



Sustainability within a Generation

A NEW VISION FOR CANADA

David
Suzuki
Foundation

SOLUTIONS ARE IN OUR NATURE



Sustainability within a Generation

A NEW VISION FOR CANADA

BY **DAVID R. BOYD LL.B.**

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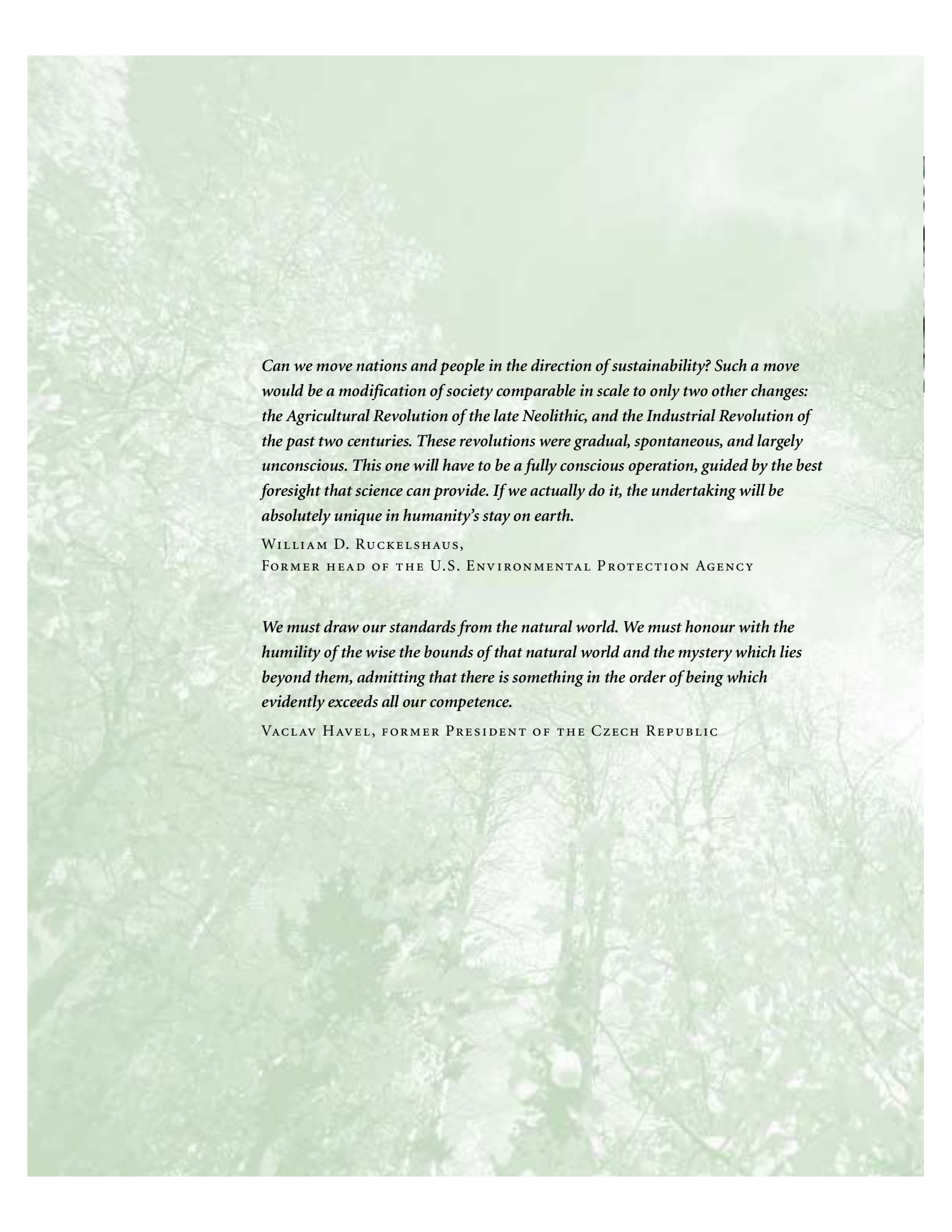
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Can we move nations and people in the direction of sustainability? Such a move would be a modification of society comparable in scale to only two other changes: the Agricultural Revolution of the late Neolithic, and the Industrial Revolution of the past two centuries. These revolutions were gradual, spontaneous, and largely unconscious. This one will have to be a fully conscious operation, guided by the best foresight that science can provide. If we actually do it, the undertaking will be absolutely unique in humanity's stay on earth.

