Area as a Share of Total Land (1989-2003)



Source: Statistics Canada, *Human Activity and the Environment* (2006).

The provinces vary significantly in terms of their climate, terrain and ecosystems; therefore, the areas for which strict ecological protection is required are unevenly distributed across the country. While the general trend toward more protected areas may be viewed as a positive development, provinces that have fewer protected areas or that have not rapidly expanded their protected areas should not necessarily be viewed as acting in a less environmentally sustainable way than those with more protected land.

Rationale and conclusion on protected areas

Governments use legislation to protect certain areas from commercial activity for a wide variety of reasons. Two of these are the desire to protect the habitats of wild species and to preserve the natural beauty of particular areas for the benefit of current and future generations of Canadians.

The identification of land unsuitable for commercial purposes and the identification of land that can safely be used for economic activity is a policy challenge for any government. The importance of this task has been recognized in recent years, and it has led to clearer demarcations between the two types of land, which is a positive development. Although the trend toward greater clarification of the appropriate use of land should be applauded, for this indicator, "more" protected land is not automatically "better". That judgment call depends upon local conditions and context.

While it is imperative that the land necessary for ecological reasons is protected, governments should not be overzealous in the identification of these lands. Several commercial activities that are prohibited on protected land are significant components of the Canadian economy, and in large portions of the country, unnecessarily restricting access to them is unwise. Governments should work to ensure that the appropriate land is protected, but they should also make it a priority to maximize sustainable economic opportunities by only applying protected-area status to land when such protection is necessary for sustainability purposes. For this reason, indefinite growth in the total share of Canada's protected areas is not ipso facto desirable, but, rather, Canadians should expect the share of protected lands to eventually plateau once the land areas in need of protection have been identified and protected.

Forestry

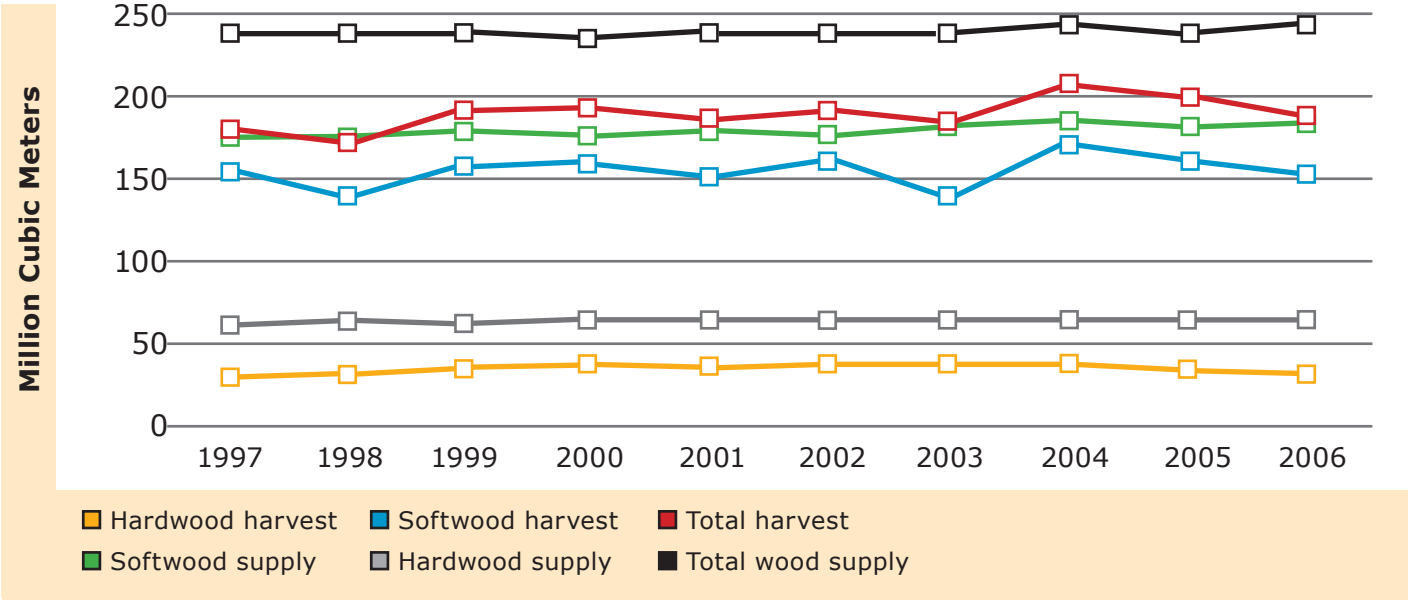
The sustainable management of Canada's abundant forest resources is one of the highest priorities in environmental policy. The challenge facing governments is how to ensure that Canadians maximize the opportunities for economic activity that are provided by Canada's forests while ensuring that the forests are managed sustainably so that future generations will benefit from them.

