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The Maple Leaf in the OECD

COMPARING PROGRESS TOWARD SUSTAINABILITY

David Suzuki Foundation

SOLUTIONS ARE IN OUR NATURE

The Maple Leaf in the OECD

COMPARING PROGRESS TOWARD SUSTAINABILITY

SUSTAINABLE PLANNING RESEARCH GROUP

SCHOOL OF RESEARCH AND ENVIRONMENTAL MANAGEMENT

SIMON FRASER UNIVERSITY

David Suzuki Foundation

SOLUTIONS ARE IN OUR NATURE

The Maple Leaf in the OECD:
Comparing Progress toward Sustainability

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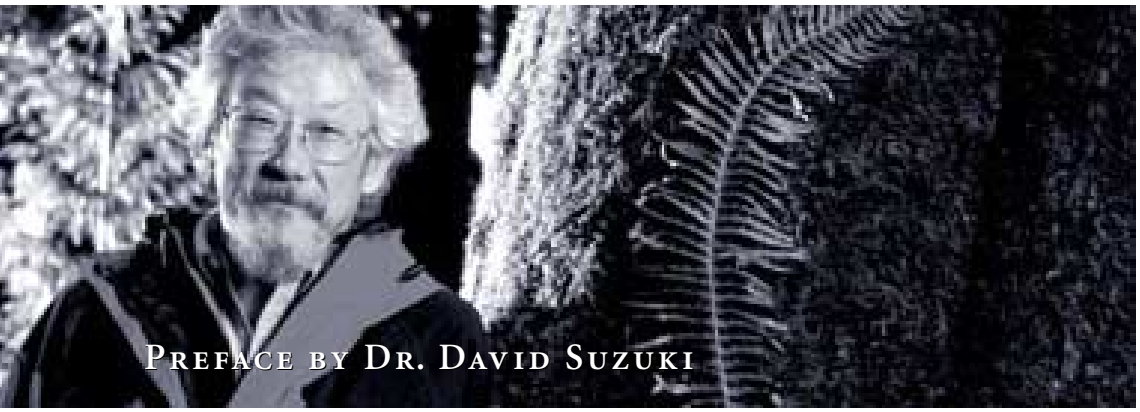
Contents

Nature does nothing without purpose or uselessly.

— ARISTOTLE



Preface by Dr. David Suzuki

I like to think Canada is a land of unsurpassed beauty and immense natural riches. But more than that, I like to think it is a place where people value and take care of that natural wealth. According to polls, the vast majority of Canadians feel that way too. They firmly believe Canada should and does take care of nature.

This report shows how we're failing our own citizens. We are not living up to our own expectations, let alone the international vision of our great country. Without a clear sustainability plan, and a monitoring system to mark our progress, we risk falling further behind.

Achieving sustainability involves three key components: setting goals, working towards them and assessing our progress along the way. The 2004 David Suzuki Foundation report, *Sustainability within a Generation*, proposed a new vision for Canada and defined the elements of a national sustainability plan.

This study focuses on measuring Canada's environmental performance against the goals established in *Sustainability within a Generation*. Written by the Sustainable Planning Research Group of the School of Resource and Environmental Management at Simon Fraser University, it builds on the groundbreaking 2001 report, *Canada vs. The OECD*, by David Boyd in conjunction with the Eco-Research Chair at the University of Victoria. In that report, Mr. Boyd provided a ranking of Canada's disappointing environmental performance relative to other industrialized countries.

This report updates Mr. Boyd's work with the most recent OECD data and extends the analysis by using more indicators and additional interpretive methodologies. It was assembled by a multidisciplinary team of 14 researchers and submitted to a peer review by experts in the private, public and non-governmental sectors. A revised draft was then submitted to a second, more limited peer review prior to publication.

Any way you look at it, Canada comes up short. We are simply not living up to the vision we have of ourselves as a nation. Canadians expect more; they expect better and we can do better. We need a national sustainability plan. We need it to protect our quality of life. We need it to conserve our rich natural assets for the future. And we need it so the true picture of Canada reflects the one we have in our hearts.

David Suzuki
CHAIR, DAVID SUZUKI FOUNDATION

Assessment

Background

With the publication of *Our Common Future* in 1987,[1] sustainability emerged as an important theme in public policy. Canada, like most other nations, enthusiastically adopted the goal of sustainability. The creation of the National Round Table on the Environment and the Economy, the mandate of Environment Canada and the start of the Commissioner of the Environment and Sustainable Development all attest to Canada's commitment.

The need for sustainability has never been as pressing. The recently released Millennium Ecosystem Assessment,[2] a global scientific review of the state of the planet, states:

> "Nearly two thirds of the services provided by nature to humankind are found to be in decline worldwide. In effect, the benefits reaped from our engineering of the planet have been achieved by running down natural capital assets ...
>
> Unless we acknowledge the debt and prevent it from growing, we place in jeopardy the dreams of citizens everywhere to rid the world of hunger, extreme poverty, and avoidable diseases – as well as increasing the risk of sudden changes to the planet's life support systems from which even the wealthiest may not be shielded ...
>
> Yet this need not be a counsel of despair. The natural balance sheet we bequeath to future generations depends on the choices made at every level and in every corner of the planet ... "

Canadians have strong environmental values. According to recent tracking polls, 90% of Canadians believe it is very important for national identity that Canada be a leader on world environmental issues.[3]

However, a 2001 report from the Eco-Research Chair at the University of Victoria found that Canada's environmental performance was one of the weakest of all countries in the Organization for Economic Cooperation and Development (OECD).[4] In response to this performance gap the David Suzuki Foundation published a widely respected report,

Sustainability within a Generation, outlining a plan and the types of policies needed to make Canada a world leader in sustainability.[5]

To evaluate Canada's progress toward sustainability, the Sustainable Planning Group at Simon Fraser University completed a major academic study using the most recent data verified and published by the Organization for Economic Cooperation and Development.[6] The study examines 29 indicators within the framework of the nine goals identified in *Sustainability within a Generation* to compare Canada's environmental performance to those of the other OECD nations. This report, *The Maple Leaf in the OECD*, presents the major findings of the academic study.

The nine goals of *Sustainability within a Generation* are:

❶ GENERATE GENUINE WEALTH

- **Canada supplements the narrow goal of economic growth with a Genuine Wealth Index that measures the state of its natural, social, human, manufactured and financial capital.**

❷ IMPROVE EFFICIENCY

- **Canada reduces energy and material use by at least 75% in order to live within the capacity of the Earth's natural systems while maintaining our quality of life.**

❸ SHIFT TO CLEAN ENERGY

- **Canada replaces fossil fuels with clean, low-impact renewable sources of energy.**

❹ REDUCE WASTE AND POLLUTION

- **Smart design of Canada's production and consumption processes would reduce environmental and health threats.**

❺ PROTECT AND CONSERVE WATER

- **Canada implements comprehensive water policies that protect freshwater systems from the threats of climate change and industrial, agricultural and municipal pollution.**

❻ PRODUCE HEALTHY FOOD

- **Canada ensures that its food is healthy and produced in ways that do not compromise our land, water, or biodiversity.**

❼ CONSERVE, PROTECT, AND RESTORE NATURE

- **Canada effectively protects species and ecosystems by strengthening endangered species legislation and ensuring that land and marine use decisions protect biodiversity.**

❽ BUILD SUSTAINABLE CITIES

- **Canadian cities become vibrant, clean, livable, prosperous, safe and sustainable.**

❾ PROMOTE GLOBAL SUSTAINABILITY

- **Canada returns to being one of the most compassionate and generous nations on Earth; a global leader in securing peace, alleviating poverty, and promoting sustainability in the developing world.**

Approach

The purpose of the Simon Fraser University study was to develop and apply a reporting system to assess Canada's progress towards sustainability by:

- Providing a benchmark for Canada's environmental performance that can be used to measure future progress.
- Assessing trends in environmental sustainability to identify key successes and failures in Canada's sustainability initiatives.
- Identifying the countries with the best environmental performance that should be analyzed in more detail to develop best practices and policies.

The study began with a review of other environmental reporting systems. Based on this review, a list of environmental indicators was prepared and assessed by the following criteria:

- The indicator must provide a meaningful measure of environmental performance.
- The indicator must be generally understandable for a non-technical audience.
- The data required for the indicator must be available in a timely fashion, reliable and produced on a regular basis using consistent definitions for OECD countries.
- The indicator should not directly replicate other indicators.

Based on the evaluation, 29 indicators for which OECD data were available were used for international comparisons. The indicators were grouped under one of the nine goals identified in the David Suzuki Foundation's *Sustainability within a Generation* report.

The statistical data for Canada and other industrialized countries come from the latest collection of the OECD's environmental data. This dataset was used because of the due diligence data assessment undertaken by the OECD to ensure reliability and comparability of data.

The evaluation of environmental performance comes from a cross-sectional analysis that measures or "benchmarks" Canada's performance against other jurisdictions. The cross-sectional method was chosen for this study because it provides reference points based on the performance of other countries and the data necessary to complete a cross-sectional analysis are available. Furthermore, the cross-sectional evaluation used in this study is based on two components: environmental performance and environmental improvement. Environmental performance evaluates current performance and environmental improvement evaluates the change in environmental performance over time.

Canada's current environmental performance is assessed based on two measures:

- **Environmental Performance Rank (EPR)**, defined as Canada's ordinal rank relative to OECD countries for each indicator.
- **Environmental Performance Grade (EPG)**, is Canada's score on each indicator expressed as a percentage of the score of the leading country on that indicator.

Unless otherwise stated, Canada's environmental improvement is assessed by calculating the percentage change for each environmental indicator over the period 1992 to 2002. The rate of change is assessed to determine if the indicator value is improving or

deteriorating and by how much. The Canadian trend is then compared to the OECD average and OECD best trend over the same period.

It is important to keep the following qualifications in mind when interpreting the results of this study. First, composite country rankings are sensitive to the aggregation method and indicators used. Different indicators, different indicator weights, and different aggregation methods will produce different results. For this reason, it is important to focus on the disaggregated results by indicator, as well as the composite results. Second, differences in environmental performance are due to a number of factors, including some that may be beyond the control of a country. Third, although the OECD has completed a rigorous due diligence assessment to ensure comparability and quality of the environmental data used is this study, comparability of data can vary due to differences in quality of data collection among countries, different definitions, and differences in the most recent year data is available. Finally, comparing relative improvements in environmental performance between countries should be interpreted with caution because the percent change in values depends on the starting point value. Countries may show large percent improvements simply because they may have recorded very low indicator values in the base year. Conversely, countries may show a low percent improvement because they recorded a high value in the base year. The current environmental performance could still be very poor or very good, despite the percent change in value.

Three other studies ranking Canada's environmental performance are assessed in the SFU study.[7] In 2001, the University of Victoria study ranked Canada 28th of 29 countries.[8] The Conference Board ranked Canada 16th in 2002, 12th in 2003 and 9th in 2004 out of 24 countries.[9] The improvement in rank for Canada from 2002 to 2004 in the Conference Board Study was due to a change in indicators, which had the unintended result of biasing the results in favor of low-density countries such as Canada. In 2005, the Yale Environmental Sustainability Index (ESI) study ranked Canada 6th of 146 countries.[10] However, the Yale ESI measured the potential of countries to manage the environment, in addition to current environmental performance. When the Yale ESI results were disaggregated to focus on environmental performance alone, Canada's ranking dropped to 69th of 146 countries. Although the Conference Board and Yale ESI studies present a more favorable rank for Canada because they use different indicators, the rank for Canada is unsatisfactory in all four ranking studies.

FINDINGS

The environmental performance rank of OECD countries is provided in **TABLE 1** (page 5). A country's rank is based on its average rank for all 29 environmental indicators with the best performance given a 1 and the worst a 30.

The data shows that Canada' overall environmental performance is far behind other OECD countries, with a rank of 28th out of 30. Only two countries have poorer environmental records: United States and Belgium.

The top ten countries in environmental performance fall into two groups. The first group includes Turkey, Poland, and the Slovak Republic, which have high environmental

rankings because they have relatively weak economies and therefore have lower per capita resource use and emissions. The more relevant group to Canada includes Switzerland, Denmark, Germany, Austria, Sweden, Italy, and the Netherlands, which have high per capita incomes. These countries have high environmental rankings because they have strong environmental policies.

The study found:

- Canada does not finish first on a single environmental indicator.
- Canada is the worst performer on three indicators (volatile organic compound emissions, carbon monoxide emissions, generation of nuclear waste).
- Canada is the second worst performer on five indicators (intensity of energy use, water consumption, sulfur oxide emissions, environmental pricing, distance travelled by vehicle).
- Canada has shown no improvement relative to OECD countries over the past 10 years. Canada was 28th in 1992 and 28th in 2002.
- Canada's overall Environmental Performance Grade is only 26.7%. Canada received a failing grade on 24 of 29 indicators.

Detailed findings according to each of the nine goals found in *Sustainability within a Generation* follows on **TABLE 2** (page 6).