WILLIAM D. RUCKELSHAUS,
FORMER HEAD OF THE U.S. ENVIRONMENTAL PROTECTION AGENCY

We must draw our standards from the natural world. We must honour with the humility of the wise the bounds of that natural world and the mystery which lies beyond them, admitting that there is something in the order of being which evidently exceeds all our competence.

VACLAV HAVEL, FORMER PRESIDENT OF THE CZECH REPUBLIC



Ask a dozen Canadians what sustainability means and chances are you will get a dozen different answers, not to mention a few funny looks. It's a concept that can be hard to define, yet easy to exploit. The fossil fuel industry, for example, often talks about sustainability, but using fossil fuels is, by its very nature, unsustainable. There is a finite amount of oil, coal and gas in the Earth and, once used up, it will not be available again. Even more important, there is a very limited ability for the Earth to absorb the by-products created when we use these fossil fuels.

And that, quite simply, is the issue. We live in a finite world with finite resources. Although it may sometimes seem quite big, the Earth is really very small – a tiny blue and green oasis of life in a cold universe. Our atmosphere may seem to stretch forever, but it is only 10 kilometres thick. Beyond that there is nothing – only the vacuum of space. When I was in high school in the 1950s, teachers taught us the oceans were a source of near limitless protein. Well, they may have once seemed inexhaustible, but collapsing fish stocks around the world tell us that we have already surpassed their limits. Less than a century ago, vast tracts of virgin forests covered much of the planet. Today, few remain. Even in the Far North, as remote as you can be on our planet, the buildup of persistent pollutants bears the signature of humanity.

Everywhere we look, human activities are tearing at the very fabric of life on Earth. We have changed the composition of the atmosphere. We've altered the hydrologic cycle. We've literally moved mountains and created immense lakes behind giant dams. The fact is, we cannot continue on this same path. With an estimated population of nine billion people by 2050, we cannot continue to consume resources at the same rate and maintain our quality of life.

That's where sustainability comes in. Quite simply, sustainability means living within the Earth's limits. It means living in a world where feeding people does not necessitate polluting groundwater and coastal shorelines. Where transporting people and goods

does not mean polluting our air and changing our climate. Where heating our homes and powering our industries does not require vast amounts of polluting fossil fuels.

Sustainability means doing things better – not doing without. Right now, Canadians consume too much, and most of it is wasted. Less than 10 per cent of the energy we generate is actually used for its intended purpose. Most of it goes up in smoke. Our economy is fully one-third less energy efficient than the United States and only half as efficient as most European countries.

We're wasteful because we live in a land of plenty. With a small population and a massive resource base, Canada is a nation blessed like few others. We have plenty of land on which to grow our food, plenty of forests to help clean our air, and plenty of fresh, clean water – more, in fact, than any other country on Earth.

But even here, our wasteful ways are catching up to us. Air in our cities is no longer clean (or invisible as I was taught in high school). Water is not always safe. We've been behaving as though the resources and services that nature provides for our high quality of life are free and limitless. They are not. We can only take so much carbon from the Earth and release it into the atmosphere before we start causing serious problems. The Earth can only absorb so much of our waste. We have only so much fertile farmland to grow our food.

Unfortunately, Canada's laws and regulations greatly undervalue these natural services. They focus too much on the narrow accumulation of monetary wealth without considering the consequences. They subsidize polluting industries and dissuade clean ones. They encourage waste.

If we want the next generation of Canadians to have the same opportunities that we have enjoyed, we have to start changing now. That means including the social and environmental costs of our actions in all of our decision-making processes. It means focusing on the creation of genuine wealth, like health, education and the state of our environment, rather than just the accumulation of more stuff. It means moving from being wasteful and complacent, to being efficient, modern, and thoughtful.

Sustainability within a generation can be achieved, and this report tells us how. Here's a vision for a better Canada – a cleaner, healthier Canada. It lays the groundwork so that, if followed, 30 years from now the average Canadian will not only understand the concept of sustainability, but take it for granted as a principle underlying every aspect of our lives.



Introduction

When I was in space looking down on our magnificent blue and brown planet Earth, I realized how truly unique Canada is. This country, with its fresh water, soil, atmosphere, and various types of climate, may well be the salvation of the whole planet.

DR. ROBERTA BONDAR, CANADIAN ASTRONAUT

Canadians love this big, beautiful country. We love the forests, parks, mountains, the Arctic, the Prairies, wildlife, rivers, lakes, oceans, and beaches. We base our national identity on nature – from the maple leaf on our flag to the wildlife on our currency. Individual Canadians enjoy a deep-rooted connection with the natural world:

- 98% of Canadians view nature in all its variety as essential to human survival;
- 90% of Canadians consider time spent in natural areas as children very important; and
- 85% of Canadians participate regularly in nature-related activities such as hiking, bird watching, and fishing.¹

Canadians are among the most staunchly pro-environment citizens on the planet. Nine out of ten Canadians rate the environment as one of their top concerns.² Eight out of ten Canadians believe that environmental protection should be given priority over economic growth.³ This is the highest proportion of support for environmental protection in the 30 countries surveyed by the research firm Environics International.