Balancing these two priorities is important for Canada's short-term economic prospects and its long-term prosperity, as forestry represents a sizable component of the national economy. Canada is the world's largest exporter of forest products. The forest industry directly employs 300,000 people and constitutes approximately three per cent of Canada's gross domestic product.[49] Due to forestry's importance to the economy, provincial governments (which hold jurisdiction in this area) must manage the forests with two objectives in mind: first, to maintain their long-term viability; and second, to ensure that this generation of Canadians is able to make use of this valuable resource without unnecessary restrictions.

To achieve these objectives, provincial and territorial governments regulate the amount of wood that can be harvested each year. These regulations are usually specified as the Annual Allowable Cut (AAC). Provincial forest managers establish the AAC at the maximum level of sustainable use. In other words, the AAC is

Chart 30: Annual Allowable Cut and Actual Timber Harvests

ESTIMATED WOOD SUPPLY AND HARVEST LEVELS



Source: Natural Resources Canada, *The State of Canada's Forests. Annual Report: 2008,* (2008) p. 32

set at the level at which forest managers are confident that the harvested trees can be replaced, with the goal of no loss to the provinces' forest resources over time.

The ideal forest-management system would be one in which annual forest harvests are perfectly aligned with the AAC. Obviously, it is undesirable for a province to have harvest levels that exceed the AAC, as this would threaten to diminish forest resources over time. However, it is also undesirable for annual forest harvests to be significantly below the AAC, as this would mean missed opportunities for sustainable economic activity. For this reason, one key indicator of success in forest management is the alignment between the AAC and the actual quantity of timber harvested.

Although no official national AAC exists, the national AAC can be determined by aggregating the annual allowable cuts established by the provinces and territories. A comparison of this unofficial AAC with the actual Canadian timber harvests allows us to evaluate the success of managing forestry resources on a nationwide scale.

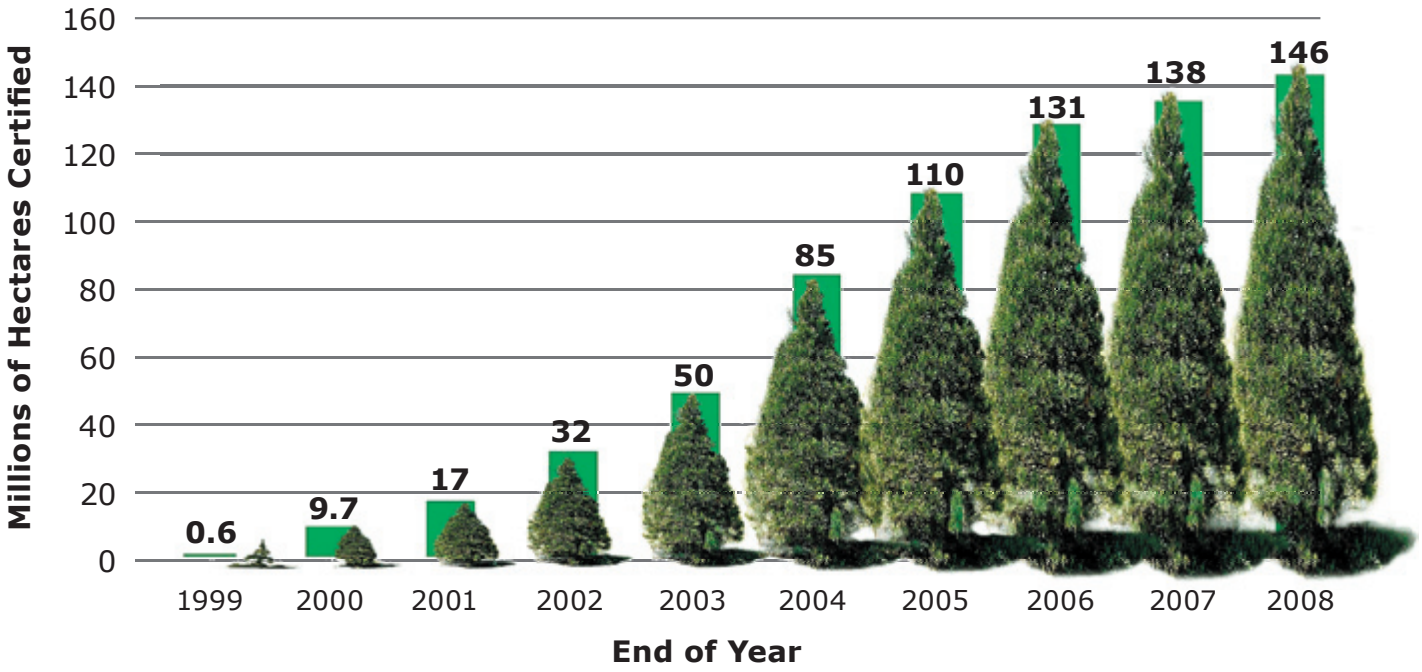
There are two major categories of timber species, hardwoods and softwoods. Provincial governments set separate AACs for each category. These two numbers can be added together to determine the total annual allowable cut for all types of timber. As Chart 30 (previous page) illustrates, the Canadian timber harvest for both hardwoods and softwoods has been consistently below the permitted annual allowable cut throughout the past decade. This is particularly true in the case of hardwood lumber. In 2006, the hardwood harvest was 35-million cubic metres, less than 60 per cent of the AAC for that year, which was set at 60-million cubic metres. In the case of softwood lumber, harvests have consistently been approximately 20 per cent below the aggregate national AAC throughout the past 10 years.

