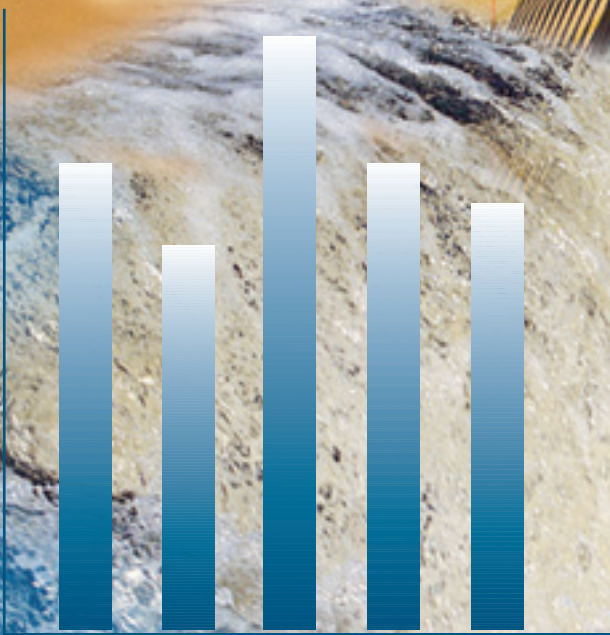




# Canadian Environmental Sustainability Indicators 2005

## Highlights



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### Ordering information

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# Introduction

Canadians' health and their social and economic well-being are fundamentally linked to the quality of their environment. Recognizing this, in 2004 the Government of Canada committed to establishing national indicators of freshwater quality, air quality and greenhouse gas emissions. The goal of these new indicators is to provide Canadians with more regular and reliable information on the state of their environment and how it is linked with human activity. Canadians need clearly defined environmental indicators—measuring sticks that can track the results that have been achieved through the efforts of governments, industries and individuals to protect and improve the environment.

Environment Canada, Statistics Canada and Health Canada are working together to further develop and communicate these indicators. Reflecting the joint responsibility for environmental management in Canada, this effort has benefited from the cooperation and input of the provinces and territories.

The indicators are:

**Air quality:** Tracks Canadians' exposure to ground-level ozone—a key component of smog. The indicator measures one of the most common, harmful air pollutants to which people are exposed. The use of the seasonal average of ozone concentrations reflects the potential for long-term health effects.

**Greenhouse gas emissions:** Tracks the annual releases of the six greenhouse gases that are the major contributors to climate change. The indicator comes directly from the greenhouse gas inventory report prepared by Environment Canada for the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol. The data are widely used to report on progress toward Canada's Kyoto target for reduced emissions.

**Freshwater quality:** Reports the status of surface water quality at selected monitoring sites across the country. For this first report, the focus of the indicator is on the protection of aquatic life, such as plants, invertebrates and fish. This new indicator uses the Water Quality Index, endorsed by the Canadian Council of Ministers of the Environment, to summarize the extent to which water quality guidelines are exceeded in Canadian rivers and lakes.

These Canadian Environmental Sustainability Indicators supplement traditional health and economic measures, such as gross domestic product, so that Canadians can better understand the relationships that exist among the economy, the environment, and human health and well-being. They are intended to help those in government responsible for developing policy and measuring performance, as well as offering all Canadians more information about the trends in their environment.



# Air quality

## What is the issue?

Ground-level ozone, a key component of smog, has significant negative effects on human health, on the natural environment, and consequently, on economic performance.

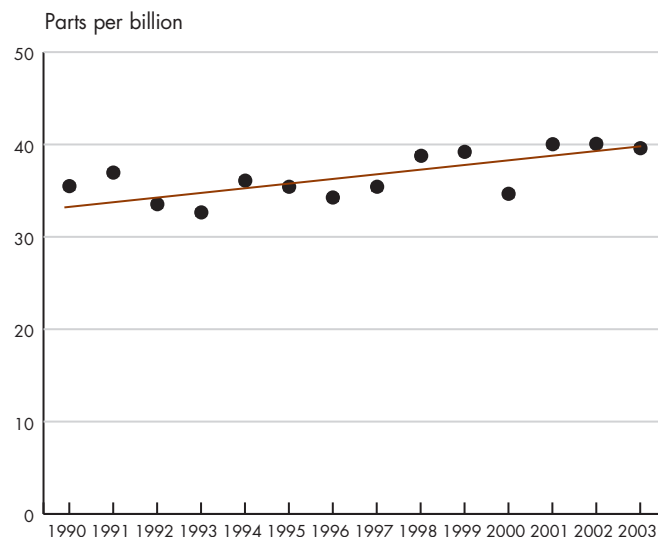
## What is happening?

- The national seasonal average concentration of ozone increased 16% from 1990 to 2003. Most monitoring stations are located in urban areas in southern Canada.
- The highest seasonal average ozone concentrations in 2003 were all recorded at stations in Southern Ontario; concentrations in this region had also grown the fastest since 1990.