Despite our strong values and extraordinary potential, Canada is struggling environmentally.⁴ More Canadians die every year from air pollution than die in traffic accidents.⁵

Canada is among the world's most wasteful nations in terms of excessive energy consumption, water use, and greenhouse gas emissions. If every individual in the world consumed as much energy and resources and produced as much waste as the average Canadian then we would need four additional planets like Earth to produce the resources and absorb the waste.⁶ The Conference Board of Canada, the United Nations, and the World Economic Forum agree that Canada is a laggard on environmental issues among industrialized nations.⁷ We finished 28th out of 29 nations in the Organisation for Economic Co-operation and Development (OECD) in a study that examined 25 key indicators in ten categories including air, water, energy, waste, climate change, ozone depletion, agriculture, transportation, and biological diversity (see Appendix 1 for more details).⁸ While it is important to note improvements in some areas (protecting the Earth's ozone layer, reducing acid rain, and creating more parks), Canada's performance on the majority of environmental indicators is worsening. Also disturbing is the decline in Canada's contribution to sustainable development in the world's poorer regions, exemplified by the 50% decrease in Canadian foreign aid during the 1990s.⁹

There is a disturbing gap between our strong environmental values and our poor environmental record. To close this gap, Canada needs to develop and implement an ambitious new environmental, economic, and social agenda. Despite our generally poor environmental record, there is a widespread perception that Canada and Canadians can do better – that we could be better stewards of our land and water; that we could do more to create a brighter future for our children. This document represents the first step in setting a path for Canada to achieve the sustainable future that Canadians deeply desire.



Vision

By 2030, Canadians will be world leaders in sustainable living and environmental protection.

We are proposing two bold new priorities for Canada, charting an exciting course that will enable us to fulfill our dreams and aspirations.

First, Canada should set a goal of achieving sustainability within a generation (i.e. 20-25 years). This goal may strike some as too ambitious, while others may feel that we must act even faster. Balancing social, economic, institutional, and technological constraints with the urgency of altering our current trajectory makes one generation a realistic time frame. Countries with reputations for environmental leadership such as Sweden and the Netherlands have already embraced a similar objective and are making progress towards a sustainable future.

What is sustainability? It is neither a lofty ideal nor an academic concept but rather an urgent imperative for humanity. Sustainability means living within the Earth's limits. In a sustainable future, air and water would be clean, so that no Canadian would ever think twice about going outside for a walk or drinking a glass of tap water. Food would be free from pesticide residues, antibiotics, and growth hormones. Air, water, and soil would be uncontaminated by toxic substances. In a sustainable future, it would be safe to swim in every Canadian river and lake; safe to eat fish wherever they were caught. Clean, renewable energy would be generated by harnessing the sun, the wind, water, and the heat of the Earth.

A sustainable future would mean a global climate undisturbed by human impacts. Canadians would no longer fear sunburn or cancer caused by damage to the ozone layer. No one would have to worry about nature's extraordinary diversity diminishing at human hands. Endangered ecosystems and species at risk, from old-growth forests to beluga whales, would recover and thrive. In a sustainable future, Canadians would be confident that their children, grandchildren, and many more future generations would enjoy the same spectacular natural heritage and quality of life that most Canadians enjoy today. Canada should

Human capital includes our knowledge, skills, wisdom, experience, life energy, and good health (physical, mental, spiritual, and emotional).

Natural capital refers to ecological systems and ecosystem services. Ecological systems include watersheds and wetlands as well as energy sources, minerals, forests, wildlife, plants, and fish. Ecosystem services include life-supporting natural processes that clean the air, purify water, pollinate plants, absorb carbon dioxide, recycle nutrients, process wastes, prevent floods, control pests, and replenish the soil.¹²

Social capital describes the strength of our personal and civic relationships – trust, goodwill, neighbourliness, networks, and our sense of community – as well as our democratic rights and freedoms.

Manufactured capital includes buildings, manufacturing and processing plants, energy, transportation, and communication infrastructure, and technology.

Financial capital describes monetary assets – cash, savings, investments – as well as debts and other financial liabilities.

strive to be the world’s most environmentally friendly nation, making concepts such as waste, pollution, and the destruction of ecosystems become things of the past.

