

ENVIRONMENTAL QUALITY INDICATORS AND SOCIETAL RESPONSE TO SUSTAINABLE LIVING: THE CANADIAN EXPERIENCE

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Introduction

For many years, Canadians have been clearly concerned about the environmental issues that affect their health and the health of ecosystems. They are increasingly seeking information on progress made towards managing issues such as air and water pollution, endangered species, the release of toxic substances, and the use of Canada's natural resources. The Government of Canada is strongly committed to working towards environmentally responsible decision-making at all levels of society and to making reliable environmental information available on which to base these decisions.

Environmental indicators provide an effective means by which complex environmental data can be transformed into easy-to-use communication and decision-making tools - tools that can help us keep track of the state of the environment and measure progress towards sustainable development. Ideally, environmental indicators can be used in much the same way that economic indicators have been for many years.

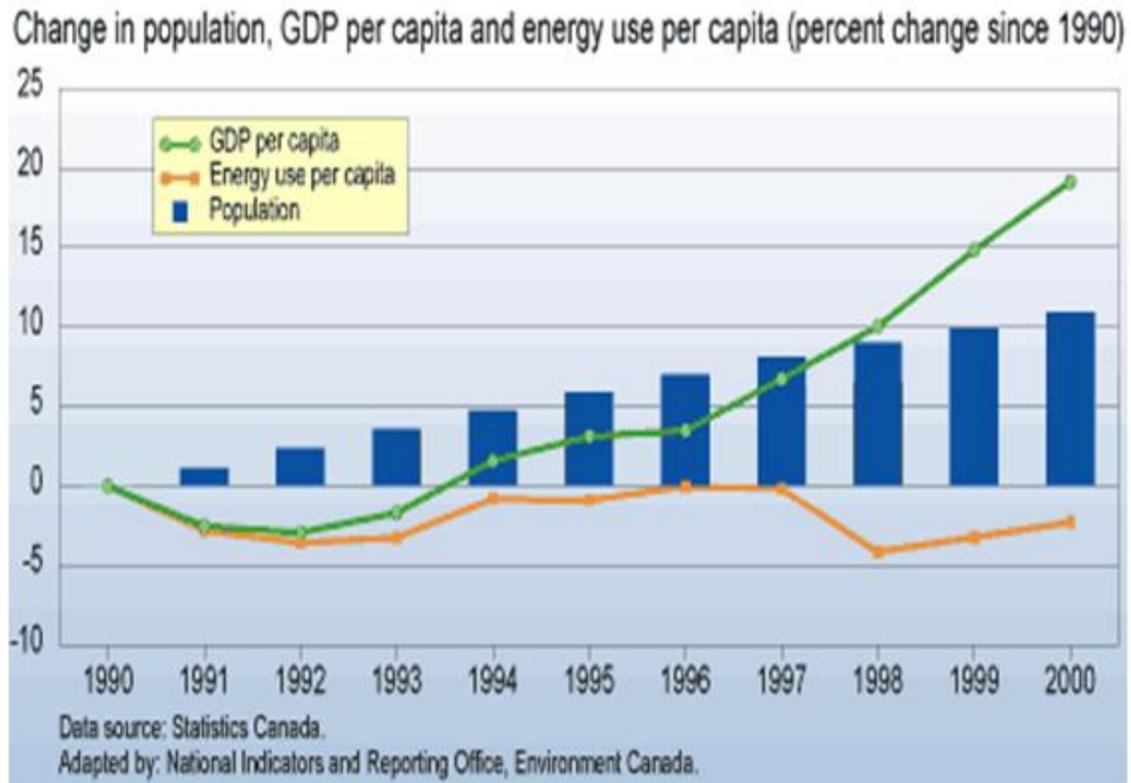
This paper provides an illustrative highlight of the current state of Canada's environment with respect to a preliminary set of environmental indicators, based on existing information and monitoring by the National Indicators and Reporting Office, an Indicators Task Force led by Environment Canada, created to establish a framework for developing indicators. To make it specific and limited, only a selected set of environmental issues is provided viz. *biodiversity, forestry, urban air quality, municipal wastewater treatment and municipal solid waste*. The paper concludes with a look at what decisions individuals and society can make to live more sustainably. The Canadian experience provides a lesson for India in formulating strategies designed towards minimizing environmental risks from increasing consumerism entailed by a growing economy, increasing per capita incomes and elevated standards of living.

