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# Environment

REPORT HIGHLIGHTS

ALEXIS MORGAN  
Associate, The Pembina Institute

 CANADIAN  
**Index**  
OF WELLBEING  
Measuring what matters

The environment is the foundation upon which human societies are built. We are a part of the planet, made up of the same materials and energy as the earth, plants, and animals around us. Indeed, the dictionary defines the environment as: “the complex of physical, chemical, and biotic factors (as climate, soil, and living things) that act upon an organism or an ecological community and ultimately determine its form and survival.”

Despite its fundamental importance to us as a species, and despite estimates that Canada’s natural resource wealth exceeds one *trillion* dollars, we often take our environment for granted. We fail to appreciate the various ecosystem services provided by nature that sustain human wellbeing.

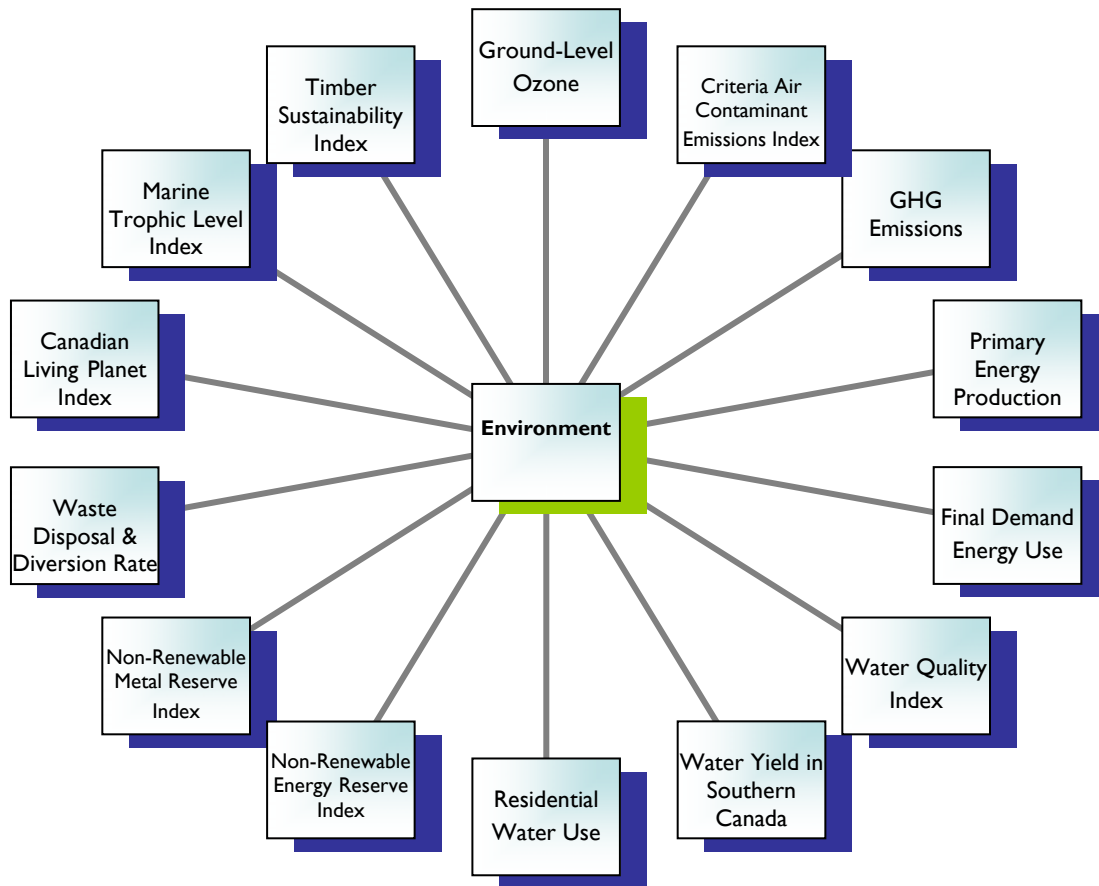
The Environment Domain provides a snapshot on the state and trends in Canada’s environment and its links to wellbeing. It recognizes that the welfare of humans is inseparable from the welfare of the environment and focuses on aspects that are important to life in general, such as:

- air (including climate);
- energy;
- water (focusing on freshwater);
- non-renewable materials (including minerals and metals); and
- biotic resources (including space, genetic resources, species and ecosystems).

The Domain’s general approach is to view the environment as “natural capital” by looking at changes to the stock of natural resources and how this affects the flow of valuable goods or services into the future.

The Environment Domain measures 14 indicators:

### The Environment Domain Model



### Trends

- Air quality is showing mixed signs but is still problematic and is costly to Canadians' health, particularly in large traffic-congested cities.
- Greenhouse gas emissions continue to rise. Canada is heading in the wrong direction to avoid dangerous climate change.
- Canadians continue to be large consumers and producers of hydrocarbon energy. Reserve levels are stable but their projected lifespan is declining due to growing demand.
- Water quality is good, but supplies are shrinking in parts of the country and, combined with high demand, raise concerns for the future.
- Canadians are consuming more and disposing more. There are some signs of reduced consumption in the last few years, but it remains to be seen whether

this was because of actual behaviour change or the onset of the recession. Recycling is increasing but not enough to reduce total waste.