Second, Canadians should focus our national efforts on generating genuine wealth, rather than measuring progress by the narrow and inherently flawed yardstick of economic growth.

What is genuine wealth? While we often think of wealth in strictly financial terms, the concept of genuine wealth is much broader. Genuine means “true to our values” while wealth refers to “the condition of well-being.”¹⁰ Genuine wealth encompasses five key areas of assets – human, natural, social, manufactured, and financial capital.¹¹ Thus genuine wealth embraces the full range of qualities that make life worth living – things like vibrant communities, meaningful work, good housing, high quality education and health care, functional infrastructure, outstanding recreational opportunities, clean air, clean water, healthy relationships with others, and dynamic economic prospects.

These new national priorities – achieving sustainability and generating genuine wealth – go hand in hand. Our quality of life is fundamentally dependent upon the environment. Clean water, fresh air, a stable climate, and ecological processes such as pollination and soil regeneration are prerequisites to healthy communities and a vibrant economy. At the same time, it is only by broadening our societal objectives from the narrow goal of economic growth toward the more comprehensive concept of genuine wealth that we will achieve sustainability. Although governments use changes in Gross Domestic Product (GDP) as a surrogate for progress, Canadians want much more from life than economic growth. A recent study of Canadians in 40 communities revealed that economic development ranked eighth among the nine most important quality of life issues, with the environment ranked fourth after democratic rights and freedoms, health, and education, respectively.¹³ By setting our sights on achieving sustainability and generating genuine wealth, we are much more likely to improve our overall quality of life.



Principles of Ecological Sustainability

The planet is not as big as people think it is.

MARC GARNEAU, CANADIAN ASTRONAUT

In order to attain a sustainable future, Canadians must come to terms with the reality that the planet we live upon is finite. There are natural limits to the amount of resources the Earth can produce and the amount of waste the Earth can assimilate. Scientists believe that humans are overloading the waste absorption capacity of the planet and approaching or exceeding critical thresholds in the regenerative capability of renewable resources.¹⁴ The blame is not evenly spread across the globe. Only 20% of the world's population lives in the wealthy, industrialized nations like Canada. However this 20% consumes 80% of the world's resources, and produces a similar proportion of the pollution that the Earth must absorb.¹⁵

Scientists associated with “The Natural Step” have identified four basic principles that must be respected in order to recognize the Earth's limits and achieve a sustainable future.¹⁶ In simple terms, the first three principles state that nature must not be subject to a systematic:

- buildup of materials extracted from the Earth's crust;
- buildup of synthetic substances produced by society; or
- degradation of its diversity, productivity, or capacity for renewal.

The fourth principle is that basic human needs must be met worldwide. (*See Appendix 2 for a more detailed explanation of these principles*).

Unfortunately, Canada is currently violating these principles of sustainability. For example, our excessive reliance on fossil fuels like oil and coal is pumping unsustainable quantities of carbon dioxide into the atmosphere, contributing to climate change, and

violating the first principle. Our use of synthetic chemicals that do not easily break down in nature, accumulate in the food chain, and cause cancer, birth defects, endocrine disruption, or other damage to human and environmental health, contravenes the second principle. Ongoing activities including urban sprawl, excessive rates of logging and fishing, and myriad other developments that destroy or damage natural habitat are inconsistent with the third principle. At the same time, our commitment to eliminating the worst in global inequities and defending basic human rights seems lukewarm.

If we can take commitments at their word, there are signs of hope.¹⁷ Canada ratified the *Kyoto Protocol* to reduce greenhouse gas emissions and we are signatories to the *Stockholm Convention on Persistent Organic Pollutants*. In both cases, our commitments need to be met by action. Over 40 million hectares of spectacular Canadian ecosystems were protected in the past decade in national, provincial, aboriginal, and territorial parks and protected areas. There have been dramatic reductions in the production and use of ozone-depleting substances and sulphur dioxide that causes acid rain, modest improvements in municipal sewage treatment, and rapid advances in energy efficiency for appliances. However, Canadian failures continue to outnumber successes as our environmental record deteriorates.