Table 1.
Ranking of OECD Nations

COUNTRY	ENVIRONMENTAL PERFORMANCE RANKING
Turkey	1
Switzerland	2
Denmark	3
Poland	4
Slovak Republic	5
Germany	6
Austria	7
Sweden	8
Italy	9
Netherlands	10
Portugal	11
Czech Republic	12
Mexico	13
Norway	14
Hungary	14
Japan	16
Finland	17
France	18
United Kingdom	18
Greece	20
Spain	21
Luxembourg	22
Korea	23
Iceland	24
New Zealand	25
Australia	25
Ireland	27
Canada	28
Belgium	29
United States	30

Note: A country's rank is based on the average rank for all 29 environmental indicators.

Table 2. Canada's Performance on the goals found in *Sustainability within a Generation*

GOAL	INDICATOR	RANK	EPG*
Improve Efficiency	Energy Consumption (toe/cap)	28th of 30	13.3%
	Energy Intensity (toe/U.S.$1,000 GDP)	29th of 30	45.5%
	Water Consumption (m^3/cap)	29th of 30	9.2%
	Environmental Pricing (environmental taxes as % of GDP)	28th of 29	27.7%
Shift to Clean Energy	GHG Emissions (tonnes CO^2 equiv/cap)	26th of 29	15.5%
	Renewable Energy (including Hydro)	5th of 29	59.8%
	Low Impact Renewable Energy	18th of 30	8.3%
Reduce Waste & Pollution	Sulfur Oxides (kg/cap)	27th of 28	3.4%
	Nitrogen Oxides (kg/cap)	26th of 28	15.8%
	VOCs (nonmethane) (kg/cap)	29th of 29	12.9%
	Carbon Monoxide (kg/cap)	28th of 28	8.7%
	Ozone-Depleting Substances (kg/cap)	12th of 14	4.0%
	Municipal Waste (kg/cap)	19th of 28	61.2%
	Recycling of Municipal Waste (% of municipal waste)	9th of 30	52.7%
	Nuclear Waste (kg/1000 people)	30th of 30	0.0%
	Pollution Abatement Control Expenditures (% of GDP)	13th of 25	45.8%
Protect and Conserve Water	Municipal Sewage Treatment	14th of 28	73.1%
Produce Healthy Food	Pesticide Use (kg/km^2 arable land)	8th of 30	4.0%
	Fertilizer Use (tonnes/km^2 arable land)	2nd of 29	83.8%
	Livestock (sheep equiv/km^2 arable and grassland)	2nd of 29	48.8%
Conserve, Protect and Restore Nature	Number of Species at Risk	26th of 30	10.0%
	Proportion of Species at Risk	8th of 30	32.5%
	Protected Areas	16th of 30	26.6%
	Timber Harvest (m^3/ km^2 forestland)	2nd of 29	39.9%
	Timber Harvest-Forest Growth Ratio	5th of 29	25.0%
	Per Capita Capture Fisheries (kg/cap)	20th of 28	0.8%
	Fisheries as Percent of World Catch	15th of 23	10.0%
Build Sustainable Cities	Distance Traveled (1,000 vehicle-km/cap)	29th of 30	6.4%
Promote Global Sustainability	Official Development Assistance (% of GNI)	12th of 27	29.2%
Overall Average		28th of 30	26.7%

* Environmental Performance Grade (EPG) is Canada's performance as a percent of the top-performing country on each indicator. The number of countries ranked for some indicators varies due to data availability.

1 Generate Genuine Wealth

Goal

Canada becomes a world leader in innovative ways of living sustainably and protecting the environment. To do so, we must measure progress by supplementing the narrow concept of economic growth with an effort to measure all factors that make life worthwhile.

Background

Governments and think tanks are developing new strategies to calculate the wellness of societies by incorporating economic, social, and environmental factors into their measurements. Termed "genuine progress" or "genuine wealth" indexes, these new yardsticks seek to incorporate indicators of natural, human, manufactured and financial capital in a measure that gauges the genuine wealth of a nation. Although measuring genuine wealth does not achieve its creation, it is a first and necessary step towards that goal. While preliminary efforts have been made in Canada and other countries, the development and use of genuine wealth indexes are in the embryonic stage. As a result, there is no ranking or rating of countries' performance in this report.

2 Improve Efficiency

Goal

Canada becomes a world leader in the efficient and effective use of energy and resources, enabling us to improve our quality of life while reducing energy and material use. If we are to live within our means, this goal is critical because it recognizes the limits of Earth's natural systems.

Background

Environmental efficiency measures the amount of a natural resources used per unit of output. The higher the resource use per unit of output, the greater the stress on the environment. Higher energy consumption, for example, increases health and environmental problems such as air pollution and climate change. Higher rates of natural resource consumption increase the rate of resource depletion. Non-renewable resources such as oil and gas will be used up faster, while renewable resources will reach the limits of their capacity to regenerate sooner.

Energy Consumption

Canada's Levels and Trends

Energy consumption is measured in millions of tonnes of oil equivalent (toe), which allows for conversion of different energy types to a common measure for comparison. In 2002, Canada consumed 6.07 toe per capita, almost double the OECD average of 3.36 toe per capita. Canada ranks 28th of 30 OECD countries in energy consumption per capita (figure 1A).

Total energy consumption increased in Canada by 17.8% from 1992 to 2002 and per capita consumption increased by 6.5%. Canada's per capita energy consumption increase

is lower than the 10% average rate of increase recorded by OECD countries over the last decade (fig. 1B). Overall, Canada ranks 15th out of 30 OECD countries in reducing per capita rate of growth in energy consumption.

The OECD[11] suggests that Canada's high rate of energy consumption is due to geography, climate, industrial structure, and low energy prices. Energy prices, which are a matter of public policy, are significantly lower than the OECD average.

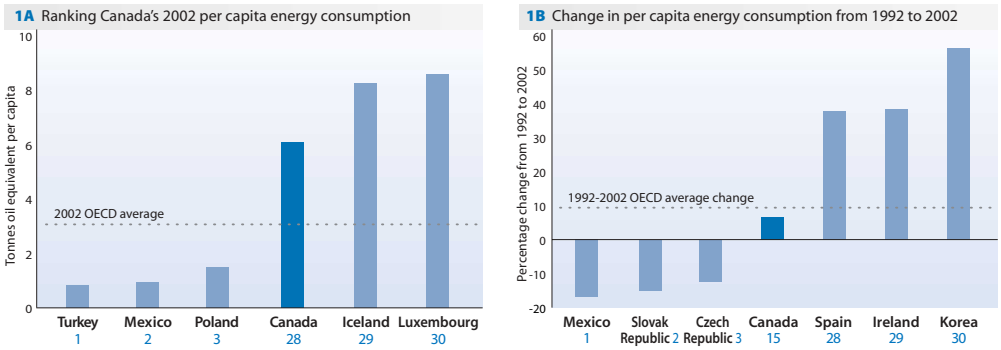


FIGURE 1: Ranking Canada's 2002 per capita energy consumption (A) and change in per capita energy consumption from 1992 to 2002 (B) among OECD member countries

Energy Intensity

Canada's Levels and Trends

Energy intensity measures the amount of energy required (toe) per unit of gross domestic product (GDP). In 2002, Canada used 0.22 toe per US$1,000 GDP, significantly higher than the OECD average of 0.15 toe and more than twice as great as the most energy efficient countries, Ireland and Italy, which each used only 0.1 toe/US$1,000 GDP (fig. 2A). Overall, Canada ranks 29th of 30 OECD countries in energy intensity.

Canada reduced energy consumption per unit of GDP by about 15% from 0.26 to 0.22 toe/US$1,000 GDP over the last decade (fig. 2B). This improvement is more than the average OECD improvement of 12.7%. Overall, Canada ranks 14th out of 30 OECD countries in reducing energy intensity from 1992 to 2002.

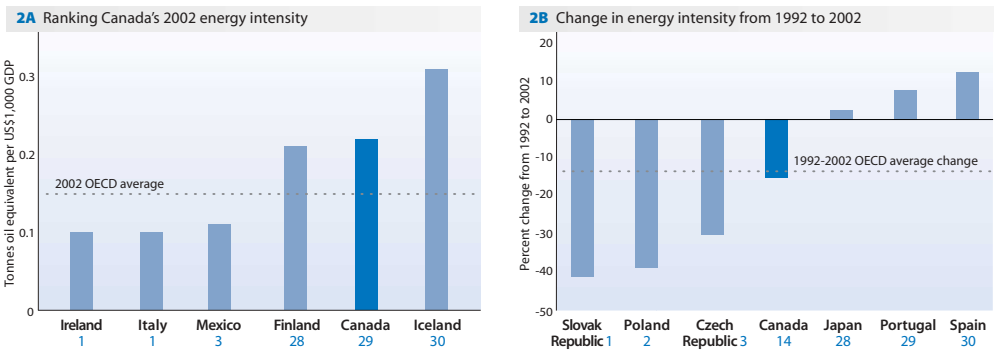


FIGURE 2: Ranking Canada's 2002 energy intensity (A) and change in energy intensity from 1992 to 2002 (B) among OECD member countries

WATER CONSUMPTION

Canada's Levels and Trends

Water consumption is measured in cubic meters (m^3) of water consumed per capita. Water consumption is defined as the difference between water withdrawn from the source and water returned to the source after use.

In 1996, Canada consumed 1,420 m^3 of water per capita, more than double the average OECD per capita consumption of 613 m^3 and more than 10 times that of the most efficient OECD country of Denmark (fig. 3A). Canada ranks 29th, second last only to the U.S. which consumed 1,730 m^3 of water per capita. The electricity sector consumed 64% (for cooling purposes), manufacturing 14%, and the primary-resource sector (mainly agriculture) 11%. The OECD estimates that Canada consumes only 1.5% of its gross annual available water supply, well below the OECD average of 11.4%.

Canada reduced per capita water consumption by 18% from the late 1980s to 1995, well above the OECD average decrease of 6% (fig. 3B). Canada ranked ninth of 23 OECD countries in reducing water consumption. Topping the list was the Slovak Republic with a 50% decrease in water consumption per capita.

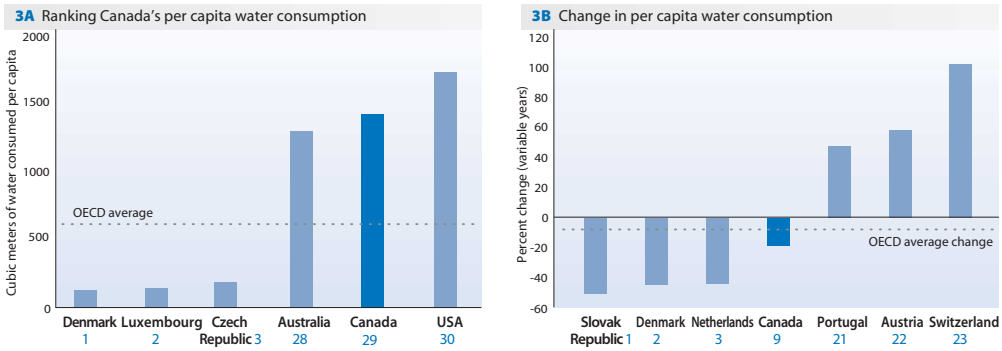


FIGURE 3: Ranking Canada's per capita water consumption (A) and change in per capita water consumption (B) among OECD member countries

ENVIRONMENTAL PRICING

One of the causes of environmental damage is the failure to adequately charge for the cost of using the environment. Producers are often able to emit pollution into the environment free of charge even though there is a significant cost to society resulting from environmental damage. The failure to include the costs of environmental damage in economic markets is a "market imperfection" that results in inefficient decision making.

Public policy traditionally deals with environmental market imperfections by regulations that limit the amount of pollution that can be emitted. More recently, there is growing support to complement regulations with market mechanisms that impose charges on pollution and other activities that have environmental and health costs. The National Round Table on the Environment and the Economy, the David Suzuki Foundation, the Green Budget Coalition and the OECD, for example, are all strong advocates of using market mechanisms, which in Canada are referred to as ecological fiscal reform (EFR).

EFR is normally divided into three components: environmental pricing, elimination of subsidies, and direct investment in environmental protection. All three components

attempt to improve economic efficiency by making sure economic markets include all relevant costs and benefits. Environmental pricing, for example, requires those causing environmental damage to bear the environmental costs. Examples would be the use of a carbon tax to compel users of fossil fuels to help cover the costs of climate change, and a pollution tax on the emissions of toxic chemicals to help cover the cost of damage to our environment and health. Including some of the cost of environmental damage in the price would reduce emissions and encourage the development and use of more environmentally friendly technologies.

As a result of the growing interest in environmental pricing, the OECD began collecting data on revenues from environmental-related taxes. The OECD defines environmental-related taxes as "any compulsory, unrequited payment to general government levied in tax bases deemed to be of particular environmental relevance."[12]

Canada's Levels and Trends

Revenue from environmental charges in Canada is equivalent to 1.3% of GDP, the second lowest of OECD countries and well below the OECD average of 2.5% (fig. 4A). Only the United States, at 0.9% of GDP, has lower use of environmental charges. Denmark has the highest rate of environmental charges at 4.7% of GDP. The use of environmental charges in Canada declined by almost one-quarter from 1995 (1.7% of GDP) to 2001 (1.3% of GDP) (fig. 4B). On average, OECD countries recorded virtually no change in the level of environmental fees during the same period.