Drivers of environmental stress

The impact of humans on the environment is a function of total population, per capita consumption and waste generation, and the type of technologies used. Globally, growth in human populations is seen as a major driver of environmental deterioration. With the present rate of world population growth, one billion people are added every 14 years, and each of these additional persons places demands on natural ecosystems. Compared with many countries, Canada has a small population relative to its large landmass and rich supply of natural resources. Even so, growing population numbers are having significant effects around some urban areas.

Urban sprawl, particularly in southern Ontario and Quebec and the Fraser Valley and southern interior of British Columbia, is affecting sensitive ecosystems (e.g. wetlands, grasslands, freshwater bodies), placing stress on water and transportation infrastructures, and encroaching on some of the highest quality agricultural soils.

In Canada, individual lifestyles and the degree to which more environmentally benign technologies are embraced are as important indicators of environmental stress as is total population. The slight decline in per capita energy use since 1990, coupled with a significant increase in per capita economic growth, indicates that the Canadian economy is becoming more energy efficient. However, a powerful suite of measures that show the extent to which economic activity is impacting the environment is not yet developed. Over the coming years, as better indicators of the relationship between the economy and the environment are developed, it will become easier to track how rapidly the economy is embracing environmental values and whether or not economic growth is depleting Canada's natural capital.



Indicators of Environmental Quality in Canada

Biodiversity and protected areas

Canada is home to about 71500 known species of wild animals, plants, and other organisms, as well as steward of a large proportion of notable ecosystem types, such as boreal forests and wetlands. The amount of strictly protected area in Canada has increased from over 36 million hectares in 1992 to over 61 million hectares in 2001. The creation of protected areas is a key component of Canada's strategy to protect biodiversity. Since 1992, governments in Canada have doubled, to 6%, the land area designated as strictly protected. Over 10% has some level of protection. Although some large protected areas, greater than 10 000 square kilometres, have been created in recent years, most of Canada's protected areas are smaller than 10 square kilometres. Of the 194 terrestrial eco-regions in Canada, over 40% are without any strict protection.

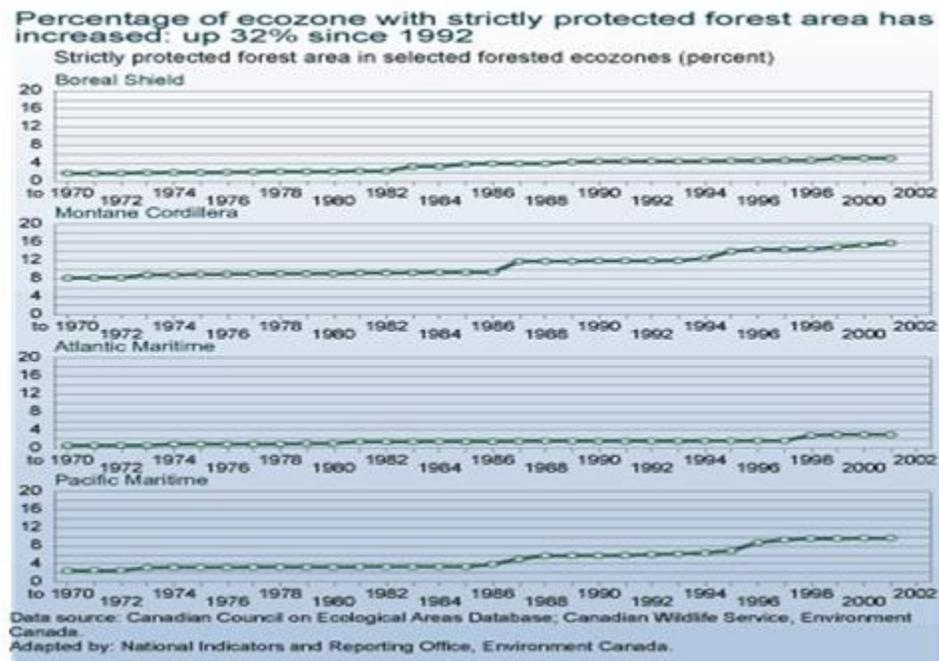
Loss of habitat has been identified as the key threat to biodiversity in Canada. However, other threats also play a role. All of the environmental stresses that affect human and ecosystem health, such as acid rain, water and air pollution, severe weather events, and climate change, also place