Root Causes of Canadian Unsustainability

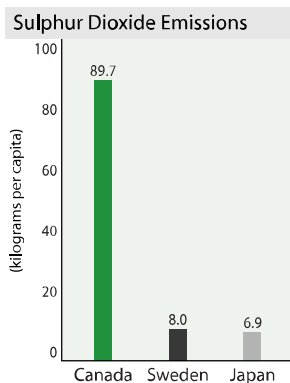
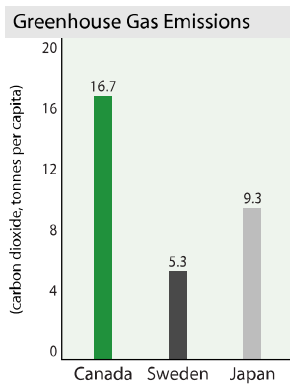
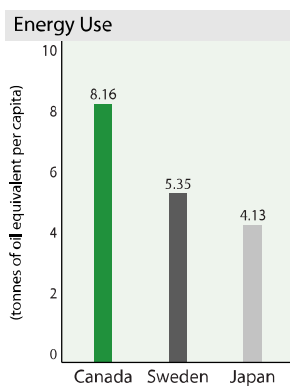
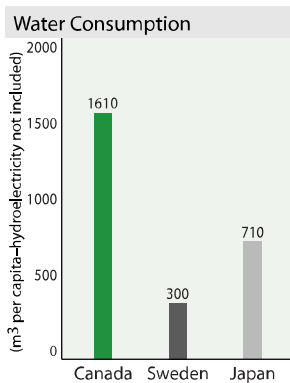
The current overuse of natural resources, including energy resources, is probably one of the most profound challenges mankind has ever been confronted with.

SWEDISH MINISTRY OF ENVIRONMENT

In Canada, over-consumption is the root cause of our environmental woes.¹⁸ As the North American Commission for Environmental Cooperation points out, our “prevailing emphasis on consumption – with high levels of waste, energy use, and greenhouse gas emissions – jeopardizes the capacity of natural resources and systems to support future generations.”¹⁹ Consumption in this context refers not only to the energy and resources consumed by individual Canadians but encompasses the use of energy and resources by the entire industrial economy. Most Canadians see only the tip of the iceberg of the resources consumed to supply the goods and services required by current lifestyles.²⁰ We are largely blind to the industrial activities that consume vast amounts of resources and cause extensive environmental damage.

A detailed assessment of total energy and resource consumption in the U.S. revealed that the American economy uses approximately 85,000 kilograms of resources per person annually.²¹ Since Canadian and American consumption is similar, this works out to 232 kilograms of materials per Canadian each day, or the equivalent of about 45 full shopping bags per person, per day. Lifetime statistics for the consumption of energy and resources by the average Canadian are equally mind-boggling, as the average Canadian will, in his/her lifetime:

- use 125,000,000 litres of water;
- consume the equivalent of 600,000 cubic metres of natural gas, 1,100,000 kilograms of coal, or 575,000 litres of crude oil;
- travel 700,000 kilometres in motor vehicles which is equivalent to traveling around the world at the equator 17.5 times;



- generate 40,000 kilograms of garbage;
- produce 1,300,000 kilograms of greenhouse gases;
- emit 7,000 kilograms of sulphur dioxides, and 5,000 kilograms of nitrogen oxides; and
- use more than 7,000 kilograms of pesticides and fertilizers.²²

These staggering statistics indicate the extent to which current generations of Canadians are living beyond their means and having a disproportionate environmental impact.

It is vital to understand that reducing our consumption of resources does not mean reducing our quality of life. For example, switching to a car that uses half as much fuel or a refrigerator that uses one-tenth of the electricity protects the environment, saves money, and provides the same level of service and satisfaction. Nor does reducing consumption of resources mean the end of economic growth, since we can exchange more dollars while using less resources (by focusing our efforts on adding value and providing services rather than products). However, in order to reduce our consumption of resources, we must reverse the path of several centuries when prices, policies, and governments encouraged exploitation, over-use, and waste of natural resources.

Canadian, Swedish and Japanese environmental comparison

OECD. 2002. Environmental Data Compendium, 2002. Paris: OECD.



Moving Forward: Critical Challenges for Canada Today

The use of resources in this part of the world must be reduced significantly if the Earth's ecosystems are to be capable of maintaining a growing population and if living standards are to be raised in the developing world.