> ***"Canada's forests are not over-harvested and some increases in forestry activity can be undertaken."***

Despite the significant gaps that exist between the AAC and the actual timber harvests for hardwoods and softwoods, a slight upward trend in timber harvests over the past decade is observable, and it brought harvest levels closer to the AAC. The softwood harvest has increased by approximately one per cent over the past decade while the hardwood harvest has grown by approximately three per cent since 1997. Throughout the same period, the AACs have remained almost unchanged, which has allowed some convergence to take place between the AAC and the annual harvests.

The existence of significant gaps between provincial AACs and the annual timber harvests indicates that Canada's forests are not over-harvested and that some increases in forestry activity can be undertaken without negative environmental consequences. That Canada's forests are managed sustainably is further established by the fact that over the past 10 years there has been no reduction in Canada's overall level of forest cover. Canada's forest cover has held steady at approximately 310-million acres, which is 34 per cent of Canada's land mass.[50] Although it is certainly good news that Canada's forest resources have not diminished over the past decade, the evidence presented here strongly suggests this record of conservation could be maintained even with some increase in commercial logging activity.

Chart 31: Forest Certification in Canada (1999-2008)



Source: Canadian Sustainable Forestry Certification Coalition, *Certification Status—Canada & the Globe* (2009).

Another indicator that demonstrates that Canada's forests are currently well managed is the recent large increase in forested areas that are certified by third-party certification systems as being sustainably managed. Third-party certification by any of the three internationally recognized certification systems requires forest areas to be managed according to strict sustainability criteria, such as a high level of biological diversity and ecosystem resilience.[51] The dramatic increase in certified forest area over the past decade clearly demonstrates the strength of Canada's forest-management laws and the sustainability of current forestry practices.

As Chart 31 (above) indicates, Canada went from having almost no internationally certified forestland at the start of the decade to 146-million hectares of certified forestland in 2008.[52] With this dramatic increase in forest-area certification, *Canada now has more total area of certified forest than any other nation.* That Canada has emerged as a world leader in forest sustainability certification provides further evidence that current forest-management practices are sustainable and that Canada is well positioned to continue its strong record of forest conservation.

Conclusion

The three forestry indicators considered in this report suggest that Canada's forest-management practices are environmentally sustainable. Annual timber harvests are below the level of provincial Annual Allowable Cuts. Canada's overall level of forest cover is being maintained, and there has been a dramatic increase in the forestland that is designated as environmentally sustainable by third-party certification systems. Canada's forests provide significant resources to the Canadian economy, and the evidence is strong that Canadians make use of these resources in a responsible way that does not compromise future generations' ability to benefit from this rich natural bounty.

Canada's excellent sustainability record in forest management should be celebrated. Nonetheless, the evidence suggests that Canada is not taking full advantage of the economic opportunities created by its vast forest resources. Throughout the past decade, timber harvests have been significantly below the Annual Allowable Cut. Canadians should view this gap as a lost economic opportunity. Timber harvests well below the AAC mean that more forest industry activity could be undertaken without adverse consequences for sustainability. In other words, the gap between the actual harvests and the AAC represents the additional jobs, wealth and tax revenue that could be created without compromising sustainability. Although Canada's forest-management record is generally strong, increasing actual levels of the annual timber harvest would be a further improvement, as it would allow Canadians to take full advantage of these resources while still ensuring the long-term sustainability of Canada's forests.