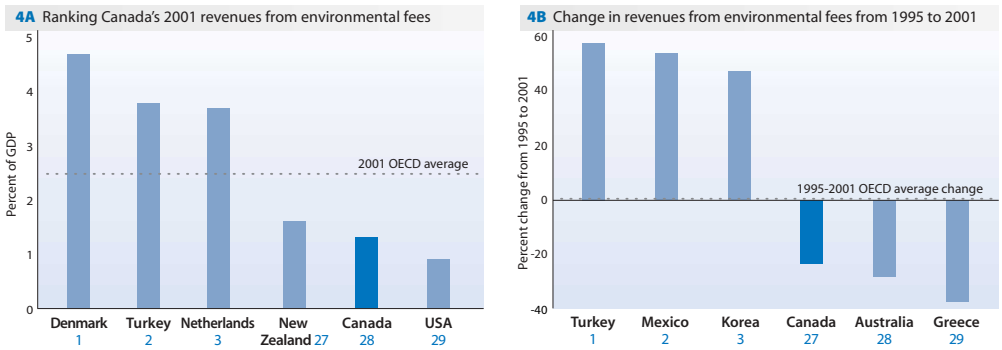


FIGURE 4: Ranking Canada's 2001 revenues from environmental fees (A) and change in revenues from environmental fees from 1995 to 2001 (B) among OECD member countries

TABLE 3: Efficiency Scorecard

GOAL	INDICATOR	RANK	EPG
Improve Efficiency	Energy Consumption (toe/cap)	28th of 30	13.3%
	Energy Intensity (toe/U.S.$1,000 GDP)	29th of 30	45.5%
	Water Consumption (m^3/cap)	29th of 30	9.2%
	Environmental Pricing (environmental taxes as % of GDP)	28th of 29	27.7%

Environmental pricing is an important driver of resource consumption. Canada's weak performance on that indicator helps explain the weak performance on the other environmental indicators.

3 Shift to Clean Energy

Goal

Canada moves to the forefront of the global clean energy revolution, reducing fossil fuel production, use, and export, and harnessing low-impact renewable energy sources. These steps are vital for addressing the grave threat posed by climate change.

Background

Canada relies heavily on fossil fuels to supply its energy needs. In addition to contributing to air pollution, consumption of fossel fuels releases high levels of greenhouse gases that contribute to climate change. It is estimated that the average global air temperature rose by about 6 ℃ during the 20th Century, which is the fastest rate of warming in the past 1,000 years.[13] Some of the predicted impacts of climate change include higher maximum temperatures, more intense precipitation and storms, droughts, floods, increased monsoon variability, rising sea levels, melting polar ice caps, water shortages, and disruptions of forests and agriculture.[14]

Greenhouse Gas Emissions

Greenhouse gases (GHG) are released when fossil fuels are burned to produce electricity or energy for transportation, industry, and the residential and commercial sectors. The primary greenhouse gas is carbon dioxide (CO_2). Other greenhouse gases, which are produced in lesser quantities but are more potent, include methane (CH_4), nitrous oxide (N_2O), sulfur hexafluoride (SF_6), perfluorocarbons (PFCs), and hydrofluorocarbons (HFCs). Carbon dioxide, methane, and nitrous oxide are estimated to account for 50%, 18%, and 6%, respectively, of the overall global warming effect arising from human activities (UNFCCC 2003). The GHG emissions indicator reports the total level of emissions of all of these gases, expressed as CO_2 equivalents.

The chief sources of GHG emissions in Canada are transportation combustion (26%), fossil fuel production and distribution (18%), and electric power and heat generation (18%).

Other sources include agricultural activities, industrial and manufacturing processes, buildings, and waste handling and disposal.

In 1992, Canada signed the United Nations Framework Convention on Climate Change (UNFCCC), pledging to stabilize GHG emissions at 1990 levels by the year 2000. The signatories to the UNFCCC realized that a more detailed agreement was required specifying how stabilization of GHG would be achieved. Negotiations began immediately and the Kyoto Protocol was adopted in 1997. Canada signed the Kyoto Protocol in 1998 and ratified it in 2002, thereby committing to reduce GHG emissions by six percent below 1990 levels by 2012. Russian ratification, in late 2004, allowed the Kyoto Protocol to enter into force on February 16, 2005.

Canada's Levels and Trends

Canada is one of the world's largest GHG emitters per capita and per unit of GDP. Canada's 2002 production of 23.3 tonnes of GHG per capita is almost double the OECD average of 13 tonnes. In 2002, Canada ranked 26th of 29 OECD countries for GHG emissions (fig. 5A).

From 1990 to 2002, Canada's GHG emissions per capita increased by six percent from 22 to 23.3 tonnes of GHG per capita, compared to an OECD average decrease of 1.3% (fig. 5B). Canada's change in GHG emissions ranks 20th of 28 OECD countries. Despite Canada's pledge to reduce GHG emissions, *total* emissions increased 20% from 1990 to 2002.

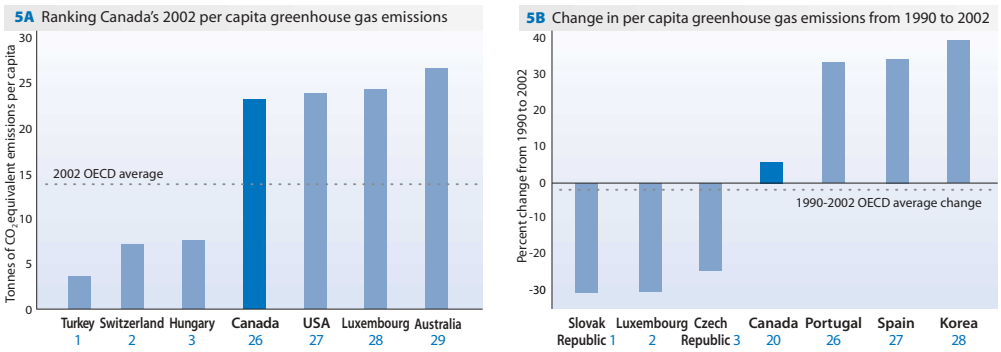


FIGURE 5: Ranking Canada's 2002 per capita greenhouse gas emissions (A) and change in per capita greenhouse gas emissions from 1990 to 2002 (B) among OECD countries

Electricity from Renewable Sources

Generating a higher proportion of electricity from clean, renewable sources of energy can mitigate some of the negative impacts of high energy consumption. The key benefit of renewable sources of energy, such as wind, tidal, solar, biomass, hydroelectric and geothermal, is that they produce low amounts of the emissions associated with acid rain, smog, or climate change.

Although hydropower is renewable, it can have a higher impact on the environment than other renewable sources. For example, hydro operations that involve flooding of large areas can result in vegetation decay that releases the greenhouse gas methane. In addition, large-scale hydro operations affect natural river systems and their associated fish and wildlife populations, as well as alter natural water flows and water quality. Other sources of renewable energy such as wind, tidal, solar, biomass, geothermal, run-of-the-river hydro,

and small-scale hydro are considered to have the lowest overall impact on the environment. These sources have earned the title "low-impact renewable energy."[15] Therefore it is useful to distinguish renewable energy that includes the high-impact, large-scale hydro portion from low-impact renewable energy.

Canada's Levels and Trends

In 2002, 59.7% of the total amount of electricity in Canada was generated from renewable sources in Canada, including large-scale hydro. This proportion is more than double the average for all OECD countries. Overall, Canada ranks 5th of 29 OECD countries in the share of energy from renewable sources (fig. 6A).

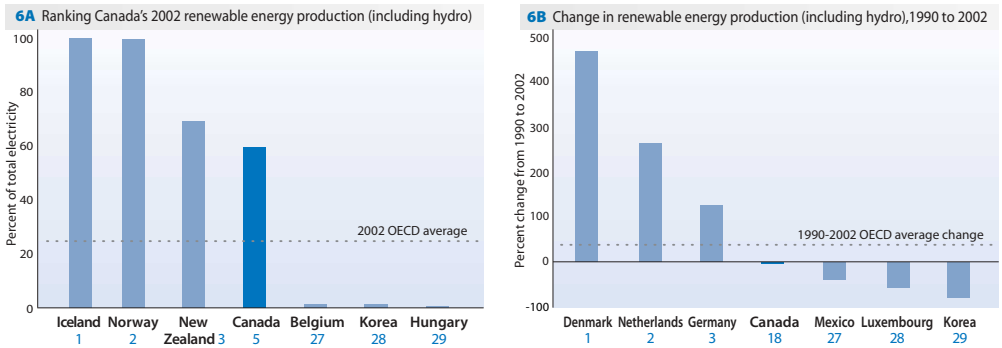


FIGURE 6: Ranking Canada's 2002 renewable energy production (including hydro) (A) and change in renewable energy production (including hydro) from 1990 to 2002 (B) among OECD member countries

Canada's share of electricity production by low-impact renewable sources is 1.5%, or half of the OECD average (fig. 7A). Canada's performance on low-impact renewable electricity production ranks 18th of 28 OECD countries. The leader in low-impact electricity production is Denmark, which produces 18.2% of its electricity using low-impact renewable sources.

The share of Canadian electricity produced using renewable sources including hydro decreased by 4% compared to the OECD average increase of 33% over the last decade (fig. 6B). Canada's share of low-impact renewable electricity increased over the last decade, from 0.8% to 1.5% (fig. 7B). However, this increase only ranks Canada 14th among 23 OECD countries examined. On average, the increase in low-impact renewable energy production in OECD countries is more than two times the Canadian increase.

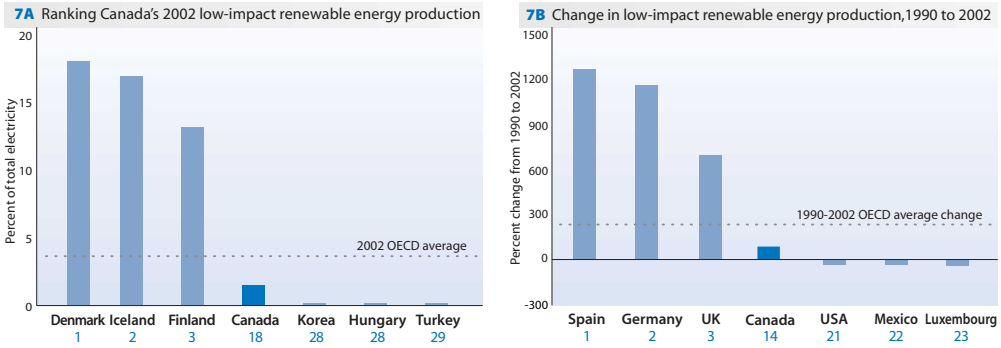


FIGURE 7: Ranking Canada's 2002 low-impact renewable energy production (A) and change in low-impact renewable energy production from 1990 to 2002 (B) among OECD member countries

TABLE 4: Clean Energy Scorecard

GOAL	INDICATOR	RANK	EPG
Shift to Clean Energy	GHG Emissions (tonnes CO_2 equiv/cap)	26th of 29	15.5%
	Renewable Energy (including Hydro)	5th of 29	59.8%
	Low impact Renewable Energy	18th of 30	8.3%

Canada's high energy consumption causes poor performance on greenhouse gas emissions, despite the high rank for renewable energy (including hydro). Low-impact renewable energy is a fast growing energy source, and Canada's slow adoption of it, makes progress in greenhouse gas emission reduction difficult.

4 Reduce Waste and Pollution

Goal

Canada becomes a world leader in modifying production and consumption patterns to mimic nature's closed-loop cycles, thus dramatically reducing waste and pollution.

Background

Waste and pollution are by-products of poor or inefficient design. An environmentally optimal production process would create minimal-to-no-waste, with all materials being reused. Redesigning production processes to eliminate waste would lead to dramatic improvements in the environment, health, and economic efficiency.

Sulfur Oxides

Sulfur oxides pose a threat to human health, causing asthma attacks, eye irritation, coughing, and chest pain. Sulfur oxides cause acid rain, which harms both aquatic and terrestrial ecosystems. Emissions of sulfur oxides occur primarily from point sources, such as power plants, pulp mills, smelters, petroleum refineries, and factories. The top five sources for Canada in 2000 were smelters, power plants, the upstream oil and gas industry, oil refineries, and oil sands respectively.[16]

Canada's Levels and Trends

Canada produced 76.3 kilograms of sulfur oxides per capita, almost three times the OECD average and over 29 times higher than the lowest OECD emitter, Switzerland. Overall, Canada ranks 27th of 28 OECD countries for sulfur oxides emissions, second last only to Australia (fig. 8A).

Canada decreased sulfur oxides emissions by 31% from 110.5 kilograms per capita to 76.3 during the period 1992 to 2002 (fig. 8B). Most of this reduction in Canadian emissions occurred from 1991 to 1993, after Canada entered into the 1991 Canada-U.S. Air Quality Agreement, which stipulates the permanent national SO_2 emissions limit of 3.2

million tonnes per year. The Canada-wide Acid Rain Strategy for Post 2000, signed in 1998, established a further 50% reduction for Ontario, Quebec, New Brunswick, and Nova Scotia by 2015, and 2010 for the remaining provinces.