GOVERNMENT OF SWEDEN, 1999

In order to move toward a prosperous, just, and sustainable future, Canada must concentrate its efforts in two fundamental areas. The first involves finding ways to increase our genuine wealth while consuming fewer resources and substituting safe materials for the toxic substances still used in society today. The second involves facilitating sustainable futures for the world's less privileged people, for many of whom *increased* consumption is needed to attain a satisfactory quality of life. In order to achieve these ambitious aspirations, we focus on nine critical challenges:

GENERATING GENUINE WEALTH: Supplementing the narrow goal of economic growth with the objective of genuine wealth

IMPROVING EFFICIENCY: Increasing the efficiency of energy and resource use by a factor of four to 10 times

SHIFTING TO CLEAN ENERGY: Replacing fossil fuels with clean, low-impact renewable sources of energy

REDUCING WASTE AND POLLUTION: Moving from a linear "throw-away" economy to a cyclical "reduce, re-use, and recycle" economy

PROTECTING AND CONSERVING WATER: Recognizing and respecting the value of water in our laws, policies, and actions

PRODUCING HEALTHY FOOD: Ensuring Canadian food is healthy, and produced in ways that do not compromise our land, water, or biodiversity

CONSERVING, PROTECTING AND RESTORING CANADIAN NATURE: Taking effective steps to stop the decline of biodiversity and revive the health of ecosystems

BUILDING SUSTAINABLE CITIES: Avoiding urban sprawl in order to protect agricultural land and wild places, and improve our quality of life

PROMOTING GLOBAL SUSTAINABILITY: Increasing Canada's contribution to sustainable development in poor countries

For each of these critical challenges we provide a brief context of the problem being addressed, and an ambitious goal for the future based on the principle that Canada should be a world leader in sustainability. Exercising global leadership is consistent with the environmental values of Canadians, our extraordinary natural endowment, and repeated promises from government and industry. Specific targets and timelines for improving Canada's performance are identified, along with examples of the laws and policies necessary to achieve our goals. For the most part, targets and timelines are based on goals set (and in some cases already met) by other nations. We also identify interim objectives that enable the monitoring of our progress towards these targets. We conclude with policy changes that address all nine critical challenges. Future publications will provide more detail.

Many different organizations are addressing the challenges identified in this paper and are advocating similar visions, targets, timelines, and policies. These include the National Round Table on the Environment and the Economy, the Federation of Canadian Municipalities, the Green Budget Coalition, and labour organizations such as the Canadian Labour Congress and Canadian Auto Workers.²³ This document incorporates many of the policy solutions proposed by these groups.



Too much and too long, we seem to have surrendered community excellence and community values in the mere accumulation of things . . . Gross National Product counts air pollution and cigarette advertising, and ambulances to clear our highways of carnage. It counts special locks for our doors, and jails for those who break them. It counts the destruction of our redwoods and the loss of our natural wonder in chaotic sprawl. It counts napalm and the cost of a nuclear warhead . . .

Yet the GNP does not allow for the health of our children, the quality of their education, or the joy of their play. It does not include the beauty of our poetry or the strength of our marriages; the intelligence of our public debate, or the integrity of our public officials. It measures neither our wit nor our courage; neither our wisdom nor our learning, neither our compassion nor our devotion to our country; it measures everything, in short, except that which makes life worthwhile.

SENATOR ROBERT F. KENNEDY, 1968²⁴

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 and achieve what Robert Kennedy described as “that which makes life worthwhile.”