## What does it mean?

In general, the health effects of ozone worsen as concentrations increase. Ground-level ozone has been linked to human health effects ranging from minor respiratory problems to emergency room visits and hospitalizations. Related economic effects include absenteeism, lower labour force participation and increased health care costs. Children, the elderly and those with pre-existing health conditions are most sensitive to high ozone levels.

## National seasonal average ground-level ozone concentration, Canada, 1990 to 2003



Notes: Results are weighted by population. Both the linear regression and yearly means are shown. Based on 79 monitoring stations.

Sources: Environment Canada, National Air Pollution Surveillance Network Database; Statistics Canada, Environment Accounts and Statistics Division.



## Why is it happening?

Ozone is formed by chemical reactions involving nitrogen oxides and volatile organic compounds in the presence of sunlight. Most nitrogen oxides come from human activities such as burning fossil fuels in motor vehicles, homes, industries and power plants. Canadians contribute to volatile organic compounds in the air primarily by producing oil and gas, by driving off-road vehicles as well as light-duty motor vehicles and trucks, and by burning wood in stoves, furnaces and fireplaces in their homes. Evaporation of gasoline and other liquid fuels and solvents also adds volatile organic compounds to the air. Ozone levels are affected not only by local activities but also by weather conditions and the movement of pollutants from other regions and countries.

# Greenhouse gas emissions

## What is the issue?

Greenhouse gas emissions from human activities enhance the Earth's greenhouse effect thus contributing to global climate change. Through the Kyoto Protocol, Canada has committed to reduce its emissions to 6% below the 1990 total by 2008–2012.

## What is happening?

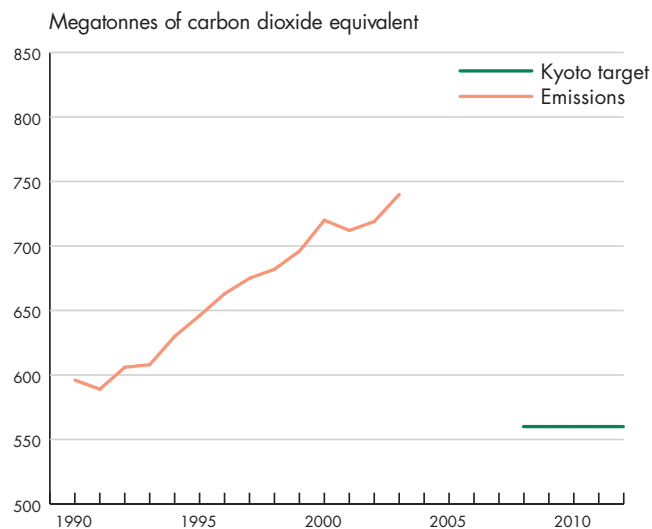
- In 2003, Canada's total greenhouse gas emissions were 24% above the 1990 total and 32% above the Kyoto Protocol target for 2008–2012.
- Greenhouse gas emissions per person rose 9% from 1990 to 2003; emissions per unit of gross domestic product fell 13%.
- The energy sector (including road transportation, fossil fuel industries and thermal electricity and heat production) accounted for 81% of total Canadian emissions in 2003 and 91% of the growth in emissions from 1990 to 2003.
- Alberta and Ontario had the highest emissions of all provinces in 2003. Saskatchewan, New Brunswick and Alberta had the highest percentage increases in emissions compared with 1990.

## What does it mean?

Canadians are vulnerable to global climate changes that may result from increasing greenhouse gas emissions. A rise in global temperatures could affect, for example, the severity of heat waves, the migration of insects and infectious diseases, water availability, and



## Greenhouse gas emissions, Canada, 1990 to 2003



Source: Environment Canada. 2005. *Canada's Greenhouse Gas Inventory, 1990–2003*.

crop yields. Extreme weather events could become more frequent. Sea levels are expected to rise. Indications of these effects have already been seen, especially in the North, where changes have been observed in ice cover, permafrost stability and wildlife distributions. The Kyoto Protocol specifies penalties for countries that do not meet their emissions reduction commitments.

## Why is it happening?

Road transportation accounted for 19% of total emissions in 2003 and 23% of the growth in emissions from 1990, reflecting a shift in the types of vehicles used for personal transportation from automobiles to vans, sport utility vehicles and light-duty trucks. Other important sources were thermal electricity and heat production (18% of 2003 emissions, 27% of growth), and fossil fuel industries (10% of 2003 emissions, 13% of growth).

# Freshwater quality

## What is the issue?

Water quality in Canada is under pressure from a range of sources including agriculture, industrial activity and human settlement. This new indicator provides a preliminary assessment of surface water quality with respect to protecting aquatic life (e.g., fish, invertebrates and plants). It does not assess the quality of water for human consumption.