Canada's success in reducing sulfur oxides is due in part to a policy regime based on establishing clear reduction targets. However, Canada's success is tempered by several important qualifications. First, recent research suggests that although 42% of monitored lakes show reduced acidity levels, lakes may be much more sensitive to acid rain than previously thought. Consequently, it is estimated that a further 75% reduction in sulfur emissions beyond current reduction targets is required to protect aquatic ecosystems.[17] Further, Canada's success in reducing sulfur emissions from 1992 to 2002 is below the OECD average decrease of 43.7% and well below the best performance by Denmark, which achieved an 87% reduction. Overall, Canada's rate of improvement ranked only 21st of 27 OECD countries.

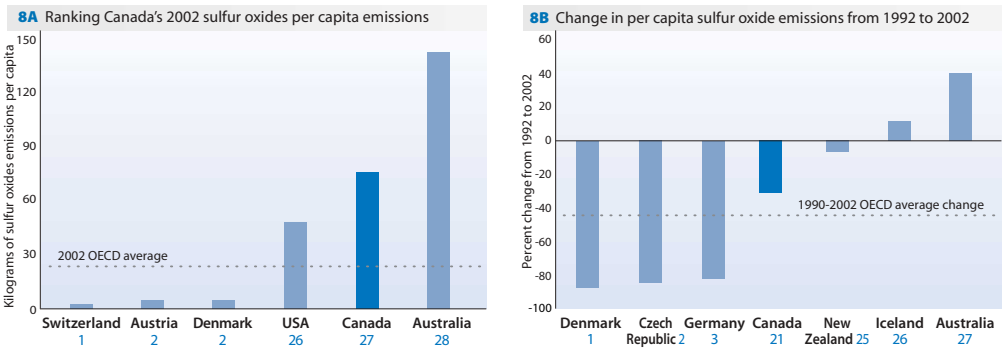


FIGURE 8: Ranking Canada's 2002 sulfur oxides per capita emissions (A) and change in per capita sulfur oxides emissions from 1992 to 2002 (B) among OECD member countries.

Nitrogen Oxides

Nitrogen oxides form during the combustion of fossil fuels, mainly by vehicles, electricity generation, and industrial processes. As with sulfur oxides, nitrogen oxides harm both human health, and the aquatic and terrestrial environment. Nitrogen oxides emissions have grown since the early 1980s, reflecting the steady increase in vehicle use. However, emission standards for motor vehicles are becoming increasingly stringent, and by 2010, Canadian national standards for nitrogen oxides will be aligned with the stronger U.S. standards.[18]

Canada's Levels and Trends

Canada's emissions of 78.4 kilograms per capita of nitrogen oxides are about two-and-one-quarter times higher than the OECD average of 35 kilograms per capita, and six times higher than the best OECD performance by Switzerland of 12.4 kilograms per capita. Overall, Canada ranks 26th of 28 OECD countries for nitrogen oxides emissions (fig. 9A).

Canada decreased emissions of nitrogen oxides from 88.8 kilograms per capita to 78.4 in the last decade, a reduction of almost 12%. This reduction compares to an OECD average decrease of 18%. Canada ranks 18th of 28 OECD countries in reduction of nitrogen oxides emissions (fig. 9B).

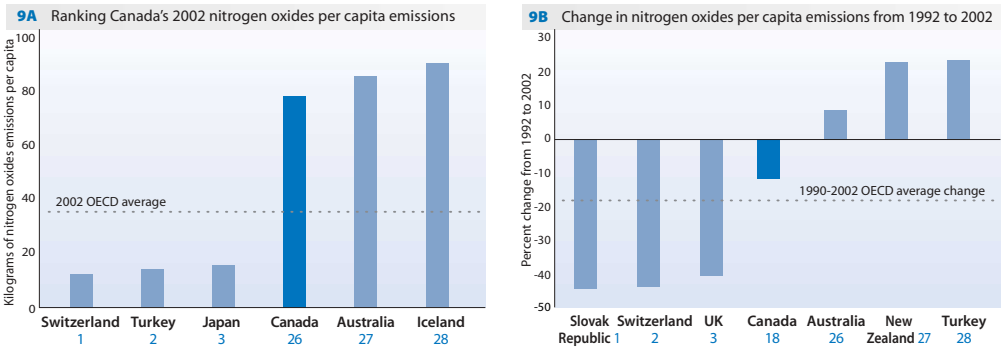


FIGURE 9: Ranking Canada's 2002 nitrogen oxides per capita emissions (A) and change in nitrogen oxides per capita emissions from 1992 to 2002 (B) among OECD member countries

Volatile Organic Compounds

When combined with nitrogen oxides, volatile organic compounds (VOCs) produce smog and ground-level ozone. Health impacts include eye irritation and a decrease in lung function. VOCs also impair growth of agricultural products such as wheat, corn, soybeans, and tomatoes. VOCs are produced by vehicle emissions and chemical manufacturing, as well as through evaporation of automotive fuels, other petroleum-based products, and chemical solvents.

Canada's Levels and Trends

Canada has the worst ranking of 30 OECD countries for per capita VOCs emissions (fig. 10A). Canada emits 83 kilograms per capita of VOCs, almost three times higher than the OECD average and about eight times higher than the best OECD performer.

Canada reduced emissions of VOCs by 13% compared to the OECD average reduction of 23% in the last decade and a 50% reduction by Iceland, which recorded the highest reduction among OECD countries (fig. 10B). Canada ranks 18th of 28 OECD countries in VOC reduction.

Progress in emissions reductions is constrained by Canada's failure to ratify the 1991 Geneva Protocol to the Convention on Long-range Transboundary Air Pollution, and failure to have explicit VOC emission reduction targets. Emissions may be reduced if Canada adopts more stringent U.S.-style vehicle emission standards.

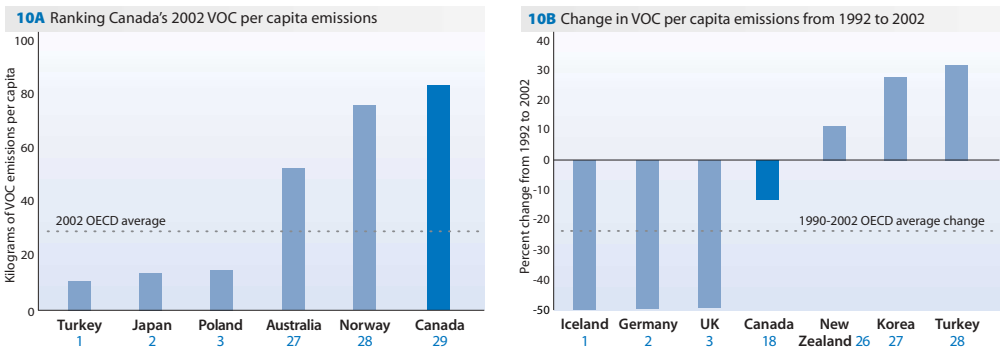


FIGURE 10: Ranking Canada's 2002 VOC per capita emissions (A) and change in VOC per capita emissions from 1992 to 2002 (B) among OECD member countries

Carbon Monoxide

Carbon monoxide (CO) is produced through combustion of fossil fuels, mainly by vehicles. CO poses serious health risks by impairing the body's ability to absorb oxygen.

Canada's Levels and Trends

Canada produced 311.2 kilograms per capita of CO, more than three times higher than the OECD average and more than 11 times higher than Japan, which achieved the lowest per capita CO emissions (27.1 kg) (fig. 11A). Canada ranks last out of 28 OECD countries in per capita CO emissions.

Canada decreased per capita emissions of CO by 27.5% between 1992 and 2002. Canada's reduction is slightly less than the average OECD reduction of 31% and significantly less than the 77% reduction attained by Luxembourg (fig. 11B). Canada ranked 18th of 27 OECD countries in reducing per capita CO emissions.

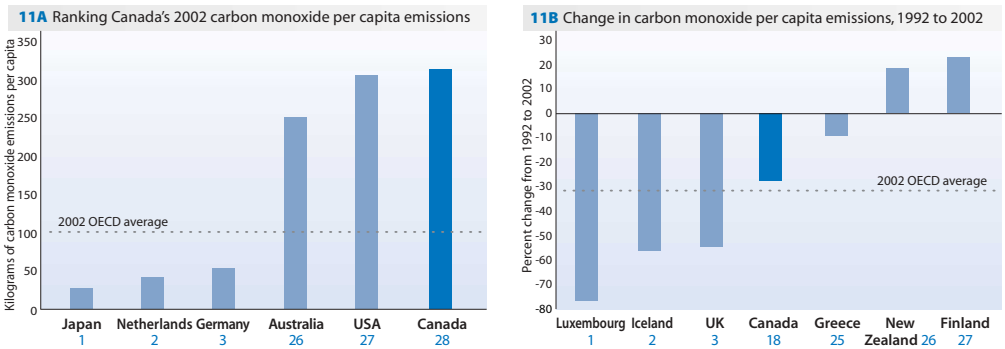


FIGURE 11: Ranking Canada's 2002 carbon monoxide per capita emissions (A) and change in carbon monoxide per capita emissions from 1992 to 2002 (B) among OECD member countries

Ozone-Depleting Substances

Ozone-depleting substances (ODS) are used in refrigeration and air conditioning equipment as coolants, in aerosol sprays, fire extinguishers, foamed plastics, and pesticides. The release of ODS damages the earth's ozone layer, resulting in increased ultraviolet radiation reaching the Earth's surface, which harms human health and the environment. Because different ODS have different ozone depletion rates, this report weights each substance with its ozone depleting potential (ODP.)

Canada's Levels and Trends

Canada no longer produces ozone depleting substances such as CFCs, halons, carbon tetrachloride, or methyl chloroform. However, Canada is still producing HCFCs, although international agreements require these chemicals be phased out by 2020. In 2000, Canada released 28 kilograms of ODP per thousand people (fig. 12A), an amount more than 60% greater than the OECD average of 17 kilograms per thousand, and over 25 times larger than the OECD best performer, the Slovak Republic (1.1 kg per thousand people). Canada ranked 12th of 14 countries for this performance.

From 1992 to 2000, Canada managed to reduce ODS by about 93% (fig. 12B). While this reduction exceeded the OECD average reduction of 90%, Canada still only ranked 7th of 12 countries. The OECD best performer, Switzerland, reduced ODS by over 99%.

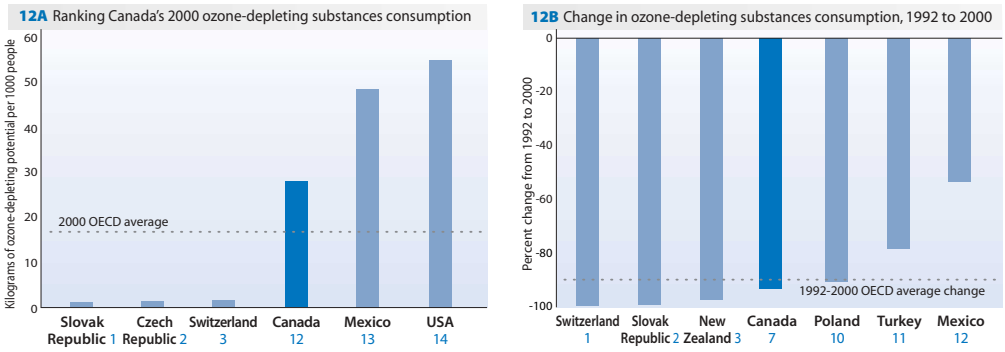


FIGURE 12: Ranking Canada's 2000 ozone-depleting substances consumption (A) and change in ozone-depleting substances consumption from 1992 to 2000 (B) among OECD member countries

MUNICIPAL WASTE

The OECD defines municipal waste as "waste from households, including bulky waste, similar waste from commerce and trade, office buildings, institutions and small businesses, yard and garden waste, street sweepings, the contents of litter containers, and market cleansing waste".[19] Inappropriate waste management can have a potential impact on human health and the environment. Municipal waste contributes to habitat destruction, surface and groundwater pollution and other forms of air, soil, and water contamination. Depending on the disposal method, several environmental problems can arise with negative consequences, such as the creation of toxic substances through incineration. Landfills also emit methane (which contributes to global warming) and other gases. Methane emissions from landfills can be reduced by home composting, which cuts the volume of organic matter sent to landfills.

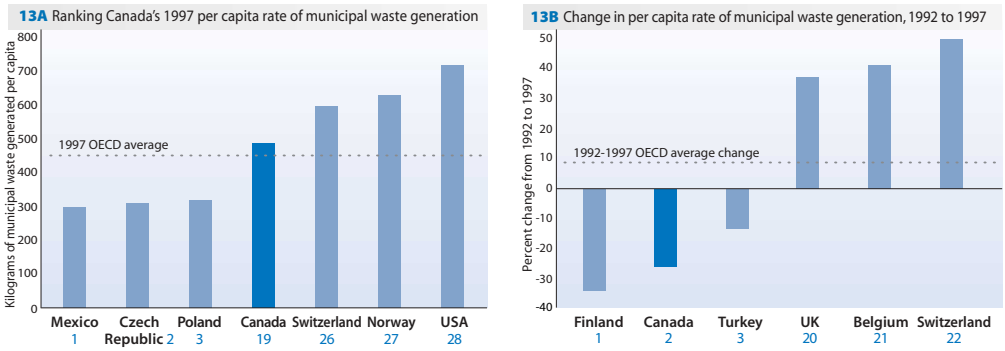


FIGURE 13: Ranking Canada's 1997 per capita rate of municipal waste generation (A) and change in per capita rate of municipal waste generation from 1992 to 1997 (B) among OECD member countries

Canada's Levels and Trends

In 1997, Canada produced 490 kilograms of waste per capita, only slightly above the OECD average of 458 kilograms per capita. Overall, Canada ranks 19th of 28 OECD countries for per capita municipal waste production (fig. 13A).