Report Conclusion

Canadians have a great deal to celebrate regarding the state of the environment. Over the past 30 years, Canada has cleaned up its air and water, preserved ecosystems and timberlands and protected the soils that feed not only its people but also many others around the world.

This has happened while Canada's population and economy grew quickly and propelled Canada, a country of only 33 million, to the status of an economic powerhouse with a standard of living that is the envy of much of the world. There is still more that can be done, but Canada is well on the way toward environmental sustainability.

SOURCES

1. CityNews, "Canadians Increasingly Concerned About Environment" (January 5, 2007). http://www.citynews.ca/news/news_6642.aspx
2. Nik Nanos, "Nanos Poll: Environment Trumps Prosperity for Oil Sands Development"(April 12, 2009). http://www.nikonthenumbers.com/topics/show/125
3. Joe Friesen, "Canadians Won't Quit on the Environment," *The Globe and Mail* (February 27, 2009). http://www.ecotrust.ca/ipsos-reid
4. Government of Canada, *Canadian Environmental Sustainability Indicators* (2007), Ottawa, Government of Canada, (2007) at page 4.
5. The Conference Board of Canada, "How Canada Performs: A Report Card on Canada" (2008). http://www.conferenceboard.ca/HCP/Details/Environment/urban-nitrogen-dioxide-concentration.aspx
6. Jeremy Brown, Kenneth Green, Steven Hansen and Liv Frederickson, *Environmental Indicators: Sixth Edition,* Fraser Institute (2004) at page 20.
7. Government of Canada, *Canadian Environmental Sustainability Indicators 2007,* Ottawa, Government of Canada, (2007) at page 4.
8. Government of Canada, *Five-Year Progress Report: Canada-wide Standards for Particulate Matter and Ozone,* Gatineau, Government of Canada, (2007) at page 11.
9. Government of Canada, *Five-Year Progress Report: Canada-wide Standards for Particulate Matter and Ozone* (January 2007).
10. *Intergovernmental Panel on Climate Change, The Physical Science Basis of Climate Change,* New York, Cambridge University Press (2007). http://ipcc-wg1.ucar.edu/wg1/wg1-report.html
11. James Hansen, "Coal-fired power stations are death factories. Close them," *The Observer* (February 15, 2009). http://www.guardian.co.uk/commentisfree/2009/feb/15/james-hansen-power-plants-coal
12. Richard Lindzen, "Is the Global Warming Alarm Founded on Fact," *An Exchange on Climate Science and Alarm* (2008). http://www-eaps.mit.edu/faculty/lindzen/L_R-Exchange.pdf
13. Syun-Ichi Akasofu, "Is the Earth still recovering from the 'Little Ice Age'? A possible cause of global warming," International Arctic Research Centre (2008). http://www.iarc.uaf.edu/highlights/2007/akasofu_3_07/Earth_recovering_from_LIA.pdf
14. Human Resources and Skills Development Canada, *Indicators of Well-Being in Canada, Environment: Greenhouse Gasses* (2009). http://www4.hrsdc.gc.ca/.3ndic.1t.4r@-eng.jsp?iid=64
15. Environment Canada, *Canada's Greenhouse Gas Emissions: Understanding the Trends, 1990–2006* (2008). http://www.ec.gc.ca/pdb/GHG/inventory_report/2008_trends/trends_eng.cfm
16. Government of Canada, *Canadian Environmental Sustainability Indicators 2008* (2009). http://www.ec.gc.ca/indicateurs-indicators/default.asp?lang=En&n=A073189E-1
17. Environment Canada, *Canada's Greenhouse Gas Emissions: Understanding the Trends, 1990–2006* (2008). http://www.ec.gc.ca/pdb/GHG/inventory_report/2008_trends/trends_eng.cfm
18. Environment Canada, *How much do we have?* (2008). http://www.ec.gc.ca/WATER/en/info/facts/e_quantity.htm
19. *United Nations Economic Commission for Europe, Environmental Indicators and Indicator-based Assessment Reports: Eastern Europe, Caucasus and Central Asia,* United Nations Publications, (2007) at page 16.
20. United States Central Intelligence Agency, *The World Factbook* (April 9, 2009). https://www.cia.gov/library/publications/the-world-factbook/docs/notesanddefs.html