- Many Canadian species are struggling, especially freshwater fish, grassland birds, reptiles and amphibians.
- Our rich forest ecosystems are not sustainable; depletion rates are exceeding growth rates.
- There is not enough environmental monitoring and existing data is largely old and inaccessible – in contrast to economic data.

## Report Highlights

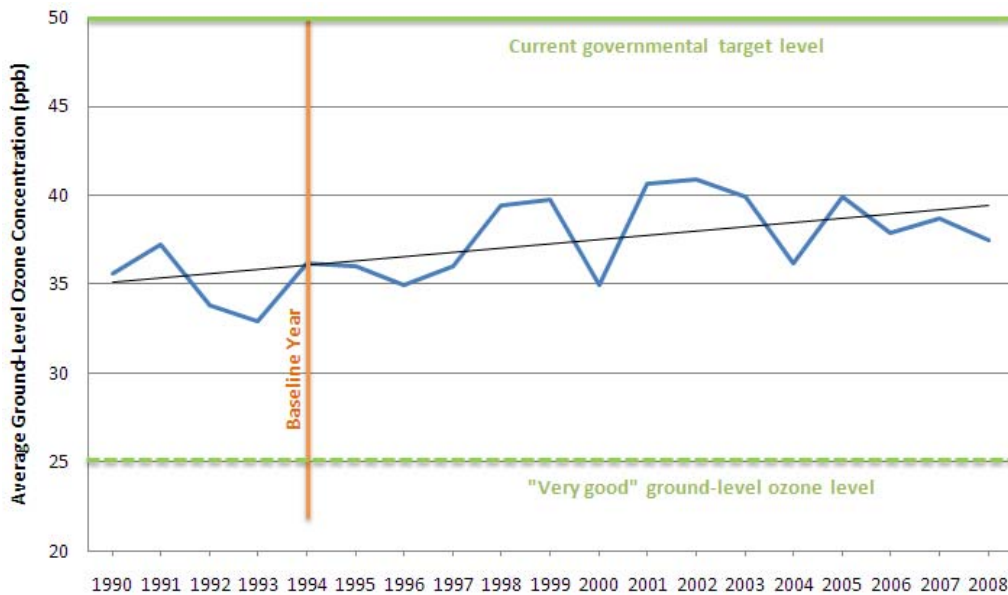
The following are the key highlights of the report, which looks primarily, at the 1997-2008 period:

### Ground-Level Ozone is Increasing

- Ground-level ozone can be directly linked to human health – such as respiratory problems – and ecosystem degradation. It can impose billions of dollars of costs on society, especially in large municipalities with traffic congestion such as Toronto, Montreal and Vancouver.

## Ground-Level Ozone

Population-weighted national average ground-level ozone exposure index, Canada, 1990-2008



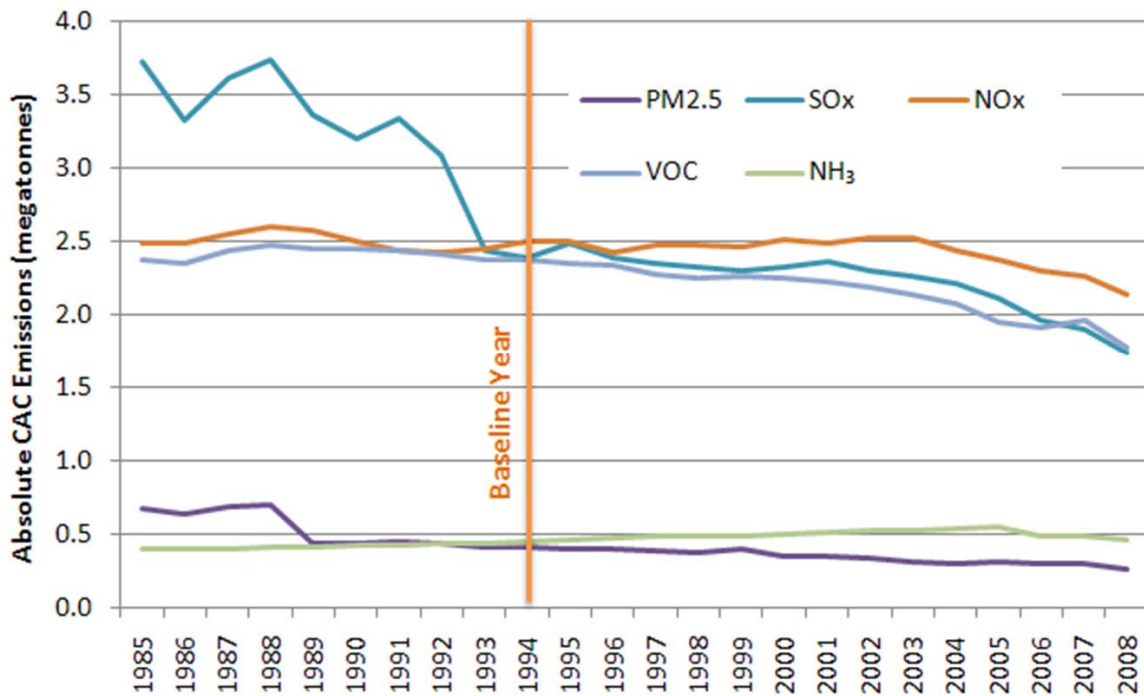
Source: Environment Canada 2010

## Overall CAC Emissions are Declining

- While there is a mixed pattern for emissions of the five Criteria Air Contaminants – a suite of harmful airborne emissions from industrial processes and the burning of fossil fuels – the overall trend is downward, i.e. improving, with the notable exception Ammonia (NH<sub>3</sub>) emissions which have increased slightly.