biodiversity at risk. Habitat is threatened directly by some industrial activity, conversion of wildlands to other uses, and secondary effects of road access.



Forestry

Canada is home to 10% of the world's forests, including one-quarter of the Earth's boreal forests. Forests cover approximately 45% of Canada's total land area. Several forest types constitute this extensive forest cover. Canada's forests play many vital ecological roles. They produce oxygen and remove carbon dioxide from the atmosphere, they purify water, and they help to moderate climate, stabilize soil, and regulate water flow. Forests also provide diverse habitats for two-thirds of Canada's wildlife - and new species are continually being discovered. Forests also act as wind breaks, as snow traps, and in sediment control. They are vital to the economy, producing wood and wood products used domestically and for export, while providing jobs for thousands of Canadians. Approximately 59% of Canada's forested land is considered capable of producing timber products.



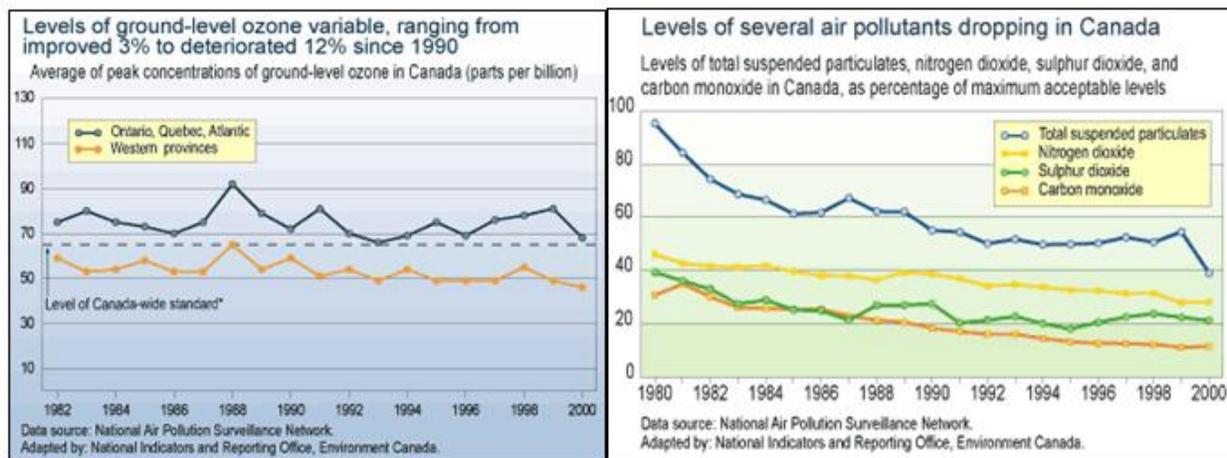
Forests moderate climate, remove carbon dioxide, and are vital to the economy, through the production of wood and wood products. In response to increasing pressures on forested ecosystems, one of which is illustrated in the adjacent figure, the strictly protected area in the four most forested eco-zones has been increased by 32% over the last 10 years. In these four eco-zones, most populations of forest bird species have shown little change.