21. The World Bank, *World Development Indicators 2005*, New York, World Bank Publications, (2005) at page 146.
22. Ibid.
23. Ibid.
24. Water Industry News, *The Connection: Water Supply and Energy Reserves".* http://www.waterindustry.org/Water-Facts/world-water-6.htm
25. World Health Organization, *Health Through Safe Drinking Water and Basic Sanitation* (2009). http://www.who.int/water_sanitation_health/mdg1/en/index.html
26. Ibid.
27. Marcel Boyer, *Freshwater Exports for the Development of Quebec's Blue Gold,* Montreal Economic Institute, (2008) at page 13.
28. Daniel Klymchuk, *Water Exports: The 1% Solution,* Frontier Centre, (2008) at page 5. http://www.fcpp.org/main/publication_detail.php?PubID=2199
29. Environment Canada, Bulk Water Removal and Water Export (2008). http://www.ec.gc.ca/water/en/manage/removal/e_FAQ.htm
30. The Conference Board of Canada, *How Canada Performs: A Report Card on Canada* (2008). http://www.conferenceboard.ca/HCP/Details/Environment/water-consumption.aspx
31. Ibid.
32. Ibid.
33. Government of Canada, *Canadian Environmental Sustainability Indicators 2007,* Ottawa, Government of Canada, (2007) at page 20.
34. Government of Canada, *Canadian Environmental Sustainability Indicators 2007,* Ottawa, Government of Canada, (2007) at page 21.
35. Ibid.
36. Government of Canada, *Canadian Environmental Sustainability Indicators 2007,* Ottawa, Government of Canada, (2007) at page 22.
37. Government of Canada, *Canadian Environmental Sustainability Indicators 2008"* (2009). http://www.ec.gc.ca/indicateurs-indicators/default.asp?lang=En&n=A073189E-1
38. The Conference Board of Canada, *How Canada Performs: A Report Card on Canada* (2009). http://www.conferenceboard.ca/HCP/Details/Environment/water-quality-index.aspx
39. Ibid.
40. Agriculture and Agri-Food Canada, *The Agriculture and Agri-Food System and the Canadian Economy: International Trade and Global Developments* (2009). http://www4.agr.gc.ca/AAFC-AAC/display-afficher.do?id=1205773523754&lang=eng
41. Agriculture and Agri-Food Canada, *Environmental Sustainability of Canadian Agriculture: Agri-Environmental Indicator Report Series Report #2,* Ottawa, Agriculture and Agri-Food Canada Publications Section, (2005) at page 108.
42. Agriculture and Agri-Food Canada, *Environmental Sustainability of Canadian Agriculture: Agri-Environmental Indicator Report Series Report #2,* Ottawa, Agriculture and Agri-Food Canada Publications Section, (2005) at page 110.
43. Ibid.

44. Agriculture and Agri-Food Canada, *Environmental Sustainability of Canadian Agriculture: Agri-Environmental Indicator Report Series Report #2,* Ottawa, Agriculture and Agri-Food Canada Publications Section, (2005) at page 114.
45. Agriculture and Agri-Food Canada, *Environmental Sustainability of Canadian Agriculture: Agri-Environmental Indicator Report Series Report #2,* Ottawa, Agriculture and Agri-Food Canada Publications Section, (2005) at page 90.
46. Encyclopedia of the Nations: Canada-agriculture. http://www.nationsencyclopedia.com/Americas/Canada-AGRICULTURE.html
47. Statistics Canada, *Human Activity and the Environment: Annual Statistics: Total area protected by province and territory* (2006). http://www.statcan.gc.ca/pub/16-201-x/2006000/4177443-eng.htm
48. Ibid.
49. Natural Resources Canada, *The State of Canada's Forests: Annual Report 2008,* Ottawa, Natural Resources Canada, (2008) at page 28. http://canadaforests.nrcan.gc.ca/rpt
50. The Conference Board of Canada, *How Canada Performs: A Report Card on Canada* (2008). http://www.conferenceboard.ca/HCP/Details/Environment/forest-cover-change.aspx
51. Kristina Vogt, Bruce Larson, John Gordon and Anna Fanzeres, *Forest Certification: Roots, Issues, Challenges and Benefits,* United States, CRC Press, (2000) at page 126.
52. Canadian Sustainable Forestry Certification Coalition, *Certification Status—Canada & The Globe* (2009). http://www.certificationcanada.org/english/status_intentions/canada.php

Further Reading

Smart and Green: An Environmental Policy for the 21st Century

October 2005

http://www.fcpp.org/main/publication_detail.php?PubID=1165

Water Exports: The 1% Solution

June 2008

http://www.fcpp.org/main/publication_detail.php?PubID=2199

For more see

www.fcpp.org