### Absolute CAC Emissions

Absolute CAC emissions by type, Canada 1985-2008

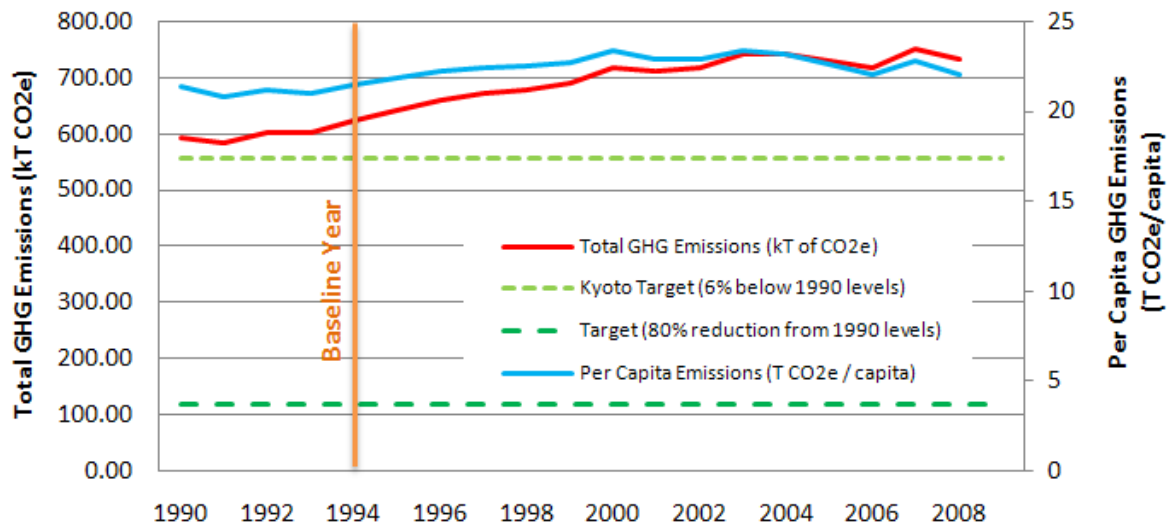


Source: Environment Canada 2010

## GHG Emissions are Growing and we are Far from Meeting Kyoto Commitments

- Canada is far from the trajectory it needs to reduce emissions to a rate that avoids dangerous climate change. Absolute GHG emissions grew by 24% since 1990. This puts us far off meeting our country's Kyoto commitment of being 6% below 1990 levels by 2012.
- Our country is amongst the highest per capita emitters in the world. We are second only to the U.S., and unlike the U.S., have shown an increasing trend in per capita emissions.
- Canada's Arctic has already experienced a warming of more than 1.7°C and an increase of 4 or 5°C is projected. This will have very large ramifications for infrastructure, communities and species throughout the Arctic, causing disruption to cultural, economic and general wellbeing.

**GHG Emissions**  
Canada 1990-2008



Source: Environment Canada 2010

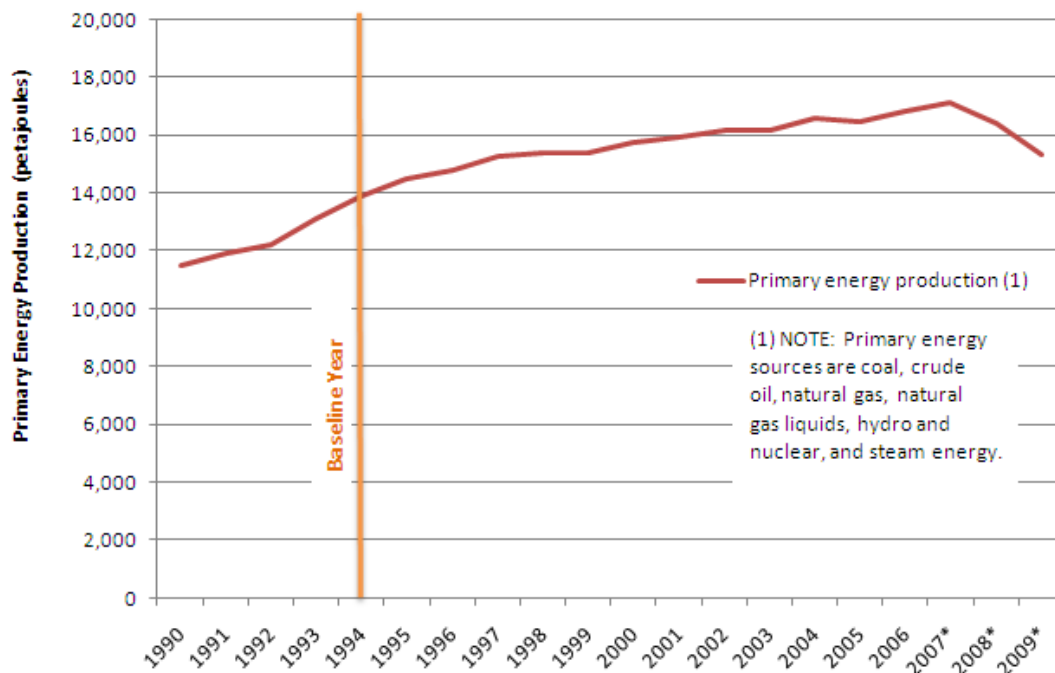
- While our economy is increasingly less GHG intensive (less GHG per GDP) Canada's performance in "de-carbonizing the economy" is average when compared to other industrialized countries.
- The main driver of GHG emissions has been certain industries with more than half of the GHG emissions produced by fossil fuel industries (22%), transportation (22%) and electricity production via utilities (16%). Household emissions have remained relatively the same over the 1994-2008 period.
- By contrast, the industrial processes sector has reduced its absolute emissions below 1990 levels. This raises an important equity issue – how do we hold sectors responsible for meeting (or failing to meet) the challenges of climate change?
- From a purely economic perspective, climate change is expected to decrease global GDP by up to 20%.