## What is happening?

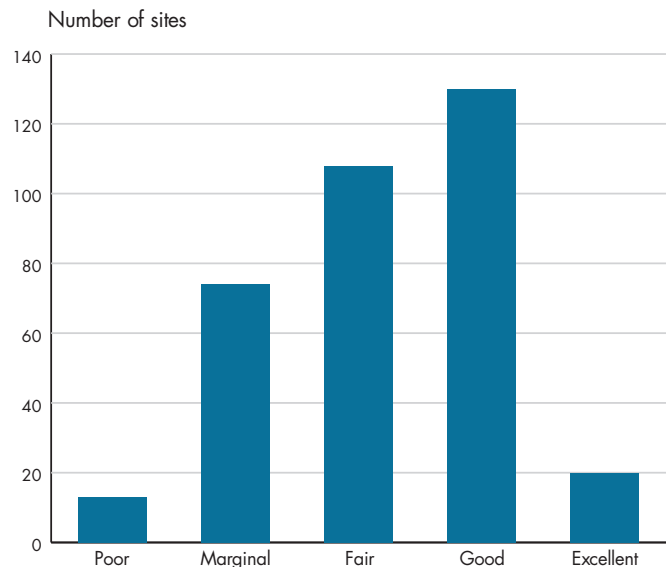
- Freshwater quality was rated as “good” or “excellent” at 44% of the sites, “fair” at 31% and “marginal” or “poor” at 25%.
- Almost all of the 345 selected monitoring sites are located in southern Canada in areas of human activity.
- This preliminary indicator will be revised in future reports to reflect improvements in monitoring and analysis.

## What does it mean?

Water quality degradation can affect both aquatic life and human uses of water. For example, higher concentrations of nutrients (e.g., nitrogen or phosphorus) may result in uncontrolled plant growth. Economic activities such as freshwater fisheries, tourism and agriculture can be undermined by degraded water quality. These initial results should not be interpreted as representing the state of all fresh waters in Canada; they apply to the water quality at the sites selected and are based on data collected from 2001 to 2003.



## Status of freshwater quality at selected sites, Canada, 2001 to 2003



Notes: The results are for surface water quality with respect to protecting aquatic life. They do not assess the quality of water for human consumption. Number of sites is 345. Observations for the Great Lakes are not included.

Source: Data assembled by Environment Canada from federal, provincial and joint water quality monitoring programs.

## Why is it happening?

Water quality experts most often identified urban development and agricultural activities as key potential causes of degraded water quality. Pulp and paper facilities, mines (including oil sands), forestry, acid rain, and dams or other diversions were also considered important stressors at some sites. Natural phenomena such as glacial flows, seasonal snow melt and heavy rainfall can also lead to high levels of suspended sediments that are rich in nutrients and metals.

# Conclusions

## What are the overall implications?

The three indicators reported here raise concerns for Canada's environmental sustainability, the health and well-being of Canadians, and our economic performance. The trends for air quality and greenhouse gas emissions are pointing to greater threats to human health and the planet's climate. The water quality results show that guidelines are being exceeded, at least occasionally, at most of the selected monitoring sites across the country.

Linking the indicators and connecting them to other socio-economic and environmental information can guide policy decisions that better address economic performance, quality of life, and environmental sustainability. For example, the pollutants that combine to form ground-level ozone (nitrogen oxides and volatile organic compounds) are emitted by transportation and energy production—activities that are essential to Canadians' lifestyles, but that are also major sources of greenhouse gas emissions. In turn, nitrogen oxides and sulphur oxides, both by-products of burning fossil fuels, fall as acid precipitation. This affects the water in sensitive lakes and rivers, notably in parts of eastern Canada, and harms their aquatic organisms.

One part of the economic dimension of the indicators is the cost associated with reducing water and air pollution. For example, governments, businesses and households need to spend to treat the water that they plan to use, and then spend again to reduce their impact on that water. Another key consideration is the socio-economic cost of the pollution itself. A monetary estimate of all the health impacts—health care costs, lost productivity, and pain and suffering—runs to the billions of dollars per year in Canada.

## What's next?

Reports will be produced annually on a continually improving set of indicators with increasingly robust analyses to track the changes in water quality, air quality and greenhouse gas emissions in Canada. The indicators will benefit from enhanced monitoring capabilities, new survey results for both water quality and air quality, new scientific knowledge and guidelines, as well as improved data management and analytical methods. Future reports will be supported with an online information system that will allow users to examine regional and sectoral details and conduct their own analyses. One of the biggest challenges will be the transition from reporting these indicator results separately to reporting them as a set that is integrated with other information on the environment, measures of economic performance and indices of social progress. The long-term goal is better decision-making that fully accounts for environmental sustainability.

## Where can I get more information?

This document highlights key findings from the Canadian Environmental Sustainability Indicators report. The full report goes into more detail on each indicator and the links among them. It is available on a website managed by Statistics Canada ([www.statcan.ca](http://www.statcan.ca)). The site also provides electronic versions of the report and background on each of the indicators—the science, the data, the methods and the limitations.



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