Canada successfully decreased production of municipal waste by over 25%, from 660 to 490 kilograms per capita from 1992 to 1997 (fig. 13B), while the OECD countries, on average, experienced a 9% increase. Canada ranks 2nd compared to other OECD countries in terms of percent change in municipal waste generation.

Recycling

The OECD defines recycling as the "reuse of material in a production process that diverts it from the waste stream, except reuse as fuel".[20] Recycling reduces the amount of material being discarded as waste and reduces consumption of natural resources.

Canada's Levels and Trends

An indicator used to measure recycling efforts is the proportion of municipal waste that is diverted to recycling. The proportion of waste recycled is the quantity of non-hazardous materials diverted from disposal facilities, and represents the sum of all materials (e.g., glass, metal, plastic, wood, paper, and cardboard) processed for recycling or reuse at an off-site recycling facility against the total generation of non-hazardous residential and non-residential solid waste.

OECD recycling data for Canada are based on household waste, which represents about one-half of municipal waste.[21] Canada's recycling rate for household waste in 2000 was 23%, which is above the OECD average but well behind the countries with the highest recycling rates (fig. 14A). Canada increased its rate of recycling from 1990 to 2000, but the rate of increase was only about one-quarter the average improvement for OECD countries (fig. 14B).

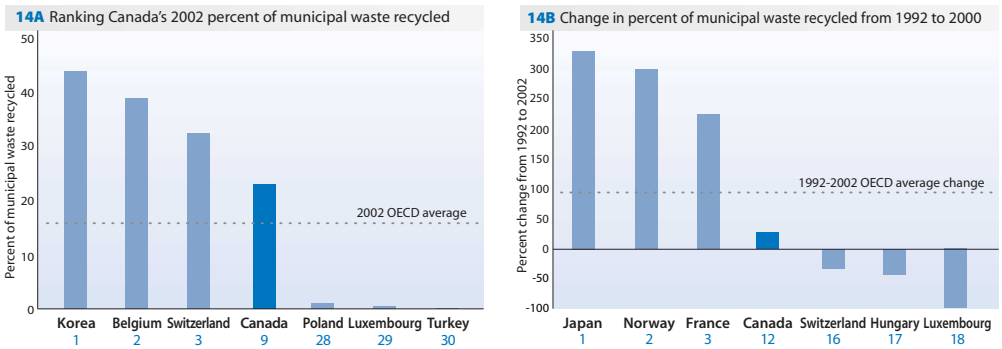


FIGURE 14: Ranking Canada's 2002 percent of municipal waste recycled (A) and change in percent of municipal waste recycled from 1992 to 2002 (B) among OECD member countries.

Nuclear Waste

Nuclear energy accounts for about 16% of Canadian electricity production. Forty-five percent of electricity in Ontario is generated from nuclear energy, while it is 30% in New Brunswick, and 3% in Quebec. Nuclear waste can be divided into three categories: nuclear fuel waste comprised of spent nuclear fuel bundles discharged from reactors, uranium mine tailings, and low level radioactive waste. Spent nuclear fuel, which remains radioactive for over 250,000 years, is stored on-site at nuclear power plants because a satisfactory technology for permanent storage of radioactive waste does not exist.

Canada's Levels and Trends

The quantity of spent nuclear fuel is expected to increase almost threefold from 1998 to 2035 from 5,583 to 14,470 cubic meters.[22] Low-level radioactive waste, which consists primarily of contaminated soil, is expected to increase from 1.8 million to 2.1 million cubic

meters by 2035. Canada is the largest generator of nuclear waste per capita of any OECD country, producing over six times the OECD average (fig. 15A). Canada did however record the largest decline in per capita production of nuclear waste from 1992 to 2002 (fig. 15B).

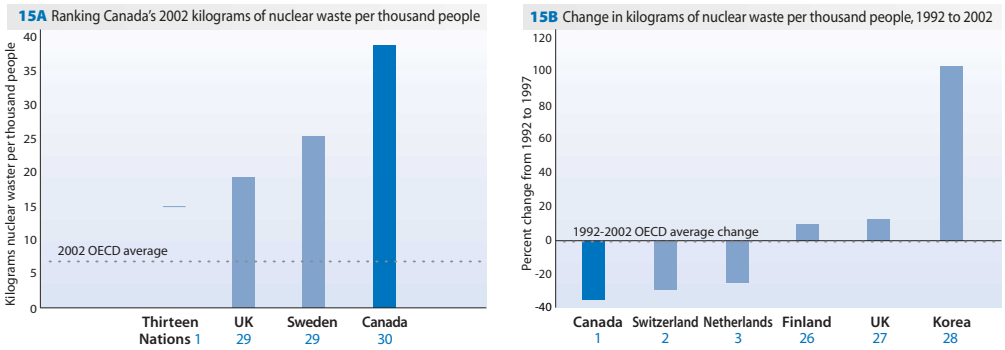


FIGURE 15: Ranking Canada's 2002 kilograms of nuclear waste per thousand people (A) and change in kilograms of nuclear waste per thousand people from 1992 to 2002 (B) among OECD member countries

Pollution Abatement and Control Expenditures

Total pollution abatement and control (PAC) expenditures are a useful measure of efforts by a society to mitigate environmental damage. The expenditures are measured as a percentage of the GDP. PAC expenditures and activities include "protection of ambient air and climate, wastewater management, waste management, protection and remediation of soil, groundwater and surface water, noise and vibration abatement, and protection against radiation".[23] The definition excludes expenditures on: resource management, including natural disaster prevention and hazard mitigation; nature protection; drinking water; workplace protection; energy saving; or improvement of production processes for commercial or technical reasons.

The federal and provincial governments report PAC expenditure as "purposeful activities aimed directly at the prevention, reduction, and elimination of pollution or nuisances arising as a residual of production processes or the consumption of goods and services".[24] Private PAC expenditures in industry are mostly associated with air pollution, water pollution, and the disposal of hazardous waste. The polluter pays principle infers that the polluter should bear the expenses of carrying out environmental protection measures, and the costs of these measures should be reflected in the cost of goods and services which cause pollution in production or consumption.

Canada's Levels and Trends

Canada spent 1.1% of its GDP on pollution abatement, almost 20% lower than the OECD average of 1.3% (fig. 16). The public sector was responsible for 55% of the total PAC expenditures in Canada.[25] Canada's expenditures are less than half the level of Austria's spending, which achieved the highest level of PAC expenditures (2.4% of GDP) among OECD countries. Canada ranks 13th of 25 OECD countries in PAC expenditures as a proportion of GDP.

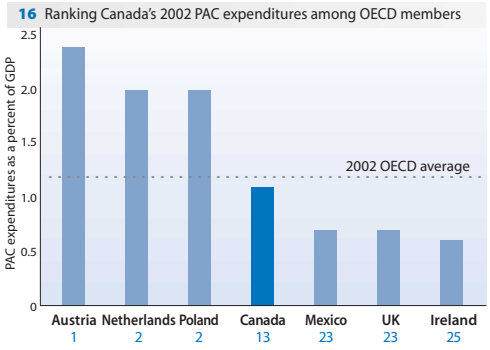


FIGURE 16: Ranking Canada's 2002 PAC expenditures among OECD member countries

TABLE 5: Waste and Pollution Scorecard

GOAL	INDICATOR	RANK	EPG
Reduce Waste & Pollution	Sulfur Oxides (kg/cap)	27th of 28	3.4%
	Nitrogen Oxides (kg/cap)	26th of 28	15.8%
	VOCs (nonmethane) (kg/cap)	29th of 29	12.9%
	Carbon Monoxide (kg/cap)	28th of 28	8.7%
	Ozone-Depleting Substances (kg/1,000 people)	12th of 14	4.0%
	Municipal Waste (kg/cap)	19th of 28	61.2%
	Recycling of Municipal Waste (% of municipal waste)	9th of 30	52.7%
	Nuclear Waste (kg/1,000 people)	30th of 30	0.0%
	Pollution Abatement and Control Expenditures (% of GDP)	13th of 25	45.8%

Increasing expenditures on pollution abatement and control could improve Canada's air pollution record but a shift toward clean energy sources and more efficient transportation systems and vehicles would address the major cause of Canada's poor performance.

5 Protect and Conserve Water

Goal

Canada becomes a world leader in water stewardship by protecting and restoring the quantity and quality of fresh water in Canadian ecosystems, and by guaranteeing access to clean water in the Canadian Charter of Rights and Freedoms.

Background

Industrial effluent, agricultural run-off, and municipal sewage pollution are among the many threats facing Canadian water quality. Industry alone is responsible for 20 million kilograms of toxic chemicals being dumped into Canadian rivers, lakes, and streams, and 135 million kilograms of contaminates into groundwater.[26] The millions of kilograms of toxic industrial chemicals released each year are leading to increased eutrophication of fresh water bodies and contamination of groundwater. Industry, agriculture, and human wastewater are all releasing harmful chemicals, some of which disrupt endocrine systems in humans and animals, and cause reproductive and immune dysfunctions, neurological, behavioural, and developmental disorders, as well as various cancers.

Electricity facilities have also significantly impacted water resources. Cooling in thermal electricity generation (coal, natural gas, and nuclear) uses twice as much water as all other sources combined. The infrastructure, facilities, and processes involved in producing hydroelectricity have severe implications on the landscape, including the inundation of large tracts of land, alteration of river flows, and harm to aquatic species.

A comprehensive assessment of Canadian water quality is not possible due to a lack of national water quality monitoring data.

Municipal Sewage Treatment

Untreated or poorly treated municipal sewage is a major source of water contamination. Many water bodies have suffered from fishing, swimming, and shellfish closures due to the release of untreated sewage waste and contaminants from non-point sources. Unnaturally high nutrient levels from agricultural run-off and sewage are leading to eutrophication and toxic algal blooms in many water bodies. Further, the release of untreated human

excrement (raw sewage) leads to unsafe levels of fecal coliforms that increase the presence of disease causing pathogens.

The impact of sewage on water can be reduced by various forms of sewage treatment, normally categorized as primary, secondary, and tertiary. During primary treatment, large solids, sediment, and organic matter are removed using filters and screens. Secondary treatment biologically processes waste using bacteria and microorganisms. Tertiary treatment uses a variety of processes to remove additional nutrients, toxic compounds, salts, acids, and metals.

Canada's Levels and Trends

Seventy-two percent of the Canadian population currently has access to sewage treatment and 58% have access to either secondary or tertiary treatment. Nine percent of Canadians are connected to an industrial wastewater plant, or have some form of personal sewage treatment system such as septic tanks or disposal fields.[27] The remaining 19% are connected to a sewer service, but the sewage is not treated. Overall, Canada ranks 14th of 28 OECD countries in terms of the proportion of population served by sewage treatment (fig. 17A). Topping the list is the Netherlands where 98% of the population has sewage treatment.

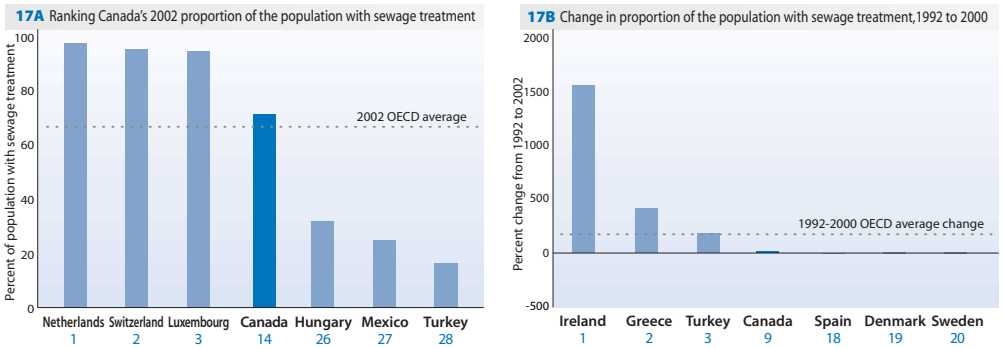


FIGURE 17: Ranking Canada's 2002 proportion of the population with sewage treatment (A) and change in proportion of the population with sewage treatment from 1992 to 2002 (B) among OECD member countries

Canada increased the percent of the population served by municipal sewage treatment by 14% from 1992 to 2002, well below the OECD average change of 119% (fig. 17B). It is important to keep in mind, however, that the percentage change is relatively low in Canada because a substantial portion of the Canadian population was already served by municipal sewage treatment. Nonetheless, there are still significant deficiencies in Canada's sewage treatment system. Three provincial capitals—Victoria, Halifax, and St. John's—continue to pump raw sewage directly into the ocean. Even in regions with the most effective treatment, faulty sewage infrastructure combined with heavy rains can result in sewage wastewater by-passing the treatment facility and flowing directly into the receiving environment through sewer overflows. The OECD estimates that based on current plans, it will take another 20 years before Canada's sewage system needs are met.[28]

TABLE 6: Protect and Conserve Water Scorecard

GOAL	INDICATOR	RANK	EPG
Protect and Conserve Water	Municipal Sewage Treatment	14th of 28	73.1%

A comprehensive assessment of Canadian water quality is not possible due to a lack of data. A national sustainability plan could include a full set of indicators to assess the quality of drinking water sources and aquatic habitat across the country.