## We are Large Consumers and Producers of Hydrocarbon Energy

- Energy production is a major source of employment and revenue for Canada and its populace, which have high energy demands. The energy sector alone accounts for about 4% of our GDP and is worth in excess of \$500-billion dollars.
- There has been a general increase in primary energy production since 1990. However, virtually all of the growth has come through the exploitation of non-renewable fossil fuels which make up some 90% of our primary energy production. Electricity generation from wind, solar and tidal sources represented less than 0.5%.

### Primary Energy Production

Canada 1990-2009 (1994 baseline)



\*Note: 2007-09 were updated using the latest available data  
Source: Statistics Canada 2011

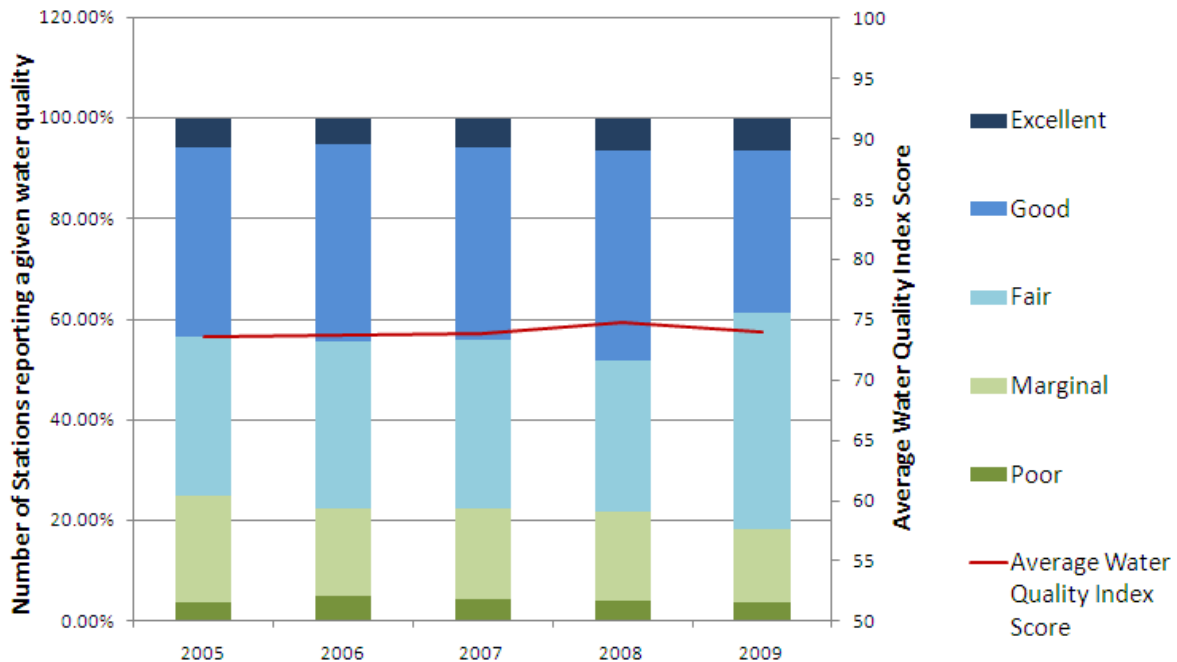
- There has been a gradual increase in energy use since 1990. The makeup of energy use by sector has remained remarkably consistent over the years, with industrial and transportation dominating energy use at nearly 60%. Use decreased in 2008 and 2009 largely due to lower demand in the manufacturing and transportation sectors.
- Such voracious energy use is the primary reason for Canada's inability to meet its Kyoto targets and stem the rising tide of GHGs noted above.