Protecting representative forests continues to be an important goal for Canada. Developing methodologies to quantify the value of ecosystem services provided by forests is becoming increasingly important, to ensure that all forest values are equally weighted when forest development decisions are made.

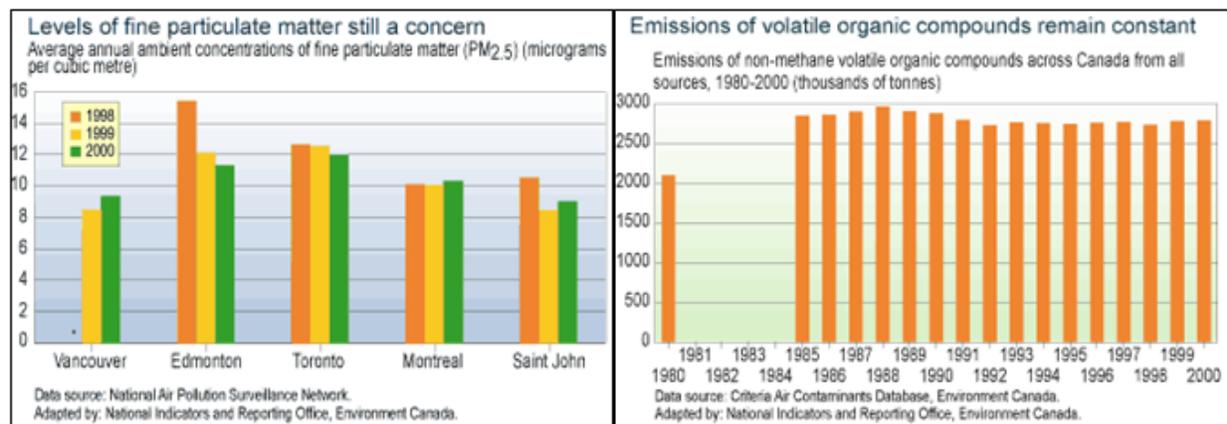
Urban air quality

High levels of pollution adversely affect most of the populated regions of Canada. Levels of airborne particles vary depending on the region, the level of pollutant emissions from both local and long-range transport sources, and the season. Although there have been improvements in levels of primary airborne pollutants, many parts of Canada, both urban and rural, continue to experience unacceptable air quality, especially in the summer. In many locations, ground-level ozone and airborne particles combine with other air pollutants to produce smog. Emissions of nitrogen oxides, sulphur dioxide, ammonia, and volatile organic compounds contribute to these concentrations of ground-level ozone and airborne particles. Fine particles, those with diameters

less than or equal to 2.5 micrometres (PM_{2.5}), pose the greatest threat to human health, because they can travel deepest into the lungs. Air also contains trace amounts of many toxic chemicals. Most air pollutants come from the combustion of fossil fuels in motor vehicles, factories, industrial or thermal power plants, and home furnaces. Some air pollutants injure plants, reducing crop yields and forest growth. In humans, air pollution can irritate the eyes, nose, and throat, reduce lung capacity, and aggravate respiratory diseases.