6 Produce Healthy Food

Goal

Agriculture in Canada provides nutritious, healthy foods for Canadians as well as people around the world, while safeguarding the land, water, and biodiversity.

Background

Pesticide contamination, dwindling water tables, surface and groundwater contamination, soil erosion, and uncertainty of impacts of genetically modified foods are some of the environmental issues associated with agriculture. Water supply can become contaminated by pesticides and agricultural waste, and inundated with fertilizer compounds such as nitrogen and phosphorous, which increase eutrophication and damage aquatic ecosystems.

Pesticide Use

Canada's Levels and Trends

Canada has over 7,000 pesticide products registered, 90% of which are used in agriculture. Over 60 pesticides used in Canada are banned by other countries due to their environmental and health impacts.[29] Canada uses 96.6 kilograms of pesticides per square kilometre of arable land, about one-quarter the OECD average. Overall, Canada ranks 8th of 30 OECD countries for kilograms of pesticides per square kilometre of arable land (fig. 18A). Korea had the largest pesticide application rate in the OECD with 1,480 kg per square kilometre. It should be noted that the volume of pesticide use is an imperfect indicator because it ignores other factors that determine the level of harm, including toxicity, application timing, sensitivity of local ecosystems, and spraying restrictions.

Between 1990 and 2002, Canada increased its kilograms of pesticides per square kilometre of arable land by 17.8%, while the OECD average pesticide application rate decreased by 17% (fig. 18B). Canada ranked 20th of 22 OECD countries for this change in pesticide application rate.

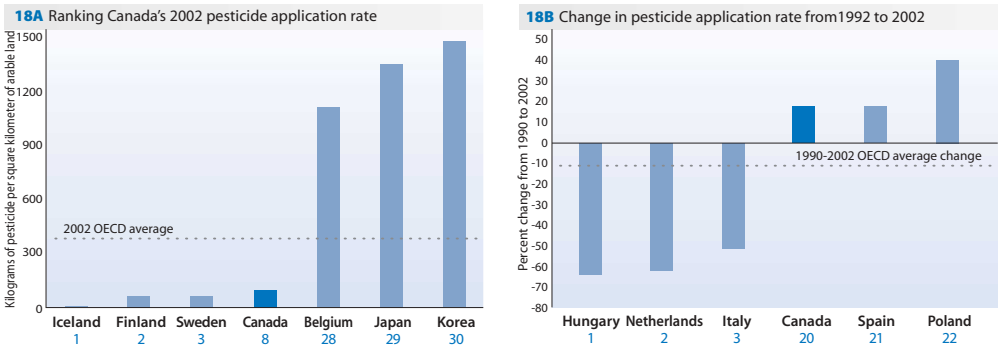


FIGURE 18: **Ranking Canada's 2002 pesticide application rate (A) and change in pesticide application rate from 1990 to 2002 (B) among OECD member countries**

Fertilizer Use

Canada's Levels and Trends

In 2001, Canada used 5.81 tonnes of fertilizer per square kilometre of arable land, about 25% of the OECD average of 23 tonnes (fig. 19A). Canada ranks the second lowest user of fertilizer of 29 OECD countries. The OECD best performer, Australia, used only about 4.9 tonnes per square kilometre, while the worst OECD performer, New Zealand, applied fertilizer at a rate of 166 tonnes per square kilometre.

Canada increased fertilizer use, from 1990 to 2001, by 16% from 5.01 to 5.81 tonnes per square kilometre of arable land, while the OECD averaged an 11% decrease. Only three OECD countries had a higher increase in fertilizer application rates. Consequently, Canada ranked 26th of 29 countries in change in fertilizer use (fig. 19B).

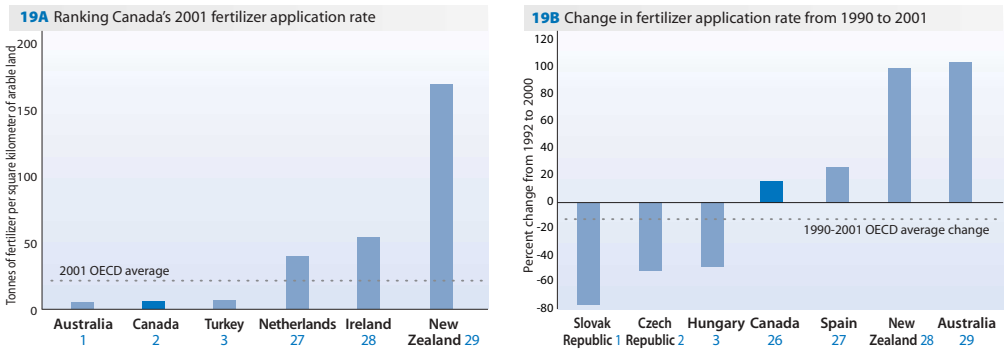


FIGURE 19: **Ranking Canada's 2001 fertilizer application rate (A) and change in fertilizer application rate from 1990 to 2001 (B) among OECD member countries**

Livestock

Canada's Levels and Trends

Meat production has a high environmental impact. Intensive livestock operations produce an enormous amount of manure – 132 billion kilograms per year in Canada – as well as requiring vast volumes of water, energy, and other resources to sustain operations.[30] Consequently, the OECD uses livestock as one of its environmental indicators. Livestock is measured in head of sheep equivalent livestock (a weighted summation of cattle; sheep and goats; horses, mules, and asses; and pigs) per unit of arable land and grassland to allow for comparison between countries.

Canada has 141.4 head of sheep equivalent livestock per square kilometre of arable and grassland compared to the OECD average of 515.3. Canada ranked 2nd of 29 OECD countries behind Iceland, a largely non-agricultural country, with only 69 head of sheep equivalent livestock per square kilometre of arable and grassland. Belgium ranked last with 1,732.6 (fig. 20A).

From 1990 to 2002, OECD countries averaged a 2.2% reduction in livestock levels. Canada ranked 12th of 29 OECD countries with a 10% reduction in levels of sheep equivalent livestock. The Slovak Republic was first with a 55% decrease, while Australia ranked last with livestock levels increasing by over 150% (fig. 20B).

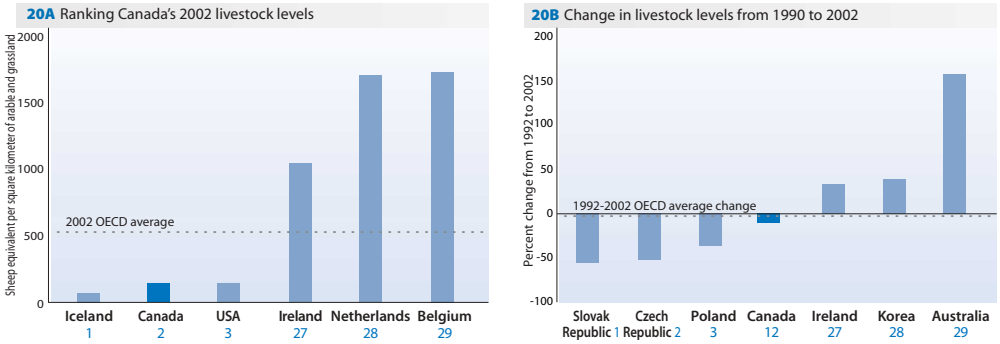


FIGURE 20: Ranking Canada's 2002 livestock levels (A) and change in livestock levels from 1990 to 2002 (B) among OECD member countries

TABLE 7: Healthy Food Scorecard

GOAL	INDICATOR	RANK	EPG
Produce Healthy Food	Pesticide Use (kg/km^2 arable land)	8th of 30	4.0%
	Fertilizer Use (tonnes/km^2 arable land)	2nd of 29	83.8%
	Livestock (sheep equiv/km^2 arable and grassland)	2nd of 29	48.8%

A full understanding of Canada's performance regarding this goal would include data on the shift to organic farming.

7 Conserve, Protect and Restore Nature

Goal

Canada becomes globally renowned for our leadership in conserving, protecting, and restoring the health and diversity of our ecosystems, the magic of our parks and wilderness areas, and the natural beauty of our nation.

Species at Risk

One indicator for measuring the health of a country's biodiversity is the number of species at risk of becoming extinct in the wild. However, an important qualification in using species at risk data needs to be emphasized. Species at risk estimates are based on completing studies of individual species; the more species studied, the higher the number of species at risk. For example, the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) estimates that the number of species at risk in Canada grew from 17 in 1978 to 467 in 2004.[31] However, the increased number of species at risk reflects in part the pace at which COSEWIC can study and designate species, rather than the pace at which species may be going extinct. Although some successes in improving the status of some of the species at risk have been achieved, it appears that overall biodiversity is in Canada deteriorating.[32]

Canada's Levels and Trends

In 2002, Canada ranked 26th of 30 OECD countries for the number of species at risk, well above the OECD average and more than 23 times greater than Norway, which had the lowest number of species at risk (fig. 21A). However, Canada ranked much better in terms of proportion of species at risk: 8th of 30 countries and well below the OECD average (fig. 22A). Canada's abundant biodiversity means that there are more species than in many other countries so the proportion of species at risk may be smaller than in countries with less biodiversity. Mammals and birds account for approximately 30% each of the species at risk, while fish account for the remaining 40%.

From 1992 to 2002, only two OECD countries – Japan and Iceland – had a greater rate of increase in their respective number of species at risk than Canada, and only one OECD country – Iceland – had a greater increase in the proportion of species at risk. For this performance, Canada ranked 27th of 29 for the change in numbers at risk (fig. 21B) and 28th of 29 for change in the proportion of species at risk (fig. 22B). These increasing Canadian rates of number of and percent of species being placed at risk are each about five times the OECD average. Compared to these large rates of increase, the OECD best performers managed to decrease total number of species at risk (the U.K. decreased by over 67%) and percent of species at risk (New Zealand decreased by over 87%). However, it should be cautioned that species at risk and the rate of change in species at risk in Canada and other OECD countries reflect the rate of study of species. For example, the large decrease in proportion of species at risk in New Zealand is due to the increase in the number of species identified, not a decrease in the number of species at risk. Therefore, while it is useful to compare species at risk data, comparison and trends should be viewed with caution.

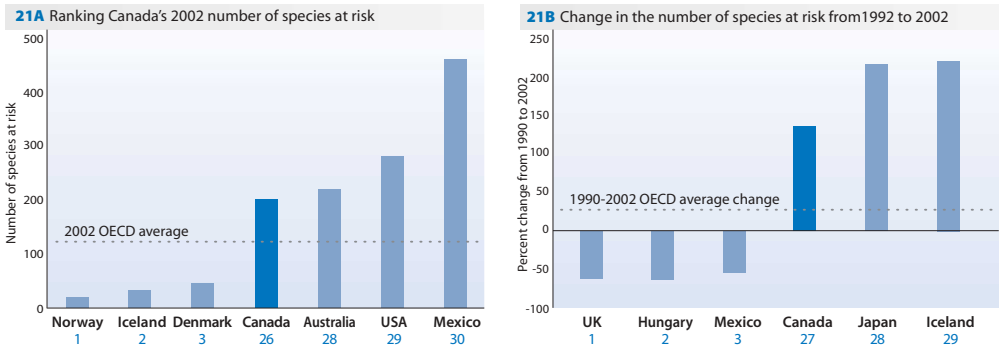


FIGURE 21: Ranking Canada's 2002 number of species at risk (A) and change in number of species at risk from 1992 to 2002 (B) among OECD member countries

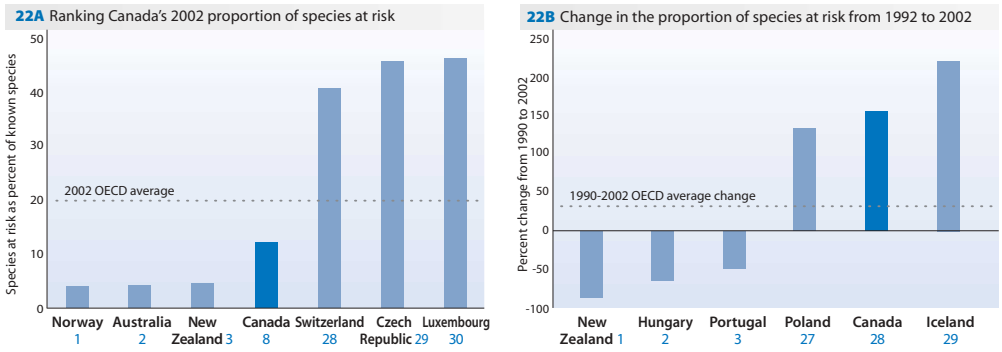


FIGURE 22: Ranking Canada's 2002 proportion of species at risk (A) and change in proportion of species at risk from 1992 to 2002 (B) among OECD member countries

PROTECTED AREAS

A protected area is an area of land or sea with restrictions on activities that damage the ecology or important cultural, recreation or natural features. Protected areas are an important component of a strategy to maintain biodiversity and ecosystem function.