## Our Freshwater Quality is Stable but the Supply is Shrinking

- Freshwater quality has been relatively stable since 2005. Nearly half of water stations reported good-to-excellent water quality, with fewer than 5% reporting poor water quality in any given year.

### Water Quality Index

Canada 2005-2009



Source: Environment Canada 2011

- Over the course of the past 30 years, the supply of water in Southern Canada decreased by 8.5% which represented an average loss of 3.5 km<sup>3</sup> per year – the equivalent of all of Canada’s residential water use for a year.
- There was considerable variability year-to-year, with the greatest variability throughout the prairies where supply went from extreme scarcity (drought) to extreme abundance (flooding). Climate change predictions suggest increasing variability in terms of both temperature and precipitation.



## Our Demand for Water Remains Consistently High

- While there has been an 8.4% decline in average daily per capita residential water use since 1989, Canadians are still among the highest water users in the world. We use more than twice as much per person – around 330 litres per day – as in other industrialized countries, except for the United States. The average British citizen used only 106 litres of water per day.
- There was a great deal of regional variability within Canada. Residents of Saint John, New Brunswick used more than five times the average amount, or over 200,000 litres per year. While Saint John may not be a water-stressed area, the prairies, the interior of British Columbia, and several other areas experienced drought conditions, suggesting that residents in cities like Saskatoon (510 L/day) ought to reconsider their water use.

### Municipal Residential Water Use

By major municipality in Canada. Ranked lowest to highest.

Municipality	Water use (litres/day/capita)	Municipality	Water use (litres/day/capita)
St. John's, NF	157	Fredericton	298
Regina	162	Québec	300
Charlottetown	164	Vancouver	358
Winnipeg	187	Moncton	372
Toronto	219	Victoria	405
Edmonton	227	Montreal	503
Ottawa	235	Saskatoon	510
Calgary	257	Saint John, NB	564
Halifax	296		

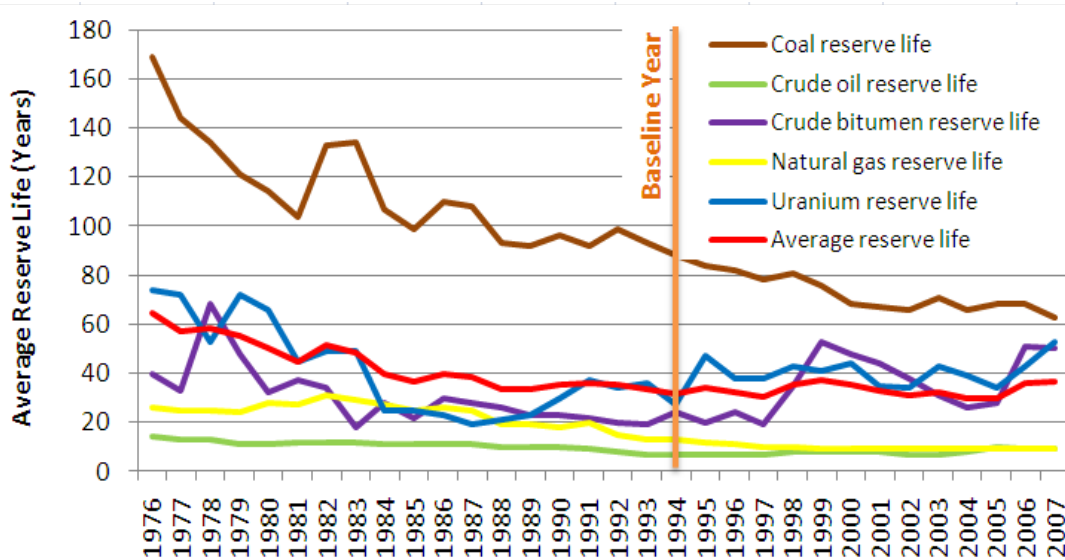
Source: Environment Canada 2010

## Our Non-renewable Energy Reserves Remain High but Metal Reserves are Declining

- Overall reserve levels of non renewable resources remained relatively stable due to continual discoveries of new viable deposits.
- However, reserve life (the number of years left before the reserve is exhausted given the supply and demand) has been in general decline since 1976. While it has stabilized, or even increased, for some resources such as uranium and bitumen, it has steadily declined in other areas such as coal and natural gas.