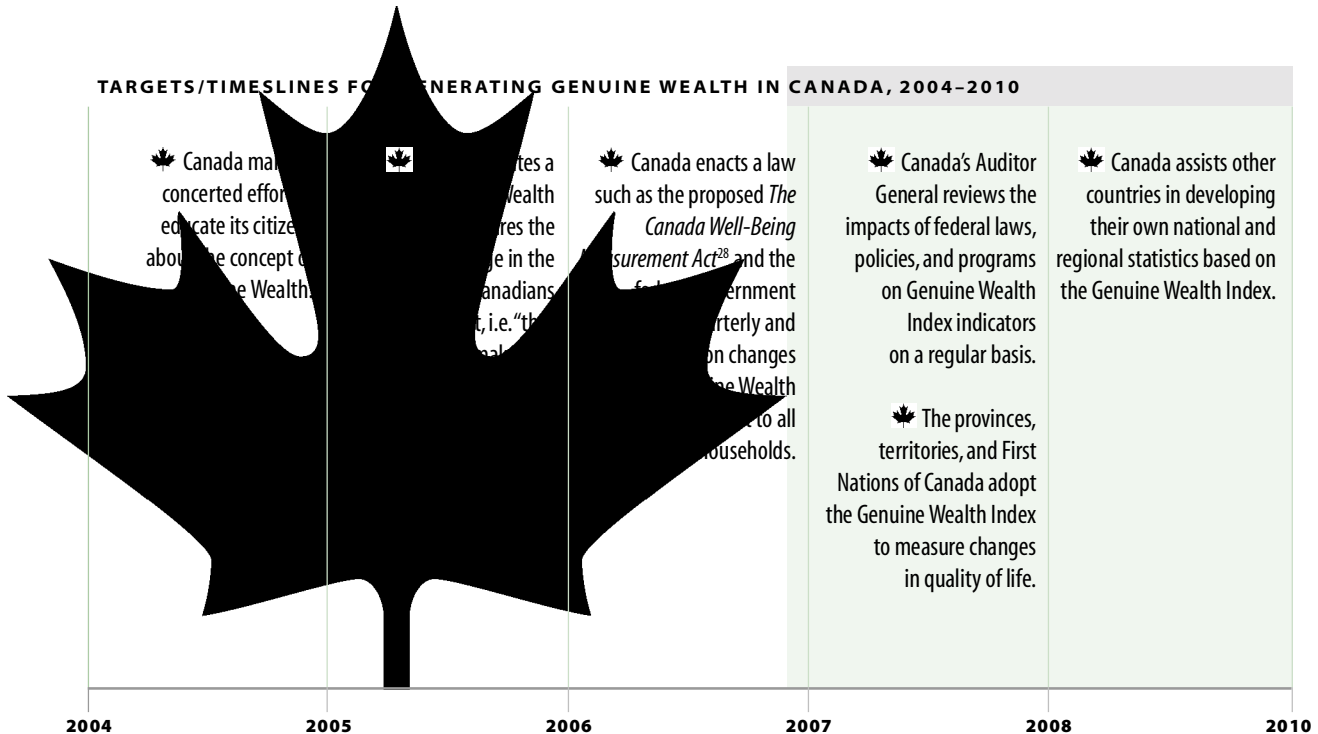
CONTEXT

Economic growth, measured as rising Gross Domestic Product (GDP), is widely used as the leading indicator of whether our society is healthy, prosperous, and moving in the right direction. Yet GDP is merely a yardstick of market activity, measuring the total number

The United Nations reports that “the percentage of Americans calling themselves happy peaked in 1957 – even though consumption has more than doubled in the meantime.”²⁷

of dollars exchanged in society. GDP statistics fail to distinguish between economic activities that increase our quality of life and those that cause harm.²⁵ Car accidents, earthquakes, robberies, oil spills, cancer, and preparing for war all cause economic growth (increases in GDP), but diminish our quality of life. GDP also ignores social and environmental values that are of great importance to Canadians, such as household labour, volunteer efforts, the health of citizens, free time, the quality of education, inequalities in wealth distribution, and environmental damage. It is often said that the things we measure and count are the things we value, and “if we do not count non-monetary and non-material assets, we effectively discount and devalue them.”²⁶

We urgently need a yardstick that provides a more complete assessment of whether Canada is moving in the right direction. Canada’s National Round Table on the Environment and the Economy has developed six indicators for natural and human capital. However, a broader suite of indicators and a more holistic “new balance sheet” is needed to account for the conditions of Canada’s genuine wealth – human, social, natural, produced and financial capital assets. Genuine Wealth Indicators should encompass measures of the actual conditions of natural capital, social capital, human capital, manufactured capital, and financial capital. The concept of Genuine Wealth goes beyond indicators – it is really a new system of evaluating the extent to which we are being good stewards of the common wealth of our nation.



Support for the Genuine Wealth concept is building. In June 2003 Parliament passed the following motion, with support of Members of Parliament representing the Liberals, Canadian Alliance, Progressive Conservatives, and New Democratic Party:

Motion No. 385 (Mr. Joe Jordan, Leeds-Grenville, Lib.)

That, in the opinion of this House, the government should develop and report annually on a set of social, environmental and economic indicators of the health and well-being of people, communities and ecosystems in Canada.

POTENTIAL POLICIES

There are precedents for the creation of a national Genuine Wealth Index. The Pembina Institute created a Genuine Progress Index (GPI) for Alberta that incorporated 51 economic, social, and environmental indicators such as crime, divorce, poverty, employment, water quality, and ecological footprints.²⁹ Alberta's GPI revealed a gradual *decline* in the quality of life enjoyed by Albertans between 1961 and 1999, despite the fact that the province's GDP *rose* by an average of 4.4% per year.³⁰ Similar research is underway by GPI Atlantic to create a GPI in Nova Scotia.³¹

These comprehensive indicators of quality of life provide a superior basis for making public policy decisions. Broad public awareness about the Genuine Wealth Index will contribute to the transition away from today's myopic emphasis on economic growth and material possessions toward a fuller, more encompassing focus on happiness, quality of life, and a sustainable future.