A commonly used indicator is the percent of the total land base that is designated as protected by a jurisdiction. A key consideration in using this indicator is the definition of

a protected area. The integrity of protected areas is affected by internal threats such as exotic species, recreational activities, and other human activities, as well as external threats such as fragmentation and development.[33] Management policy for protected areas is therefore key to determining the effectiveness of protection. The World Conservation Union (IUCN) classifies protected areas based on management intent. In general, categories I-III protected areas are those that are managed for conservation, wilderness, and ecosystem protection and allow only minor amounts of recreation.[34] Protected areas classified as IV-VI have less strict management guidelines that may allow sustainable resource use. Higher amounts of protected areas in categories I-III are clearly desirable for establishing strong and effective reserves that are capable of preserving ecological integrity.

Another consideration for protected areas is ensuring that preserved areas are valuable environments that adequately represent the full range of ecosystems. A goal that was unanimously endorsed by the House of Commons in Canada is to protect, in its natural state, a representative sample of each of the country's natural regions in both the terrestrial and marine environments.[35]

Canada's Levels and Trends

Canada has a special role to play in world protection because it contains 20% of the world's remaining natural areas.[36] As of 2002, approximately 9.9% of Canada's 998 million hectares of terrestrial land were protected according to the IUCN classes I-VI definition of a protected area. This proportion is well below the OECD average of 15% and Denmark's 37%, which represents the highest proportion of protected area among OECD countries. Overall, Canada ranks 16th of 30 OECD countries in the proportion of its land base that is protected (fig. 23A).

In comparing protected area rankings, it is important to note that although Denmark, Austria, and Germany have the highest proportion of their land base protected, few of their protected areas are in the stricter IUCN classes I-III. The respective proportions in IUCN classes I-III are: Denmark (1%), Austria (2%), and Germany (7%). Canada, on the other hand, has 56% of its protected area in classes I-III.

In the last 10 years, Canada has increased its major protected areas (IUCN classes I-VI) by 11% (from 8.9% to 9.9%), which is well below the average increase in protected areas for all OECD countries of 61% (fig. 23B). In terms of terrestrial representation, only 29 of 39 regions are currently represented in the national park system. [37] Overall, Canada ranked

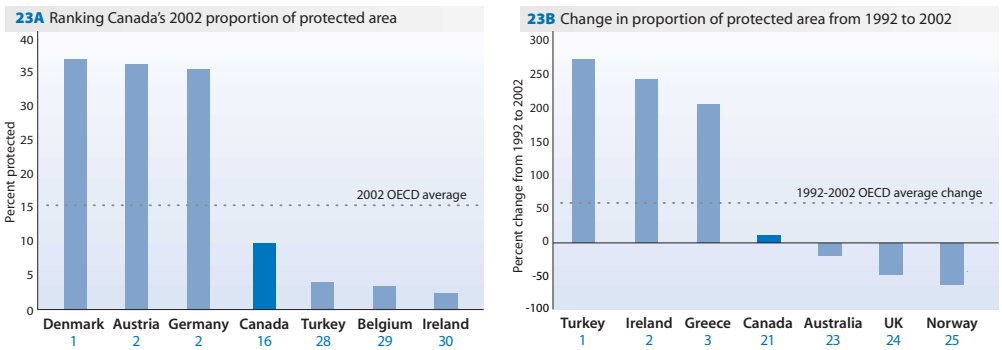


FIGURE 23: Ranking Canada's 2002 proportion of protected area (A) and change in proportion of protected area from 1992 to 2002 (B) among OECD member countries

21st of 25 OECD countries in increase in protected areas. Turkey recorded the largest increase, almost a four-fold increase in protected areas (from 1.1% to 4.1%). However, it should be noted that Turkey still has one of the lowest proportions of its land base protected.

Another component of protected areas is the marine environment. Canada has the longest coastline in the world. While a number of the terrestrial parks have small components of marine waters, very few marine protected areas have been established in Canada. Less than 1% of Canada's vast 5.5 million square kilometres of oceans have been protected by provincial or federal legislation.[38] Some marine areas also receive some degree of protection through designation as UNESCO Biosphere Reserves, Ramsar Wetlands of International Importance, National Whale Sanctuaries, and municipal or regional parks. In terms of marine representation, two of 29 marine regions are currently represented in the national park system and efforts are underway to establish parks in three more areas.[39] Additional regions are partly represented because the boundaries of several coastal parks have been drawn to include adjoining marine waters.

Forest Use

Canadian forests cover over 45% of Canada's land base and comprise 10% of the world's total forested area. Just over one-half of Canada's forests are characterized as commercial forests and just over one-quarter are used primarily for cutting timber, which is a significant component of the Canadian economy. Forests also perform important ecological functions including providing habitat for two-thirds of Canada's wildlife, clean air, carbon sequestration, clean water, and flood control. Only 6.8% of Canadian forests are designated as protected under IUCN classes I-VI.[40]

Two indicators are used to measure stress on forests: the volume of timber cut per km^2 of forested land and the timber cut to forest growth ratio. The assumption is that the higher proportion of the forest land base being cut, the greater the stress on the environment. Cut to growth ratios attempt to measure the sustainability of the timber cutting rate; ratios above one indicate that forests are being cut at a faster rate than they are regenerating. However, it should be cautioned that a ratio below one does not necessarily indicate that forest resources are being sustained or enhanced. Forest resources may be depleted by non-cutting events such as fire. Moreover, the forest being cut may be ecologically valuable old growth forest that is not adequately replaced by second growth forests that has more environmental impact. The impact of forest cutting will also vary with the method used. Large scale clearcutting, for example, will have higher impacts than selective logging.

Canada's Levels and Trends

In 2002, Canada cut 200,326,000 m^3 of timber, or 48 m^3 of timber per square kilometre of forestland (fig. 24A). This cut rate is about one-fifth the OECD average of 229.5 m^3 per square kilometre. Canada ranked second out of 29 OECD countries in timber cut rate, reflecting the large volume of forested land base in Canada relative to many other OECD countries. The OECD best performer, Australia, cut just 19 m^3 per square kilometre of forestland, while the OECD worst performer, Belgium, cut 662.7 m^3 per square kilometre.

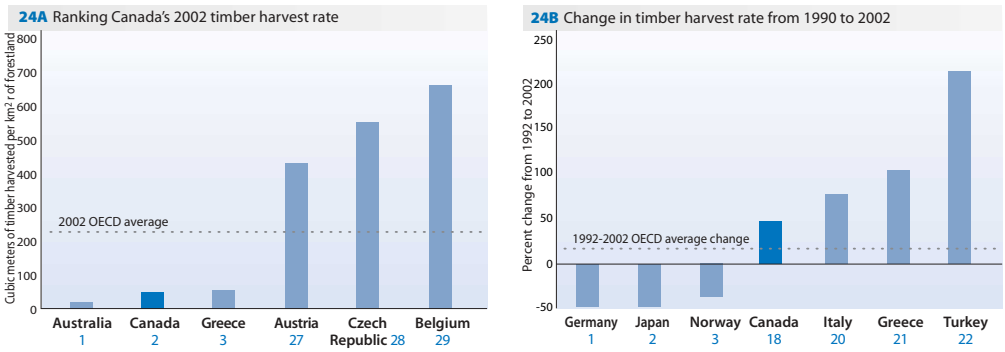


FIGURE 24: **Ranking Canada's 2002 timber harvest rate (A) and change in timber harvest rate from 1992 to 2002 (B) among OECD member countries**

The total volume of timber harvest in Canada per square kilometre of forest land increased between 1990 and 2002, increased by 46.3% (fig. 24B). Canada's timber harvest rate increase per area of forestland was almost three times higher than the OECD average increase of 16.7%, a performance for which Canada was ranked 18th of 22 OECD countries. The OECD best performer at reducing timber harvest rates, Germany, achieved a nearly 50% decrease. Although Canada's volume of timber harvested increased, it is notable that its forested area remained fairly constant over the past decade at 417.6 million hectares, of which 70% has never been cut.[41] It should also be noted that most of Canadian timber is still harvested by clearcutting.

Canada had a timber cut to forest growth ratio of 0.4 in 2002, slightly lower than the OECD average of 0.55 (fig. 25A). Canada ranked fifth among the 29 OECD countries evaluated, with Korea achieving the OECD lowest harvest to growth ratio of 0.1. While Canada has a relatively low timber harvest to forest growth ratio, it is important to emphasize that Canada's cut includes old growth forests of high ecological value. Therefore, even though the rate of harvest is below the growth rate, logging in Canada can do more environmental damage than in other countries. In the last decade, the harvest to growth ratio in Canada decreased by 43% compared to the OECD average decrease of 5% (fig. 25B). As a result, Canada is tied for second with Germany for reducing its ratio.

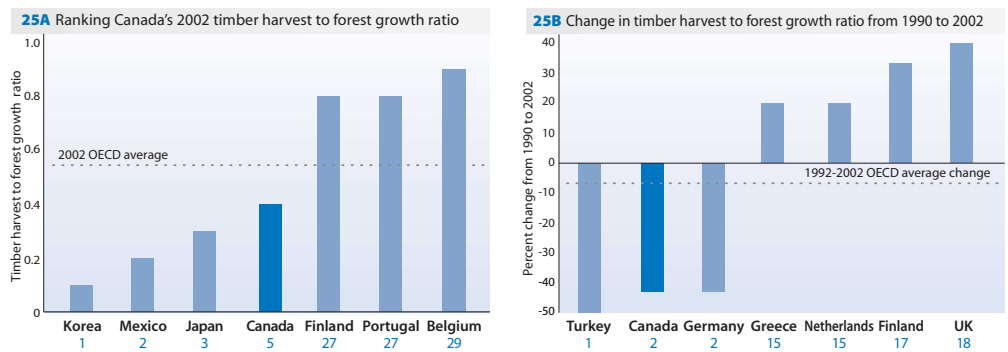


FIGURE 25: **Ranking Canada's 2002 timber harvest to forest growth ratio (A) and change in timber harvest to forest growth ratio from 1990 to 2002 (B) among OECD member countries**

FISHERIES

With over five million square kilometres of territorial seas and the longest coastline of any nation, Canada's aquatic environment supports a wealth of marine biodiversity. One in four known species of animals, plants, and microbiota in Canada is marine (approximately 17,750 species).[42] Oceans contribute to Canada's economy, providing food, medicine, industrial products, and tourism opportunities; in 1996 the oceans sector generated an estimated $20 billion of Canada's gross domestic product.[43] Furthermore, oceans provide valuable ecological services such as producing oxygen, absorbing carbon dioxide, and recycling water.

Measuring sustainability in fisheries management is challenging. An ideal indicator should measure actual catch compared to the sustainable fisheries catch. The only data available from the OECD on fisheries management are fish catch by country, which are reported in absolute quantities as well as percent of world catch. There is no data on sustainable fisheries catch. In the absence of a better indicator, wild fish catch per capita and fish catch as a percent of world take are used to indicate pressure on fish populations and on marine and freshwater ecosystems.[44] Trends in fish catch can also be an indicator of sustainability. Declines in fish catches are predominantly due to previous overfishing, pollution, habitat loss, climate change, and introduction of exotic species.

Canada's Levels and Trends

Canada caught 1,050,000 tonnes of fish in 2001, for a per capita catch rate of 33.8 kilograms ranking 20th of 28 OECD countries (fig. 26A). From 1992 to 2001, Canada decreased its per capita fish catch by 26%, from 45.5 kg per capita to 33.8 kg per capita (fig. 26B). This reduction was more than twice the OECD average reduction. Canada recorded the 6th largest reduction in per capita fish catch of 26 OECD countries.

The reduction in Canadian fish catches is due to declining salmon stocks and the collapse of the cod fisheries. In 1990, Canada's Department of Fisheries and Oceans (DFO) had established a total allowable catch of just over 400,000 tonnes of cod, but in 1992 was forced to ban commercial cod fishing in major stock areas including the Gulf of St. Lawrence and northeast Newfoundland and Labrador. According to the OECD, the crisis in fisheries encouraged Canada to apply a more cautious approach, and selective catch strategies to help move closer to environmental and economic sustainability.[45] The significant decline in the trend indicates that previous fishing levels were not sustainable.

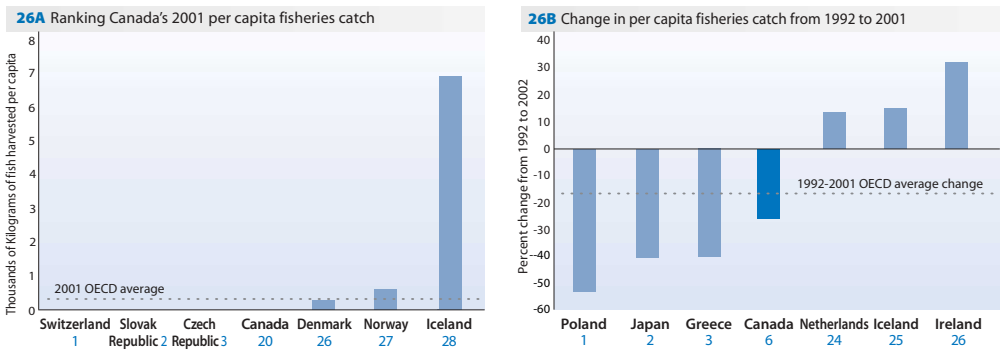


FIGURE 26: Ranking Canada's 2001 per capita capture fisheries (A) and change in per capita capture fisheries from 1992 to 2001 (B) among OECD member countries

In comparing the percent of world fish catch, Canada ranks 15th of 23 OECD countries (fig. 27A). With 1% of the world catch, Canada is slightly less than the OECD average world catch of 1.2%. In comaprison, Greece took 0.1% of the world catch and Japan had the highest percentage with 5.3% of the world's fish catch.