### Estimated Average Reserve Life for Non-Renewable Energy Reserves

Reserve Life for Select Commodities in Canada, 1976-2007

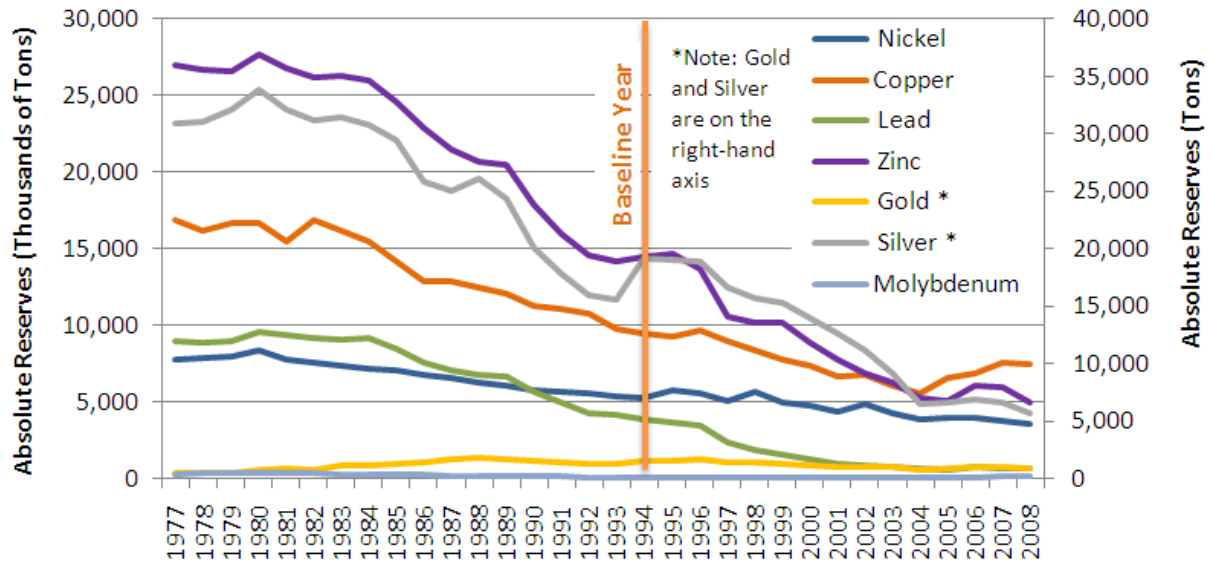


Source: Statistics Canada 2009

- Over the course of 30 years we have exported 70 years worth of coal reserve lifespan. Similarly, natural gas reserves have been in fairly steady decline, which is of concern given the extent to which this “clean” fossil fuel makes up a significant portion of our energy mix.
- Unlike energy reserves, metal reserves have universally declined and are at or near historic lows for virtually all metals. For the time being, the declining reserves in Canada are balanced through international trade with developing countries.

## Absolute Levels of Non-Renewable Metal Reserves

Canada 1977-2008 (1994 baseline)



Source: Natural Resources Canada 2010

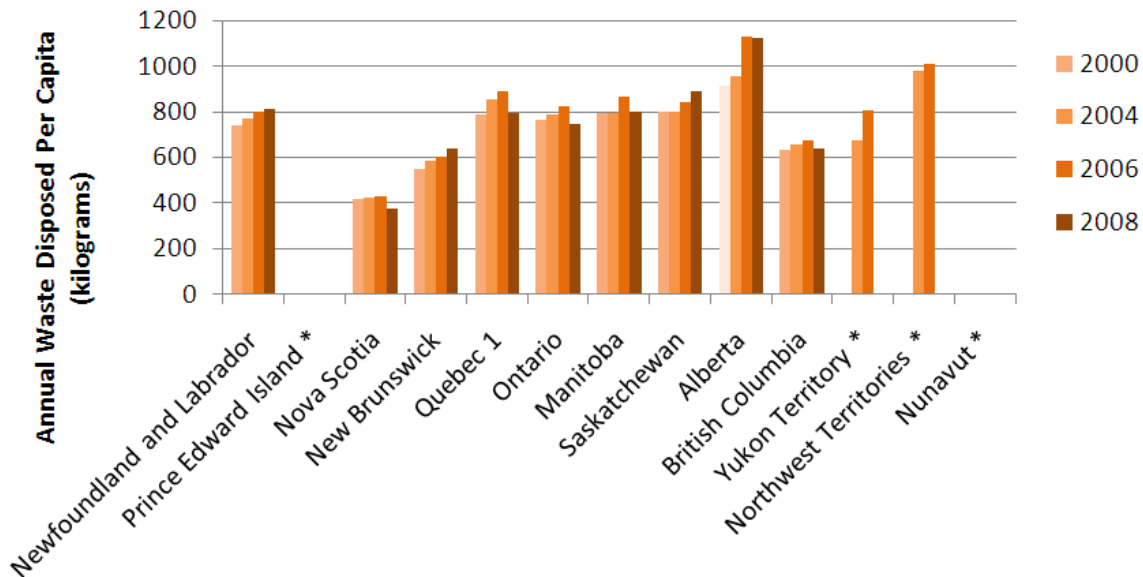
- From an economic wellbeing perspective this trend is negative since it will cost jobs and hurt the local economy of mining towns and regions. But from a health and ecosystem perspective it is positive.

## We're Creating More Waste

- The trend for waste is generally not positive. Canadians have, until very recently, exhibited a trend of consuming more and disposing more (up 6% from 1994 and 11% since 1996). The latest data point for 2008 does show some promise with decreased waste consumption rates and an increased amount of material diversion. But it remains to be seen whether this was a function of the start of the recession, or actual behaviour change.
- Nearly all provinces and territories saw waste disposal rates increase between 2000 and 2008, especially Alberta – which disposes nearly three times the amount of waste as Nova Scotia.
- The high consumption rate comes at a cost: continued resource extraction from the landscape resulting in the loss of habitats and species; pollution; large, overflowing landfill sites that nobody wants in their backyards; and in general, a society where individuals must work longer hours to obtain more “stuff”.