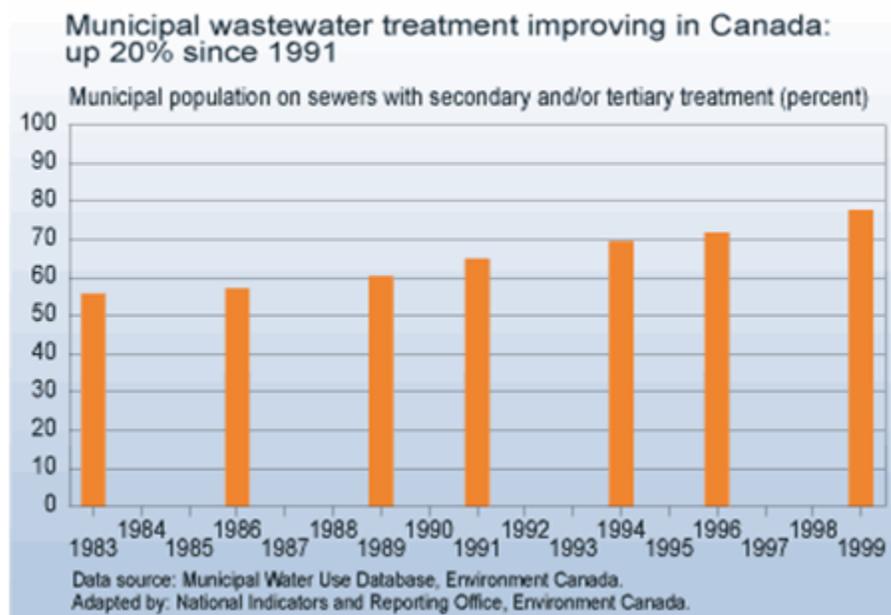


Air pollutants emitted by the combustion of fossil fuels in motor vehicles, furnaces, factories, and industrial or thermal power plants adversely affect air quality. Direct emissions of air pollutants and emissions of precursor gases contribute to the formation of ground-level ozone and airborne particles, which are two of the key components of smog. Ambient concentrations of these pollutants have dropped in some urban areas, but there is still cause for concern. Ground-level ozone levels have not changed significantly across the country, with higher levels seen east of the Manitoba/Ontario border.



Municipal wastewater treatment

Municipal wastewater effluents represent one of the largest threats to the quality of Canadian waters. The release of untreated or poorly treated municipal wastewater effluents affects aquatic life and may put Canadians at risk from drinking contaminated water, consuming contaminated fish and shellfish, and engaging in recreational activities in contaminated waters. Although treatment levels vary from region to region, overall in 1999, 78% of the municipal population on sewers received secondary and/or tertiary wastewater treatment, up from 56% in 1983. As a result, estimated phosphorus loadings to aquatic ecosystems decreased by 44%, despite a 24% increase in the urban population.



Excessive water use reduces wastewater treatment efficiency. Reduced municipal water use reduces the need for increasing the capacity of water treatment infrastructure and lowers the energy needed to build and operate the infrastructure. Canada is comparable with other developed countries in the percentage of the population receiving wastewater treatment. However, there are still communities without wastewater treatment, and existing infrastructure is faltering in many parts of the country. Even in areas with a high degree of wastewater treatment, some chemicals, many with unknown ecological consequences, may be released to the environment.

Municipal solid waste

The production of large amounts of solid waste is a major issue, particularly in a consumer society such as Canada. Canadians are often cited as being among the leading per capita producers of solid waste in the world. Inefficient production processes, low durability of goods, and unsustainable consumption patterns lead to excessive waste generation that follows or exceeds trends in economic growth. Non-hazardous solid waste can be diverted through recycling or composting or disposed of in landfills or incinerators. Disposal and incineration have potential environmental effects of soil and water contamination, degraded air quality, loss of valuable land, and deteriorated landscapes. However, waste and its management can represent lost material and energy resources, greenhouse gas and toxics emissions, and a cost of billions of dollars a year. Solid waste management typically focuses on collection, treatment, and disposal, but the minimization of waste is increasingly the aim of sustainability strategies. Minimization can be achieved through waste prevention (intervention before waste is created) and waste diversion (reuse, composting, recycling, and recovery). Increased waste generation corresponds to an increase in the demand for raw materials and nonrenewable resources.



Despite achievements in reuse, recycling, and recovery over the last decade, the amount of municipal solid waste generated per capita remains high and increased by 10% between 1998 and 2000. Industry and institutions generate 40% of this solid waste, while a third is generated by the residential sector. The primary challenge in Canada is to reduce the amount of solid waste generated. The secondary challenge is to increase the amount of waste diverted from landfill.

Conclusions – Societal Response for Sustainable Living

The lifestyle choices of Canadians are personal decisions, influenced by individual values and circumstances. Not every Canadian lives in the same way, and it would be impossible to define an ideal sustainable lifestyle appropriate for everyone. Yet if changes do not come, environmental degradation will continue and possibly accelerate.