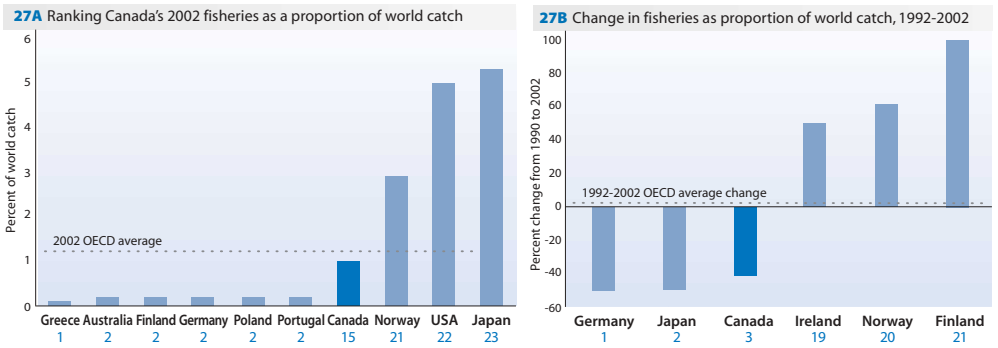


FIGURE 27: Ranking Canada's 2002 fisheries as a proportion of world catch (A) and change in fisheries as proportion of world catch from 1992 to 2002 (B) among OECD member countries

TABLE 8: Nature Scorecard

GOAL	INDICATOR	RANK	EPG
Conserve, Protect and Restore Nature	Number of Species at Risk	26th of 30	10.0%
	Proportion of Species at Risk	8th of 30	32.5%
	Protected Areas	16th of 30	26.6%
	Timber Harvest (m^3/km^2 forestland)	2nd of 29	39.9%
	Timber Harvest-Forest Growth Ratio	5th of 29	25.0%
	Per Capita Capture Fisheries (kg/cap)	20th of 28	0.8%
	Fisheries as Percent of World Catch	15th of 23	10.0%

Many economic activities have a significant effect on nature. Canada contains 20% of the world's remaining natural areas and has a responsibility to protect its natural wealth.

8 Build Sustainable Cities

Goal

Canadian cities become vibrant, clean, livable, prosperous, safe and sustainable.

Background

Reducing pollution and using resources such as land, air, and water more efficiently are critical to creating more sustainable cities. Helping Canada's urban communities become more sustainable is a key element of the federal government's efforts to meet its climate change commitments under the Kyoto Protocol.[46]

A fundamental component of sustainable cities is reducing reliance on personal automobiles through greater use of public transit. Increased use of public transit will significantly reduce environmental impacts associated with automobile use including air emissions (nitrogen oxides, carbon monoxide, volatile organic compounds, and greenhouse gases), oil contamination, and land development.

Distance Traveled

The impact of vehicles on the environment is strongly correlated with the amount of vehicle use; therefore, an important indicator of the impact of transportation is the distance traveled.

Canada's Levels and Trends

In 2002, Canadians travelled an average of 9,400 kilometres per capita in automobiles, exceeded only by the U.S.'s 15,800 kilometres per capita. The OECD average is 6,700 vehicle-kilometres per capita, 40% lower than Canada. Canada ranks 29th of 30 OECD countries for the per capita distance traveled by automobile (fig. 28A).

Canadians have increased their distance traveled per capita over the last 11 years by 13% compared to the OECD average increase of 23%. As a result, Canada ranked 10th of 25 OECD countries for increase in distance traveled (fig. 28B). During the same period, the number of passenger trips on public transit declined by about 25%.

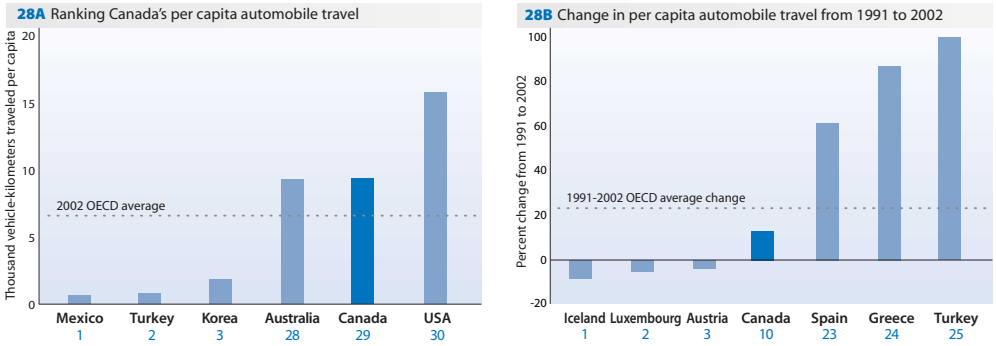


FIGURE 28: **Ranking Canada's per capita automobile travel (A) and change in per capita automobile travel from 1991 to 2002 (B) among OECD member countries**

TABLE 9: Sustainable Cities Scorecard

GOAL	INDICATOR	RANK	EPG
Build Sustainable Cities	Distance Traveled (1,000 vehicle-km/cap)	29th of 30	6.4%

Canada's reliance on personal automobiles for urban transportation is a major hurdle to building more sustainable cities.

9 Promote Global Sustainability

Goal

Canada becomes a world leader by promoting ecologically sound and socially sustainable development around the globe.

Background

Official Development Assistance (ODA), sometimes referred to as foreign aid, is a sum of monies transferred from one nation's governments and businesses to developing countries in the form of loans, grants, technical assistance, or general aid. In order for these financial flows to be considered ODA, they must:

- be undertaken by the official sector,
- promote economic development and welfare as their main objective, and
- have concessional financial terms [if a loan, having a grant element of at least 25%].[47]

Grants and loans for military purposes cannot be considered ODA. In most circumstances, ODA is calculated as a percent of a given country's gross national income (GNI). The importance of ODA for developing nations is obvious. Multilateral aid to developing countries assisted in eliminating small pox, facilitated the installation of responsible democratic governments, and increased per capita incomes.[48] ODA promotes sustainable development by encouraging local ownership, building social capital and partnerships among individuals, and ensuring projects meet first world environmental standards. For donor nations, it builds transnational connections, provides educational opportunities, and maintains a strong voice in international affairs.

Canada's Levels and Trends

In principle, the ODA indicator represents a wealthy country's commitment to the developing world. The generally accepted goal is that industrialized nations should contribute at least 0.7% of their GNI to foreign aid.[49] However, the world's wealthiest countries continually fail to meet this level of contribution. In fact, Canada's contribution (0.28%) is below the OECD average of 0.35%, a level itself that is only half the recommended rate, and well below the 0.96% contribution by the OECD's highest contributor, Denmark. As a result, Canada ranks 12th out of 27 OECD countries (fig. 29A). Poland ranks last contributing only 0.01% of its GNI.

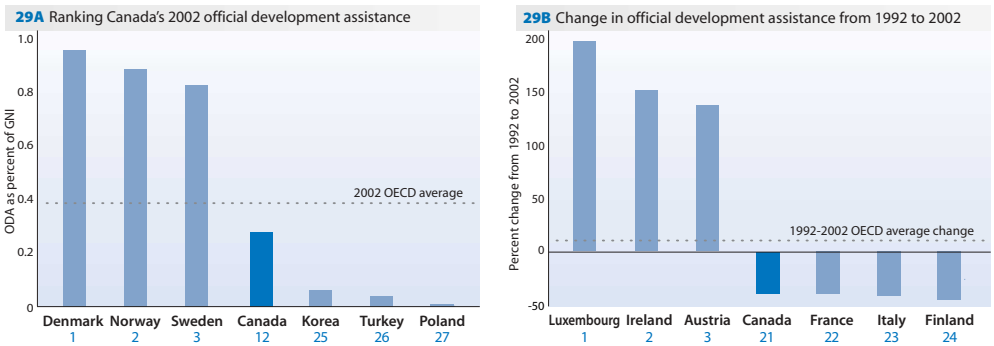


FIGURE 29: Ranking Canada's 2002 Official Development Assistance (A) and change in ODA from 1992 to 2002 among OECD member countries

Despite continued promises from Canadian governments to increase ODA, Canada's contributions to foreign aid have dropped significantly. In 2002, Canada's ODA was 0.28% of GNI, a decrease of 39% from the 0.46% of GNI it contributed a decade earlier (fig. 29B). On average, OECD countries since 1992 have increased foreign aid by 12%, led by Luxembourg, which increased its ODA by nearly 200%. Canada ranks 21st of 24 OECD countries for changes in ODA. However, the 2005 Canadian Federal Budget committed to increasing international assistance by $3.4 billion over the next five years with the goal of doubling assistance from 2001 levels by 2010.

TABLE 10: Sustainability Scorecard

GOAL	INDICATOR	RANK	EPG
Promote Global Sustainability	Official Development Assistance (% of GNI)	12th of 27	29.2%

Canada's level of development assistance ranks far below both commonly stated international goals and the efforts of leading countries with similar economies.

Conclusion

Canada's environmental performance rank – 28th out of 30 OECD countries – is far below the expectations of Canadians that their country be an environmental leader. In addition, Canada receives a failing environmental performance grade on all but one of the specific goals identified in *Sustainability within a Generation*. Even more disturbing is that Canada's relative rank compared to OECD countries has shown no improvement over the last decade.

Canada's failure to improve its environmental performance faster than the OECD average is surprising. Countries like Canada with an inferior performance should be able to improve at a faster rate than the average because they can adopt the existing technologies and practices used by the best performers.

Canada's poor environmental performance can be due to a number of factors including geography, climate, economic structure, and poor public policy. The relative significance of these factors in explaining Canada's poor performance awaits further study. However, independent evaluations by the OECD[50] and the Canadian Commissioner of Environment and Sustainable Development[51] indicate that poor public policy is a major factor explaining Canada's poor environmental performance.

The role of public policy is also illustrated by success stories in Canada in areas such as sulfur oxides and reductions in ozone depleting substances. These successes show that significant improvements are possible with the right public policy.

The role of public policy is further illustrated by the superior environmental performance of high-income countries such as Switzerland, Denmark, Germany, Austria, Sweden, and the Netherlands, which have better environmental records than Canada despite having many characteristics, such as income levels and industrial structure, in common.

There is no justification for a country with Canada's capacity to have such a poor environmental record. Clearly, Canada needs a national sustainability plan with clear goals, visionary strategies to meet them, and a legislated system to report on progress.

Canada is custodian of some of the world's most valuable environmental resources and ecosystems. Without a fundamental change in its approach to protecting these natural assets, Canada risks losing them along with the opportunity to provide future generations with a healthy environment and a healthy future.

***The Maple Leaf in the OECD: Comparing Progress to Sustainability* will be updated every two years, following the bi-annual publication of the OECD's Environmental Data Compendium.**

Notes

All statistical data in this report that is not footnoted comes from the Organisation for Economic Cooperation and Development (OECD). 2005. *OECD Environmental Data Compendium 2004*. Paris: OECD publications. The data used in the trend analysis comes from earlier OECD publications. For exact references see full study, "Canada's Environmental Performance: An Assesment" (2005) at www.davidsuzuki.org.

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47 See OECD Development Cooperation Directorate Glossary; www.oecd.org/glossary/0,2586,en_2649_33721_1965693_1_1_1_1,00.html; accessed 28 February 2005.

48 See CIDA Development Results; www.acdi-cida.gc.ca/cida_ind.nsf/AllDocIds/CFA2CD60F831096085256F58006B01AF?OpenDocument; accessed 28 February 2005.

49 Most United Nations member states first adopted this goal in October 1970, on a motion tabled by Canadian Prime Minister and Nobel Laureate Lester B. Pearson. The target of 0.7% has been reaffirmed on several occasions since 1970, most recently at the Monterey Conference on Financing International Development. See *Report of the International Conference on Financing for Development*; www.un.org/esa/ffd/aconf198-11.pdf; accessed 21 May, 2005.

50 OECD. 2004.

51 Office of the Auditor General. 2004. *The 2004 Report of the Commissioner of the Environment and Sustainable Development.* Ottawa: Minister of Public Works and Government Services.

Several surveys show that Canadians expect their country to be a world leader on environmental issues. Unfortunately, Canada's environmental performance falls far short of expectations.

The Maple Leaf in the OECD compares Canada's environmental performance to that of other countries belonging to the Organization of Economic Cooperation and Development.

This important comparison shows where Canada needs improvement, explains why, and suggests ways to improve its progress toward sustainability.

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