### Waste Disposal Rates by Province and Territory

Waste Disposal in Canada for Select Jurisdictions, 2000, 2004, 2006, and 2008



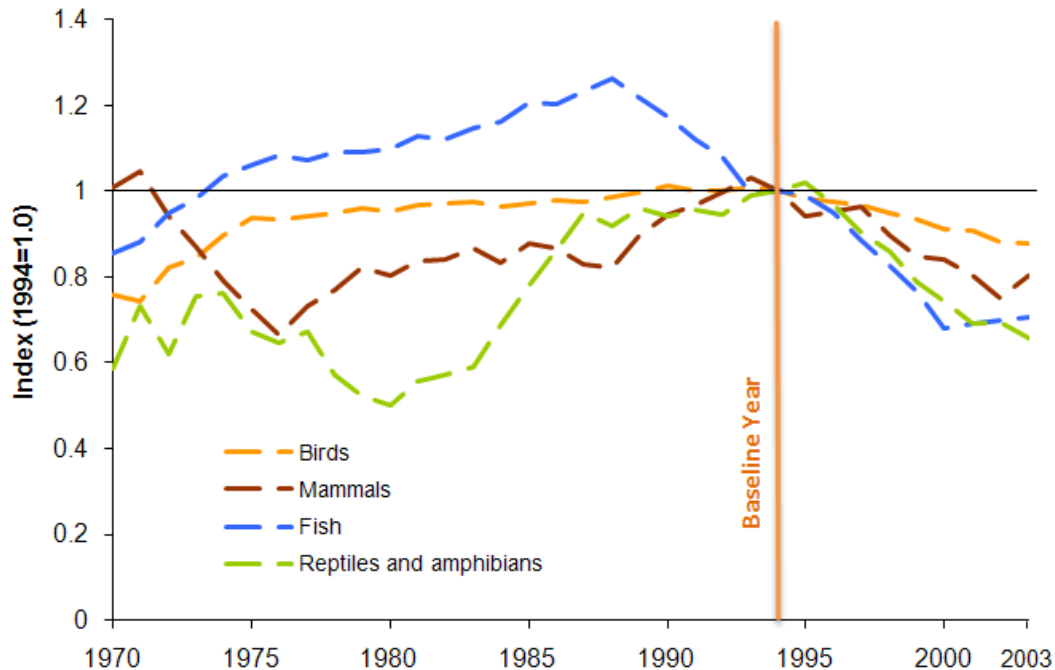
Source: Statistics Canada 2010

## Some Species Populations are Increasing While Others are Declining

- While the Living Planet Index – which measures the population levels of select species – was relatively close in 2000 to where it was in 1970, it has been declining on all fronts since the mid 1990s, with reptiles, amphibians and fish showing the greatest decrease.
- An estimated 20% of native frogs, toads and salamanders are at risk of extinction, while 18% of non-marine fishes are listed as Endangered or Threatened. Birds of grasslands and other open habitats lost of 40% of their populations, 35% of shorebirds have experienced recent declines somewhere in their range, and seabirds also show a greater number of populations in decline since the 1980s. Waterfowl and forest birds are mainly healthy.

### Living Planet Index for Select Taxa

Canada 1970-2003 (1994 baseline)