How much responsibility for making those changes do we, as individuals, have to take on? We all make countless decisions every day about what we buy, how we dispose of waste, whether we walk or take the car, and so on. Yet our choices are limited by the way production is organized in our economy and the values and assumptions built into our society. Individuals and society as a whole are two different entities that continuously influence each other and that are constantly evolving as they track each other's shifts: for example, while consumers complain that manufacturers are not providing adequate choices for a "greener" car, automobile manufacturers claim that they are only responding to consumers' demands. One is very difficult to change without change in the other. It is important, then, that lifestyle change be considered in the context of change in the social system, including the production and supply of goods and services.

There is no easy way to change a society in which habits and behaviours are strongly ingrained. To make change happen, a conscious effort will have to come from all quarters. Institutions must choose to incorporate environmental sustainability as an objective in decision-making, and individuals must try to influence society as consumers, workers, taxpayers, and voters. While seriously considering what defines "quality of life" for them, individuals need to consider ways to encourage sustainable patterns of production and consumption. At the personal level, this can consist of three areas, two of which are a form of "substituting".

First, individuals can substitute behaviours that result in less energy and material use, waste production, and ecosystem degradation. For example:

- Using a bucket, sponge, and trigger nozzle on the hose to wash the car will save about 300 litres of water each time.
- Commuting to work by transit or bicycle, rather than by automobile, will help reduce emissions of greenhouse gases and other air pollutants.
- Proper disposal of pesticides, paints, and solvents will greatly reduce the amounts of toxic contaminants reaching waterways through storm and sanitary sewers.
- Buying multi-use items rather than single-use, using your own cloth bags for shopping, avoiding products with excess packaging, and donating old clothes and books to charity

will all help reduce solid wastes.

Second, individuals can substitute more efficient technology or use products that have less environmental impact throughout their life cycle to achieve the same end. Examples include:

- using smaller, more fuel-efficient automobiles and major appliances with the lowest energy consumption ratings, which will reduce emissions of greenhouse gases and air pollutants;
- installing water-saving devices in the home, such as low-flow showerheads and toilet dams;
- using advanced combustion wood stoves, rather than conventional ones, to reduce emissions of air pollutants;
- replacing incandescent light bulbs with compact fluorescent bulbs, which use about 75% less energy and last 10 times longer;
- purchasing non-hazardous or less hazardous paints, solvents, and cleaners, which will reduce the release of toxic contaminants from household and commercial sources.

Finally, in terms of our relationship to society and its institutions, individuals can ask for appropriate information and insist that products, services, and planning at all levels be based on an understanding of environmental implications as well as other factors. For example:

- Individuals can help shed some light on environmental issues by encouraging government to support impartial information gathering and to provide Canadians with clear and consistent messages about the types of products and behaviours that are environmentally sound.
- Individuals can work within their community to encourage better planning of urban transit, cycling routes, and reduced dependency on passenger vehicles.
- Individuals, as consumers, can also encourage producers to demonstrate in a clear, understandable way how they are incorporating environmental considerations into their production processes through such things as environmental impact analysis and product life cycle management.

It may not be possible to eliminate all environmental impact. However, sustainable development requires that we be aware of the environmental effects of our activities and both plan and take action now to reduce those effects. Sustainability requires a balancing act between meeting our needs and wants and maintaining healthy ecosystem functions. There are ways for individuals to meet their needs and aspirations that are less demanding of the Earth's life support systems. There are also opportunities for individuals to re-examine those needs and aspirations.

Ultimately, however, society as a whole must support these kinds of adjustments if they are to be widespread and effective.

Selected References

1. *The State of Canada's Environment — 1996*
2. *Canada's National Environmental Indicators Series 2003*
3. *State of Environment Reports*
4. *National Indicators and Reporting Office, Environment Canada.*
5. *State of Canada's Environment Infobase web site.*