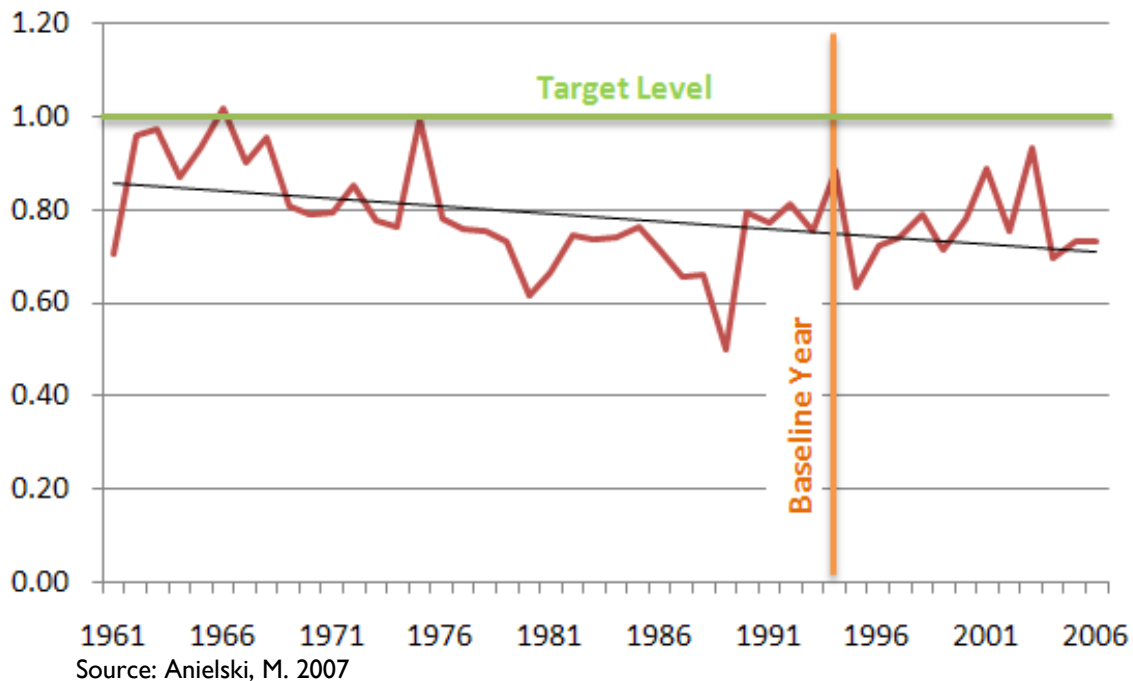
Source: WWF-Canada 2007

- We have been fishing-down the food chain, reducing the population of the larger more desirable species such as swordfish, while turning to smaller, short-lived species such as clams, shrimps and crabs.
- Average maximum fish lengths shrunk from 111 cm. in 1950 to 55 cm. in 1994 to 46 cm. in 2006.
- Declining levels of large predatory fish suggest that food chains are becoming shorter, leaving ecosystems less able to cope with natural or human-induced change.

## Our Forest Ecosystems are Not Sustainable

- Canada's Timber Sustainability Index (TSI) was at less than 1.00 for the majority of years in the period 1961-2006. A TSI of less than 1.00 is unsustainable – stock is being depleted by harvesting, fires, natural mortality (e.g. due to insect infestations) or industrial development (e.g. roads) at a rate faster than the annual growth rate of the forests.

**Timber Sustainability Index**  
Canada, 1961-2006 (1994 baseline)



- Canada's timber declined from an estimated 14.637 billion cubic metres in 1961 to 12.647 billion cubic metres in 2006, a 13.6% net loss of standing timber. While total growth in timber has been healthy at 7,653 million cubic metres between 1961 and 2006, this has been exceeded by the combination of timber harvested (6,957 million m<sup>3</sup>) plus losses due to natural mortality (1,974 million m<sup>3</sup>), wild fires (832 million m<sup>3</sup>), and roads (205 million m<sup>3</sup>), for a total of 9,969 million m<sup>3</sup>.
- Insects such as spruce budworm and the mountain pine beetle affected huge swaths of forest, with estimates being in the order of 14 million hectares per year for the spruce budworm and a cumulative of 16 million hectares for the mountain pine beetle – an area some five times the size of Vancouver Island.

## **Our Environment Needs Closer Monitoring and Data Made More Available**

- Considerable gaps exist in environmental data in Canada. Canadians, like citizens in other countries, do not have access to current data (most are at least two to four years old).
- This situation is in stark contrast with economic data which is readily available, timely, and abundant. Statistics Canada and Environment Canada do provide some excellent environmental data, and on very limited resources, which is to be commended. There are, however, few robust, multi-year and fully accessible national data sets for public use, making a report such as this very difficult.
- The capacity to undertake environmental monitoring has generally decreased over the years and is badly under-funded. This is a strong call for policy makers to improve investment in monitoring and reporting. Without information to manage our natural capital there is a potential danger for accountability to erode.

## **CONCLUSION**

The Environment Domain paints a mixed picture of Canada's environment. Some aspects are improving while others are degrading. The choices we make in terms of protecting, managing or restoring these aspects of the environment will dictate not only the state of our lands and waters, but also play a significant role in determining our wellbeing as Canadians.

While Canada is not a country in crisis, there are warning signs that not all is well when it comes to the environment and wellbeing. Given that there is an increasingly large global population with a voracious and growing demand for our natural capital, it is critical that policy makers assess the consequences of how we use the environment to better the wellbeing of all Canadians.

The path towards ensuring resilient and sustainable ecosystem services is ultimately a human choice. It begins with individual citizens, but it must also be manifest in government actions. The Millennium Ecosystem Assessment, carried out from 2001-2004, combined with the latest assessments of biodiversity, suggests that we are headed down the wrong path.

As we enter into the era of resource scarcity, global economic competitiveness and heightened interest in community health, general wellbeing will be dictated not by more, but by less; not by quantity, but by quality; not by tradition, but by innovation. The choices we make as a society will determine whether we face a distressed future or a better quality of life.



Based in the Faculty of Applied Health Sciences at the University of Waterloo, the Canadian Index of Wellbeing Network is an independent, non-partisan group of national and international leaders, researchers, organizations, and grassroots Canadians. Its mission is to report on quality of life at the national level and promote a dialogue on how to improve it through evidence-based policies that are responsive to the needs and values of Canadians.

The Network's signature product is the Canadian Index of Wellbeing (CIW). The CIW measures Canada's quality of life and tracks progress in eight interconnected categories. It allows us, as Canadians, to see if we are better off or worse off than we used to be — and why. It helps identify what we need to change to achieve a better outcome and to leave the world a better place for the generations that follow.

The Honourable Roy J. Romanow, Chair  
The Honourable Monique Bégin, Deputy Chair



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University of Waterloo, 200 University Avenue West, Waterloo, ON, Canada N2L 3G1  
519-888-4567, ext. 31235 | [ciwinfo@uwaterloo.ca](mailto:ciwinfo@uwaterloo.ca) | [ciw.ca](http://ciw.ca)