As one element of constructing the Genuine Wealth Index, Statistics Canada must measure the total energy and material requirement (TEMR) of the Canadian economy. TEMR is an important indicator of the overall level of resource consumption in an economy. While TEMRs have been calculated for the U.S., Japan, Germany and other nations, Canada does not yet compile this statistic.³²

2

Improving Efficiency



It is relatively easy to identify technical and organizational changes that can achieve 75% reductions in resource use or environmental impact.

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT³³

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 by 75 to 90% from today's levels. If we are to live within our means, this goal is critical because it recognizes the limits of Earth's natural systems.

CONTEXT

Canada is currently a very inefficient nation in terms of both energy and resource use. We rank 28th out of 29 Organisation for Economic Co-operation and Development (OECD) nations in energy efficiency, behind nations such as Poland, Mexico, and Turkey.³⁴ Canada's economy is 33% less energy efficient than the United States.³⁵ Scientists calculate that the overall energy efficiency of the Canadian and American economies ranges from 2.5% to 10%.³⁶ In other words, between 90% and 97.5% of the energy generated is wasted. Light bulbs are a classic example, as only 8% of the energy consumed by a regular bulb is used to produce light while the rest produces heat.³⁷

Canada's record on resource use is equally poor. Over 90% of the material extracted for use in manufacturing goes to waste.³⁸ With respect to water, Canada uses twice as much water as France, three times as much as Germany, five times as much as Sweden, and more than eight times as much as Denmark (on a per capita basis).³⁹ Excessive use of water causes environmental damage and unnecessary economic costs (for dams, treatment, and disposal systems).

During the energy crises of 1973 and 1980, some OECD countries improved their energy efficiency by 3% per annum.⁴⁰ At the same time, firms like DuPont implemented programs that rewarded efficiency gains. Contrary to expectations, they continue to find large energy savings even today, long after these programs were initiated. Extrapolation of these experiences suggests that a well-designed and aggressively implemented efficiency effort will yield 3% compound gains year after year.

POTENTIAL POLICIES

Energy

Mandatory energy efficiency standards for appliances, space heating systems, vehicles, homes, commercial buildings, and new renewable power generating facilities.

- Strengthen standards gradually over time to ensure continuous improvement (recognizing rates of technological change and capital turnover) and use regulations to remove the least efficient choices.
- Proclaim the *Motor Vehicle Fuel Consumption Standards Act*, passed in 1982, and gradually require vehicle manufacturers to increase fuel efficiency. Existing technologies such as hybrid engines can achieve 50% increases in efficiency.
- Provide a GST rebate on energy efficiency expenditures (e.g. hybrid vehicles, R-2000 homes, etc.).
- Improve the R-2000 and C-2000 standards and make them mandatory by incorporating them into national and provincial building and energy codes.

Subsidize energy efficiency audits of businesses, and mandate implementation of actions with a payback period of five years or less as done in Denmark.⁴³

Energy efficiency retrofit program for residential, government, and commercial buildings

- Use tax incentives, energy audits, sales tax exemptions, larger revolving funds than are currently available in most jurisdictions, and grants for showcase projects and for low-income residences, etc. Clear efficiency targets are needed for these retrofits.

Water

Make federal infrastructure grants contingent on performance based standards requiring the implementation of water demand management policies and programs by provinces, municipalities, and aboriginal communities.

Mandatory water efficiency standards for appliances (e.g. showerheads, toilets, dishwashers), irrigation, industrial equipment, homes and office buildings.

- Strengthen standards over time to ensure continuous improvement (recognizing rates of technological change and capital turnover) and use regulations to remove the least-efficient choices.
- Incorporate standards into national and provincial plumbing codes.

Require thermal power generating stations, which account for almost two-thirds of Canada's total water use, to recycle water used for cooling purposes.

A 1912 Model T Ford could get up to 35 miles per gallon of gas. This exceeds the fuel efficiency of all but one model in the 2003 Ford vehicle line-up.⁴¹

✳ CANADIAN SUCCESS STORY: ENERGY

Because of energy efficiency standards that were gradually strengthened, many of today's refrigerators use one-quarter of the energy of fridges made 20 years ago.⁴²

✳ CANADIAN SUCCESS STORY: WATER

Canadians who simply pay a flat rate for water, regardless of how much they use, consume 457 litres daily. In contrast, Canadians who have home water meters and pay for each unit of water use an average of 269 litres of water per day.

★ CANADIAN SUCCESS STORY: ENERGY

The Better Building Partnership retrofitted more than 150 buildings in Toronto, reducing building operating costs by \$6 million, eliminating 72,000 tonnes of CO₂ emissions annually, and creating about 3,000 construction jobs.

Require water metering, higher prices, and rising block rates for all users while implementing policies to ensure affordable basic services to all Canadians.

Material

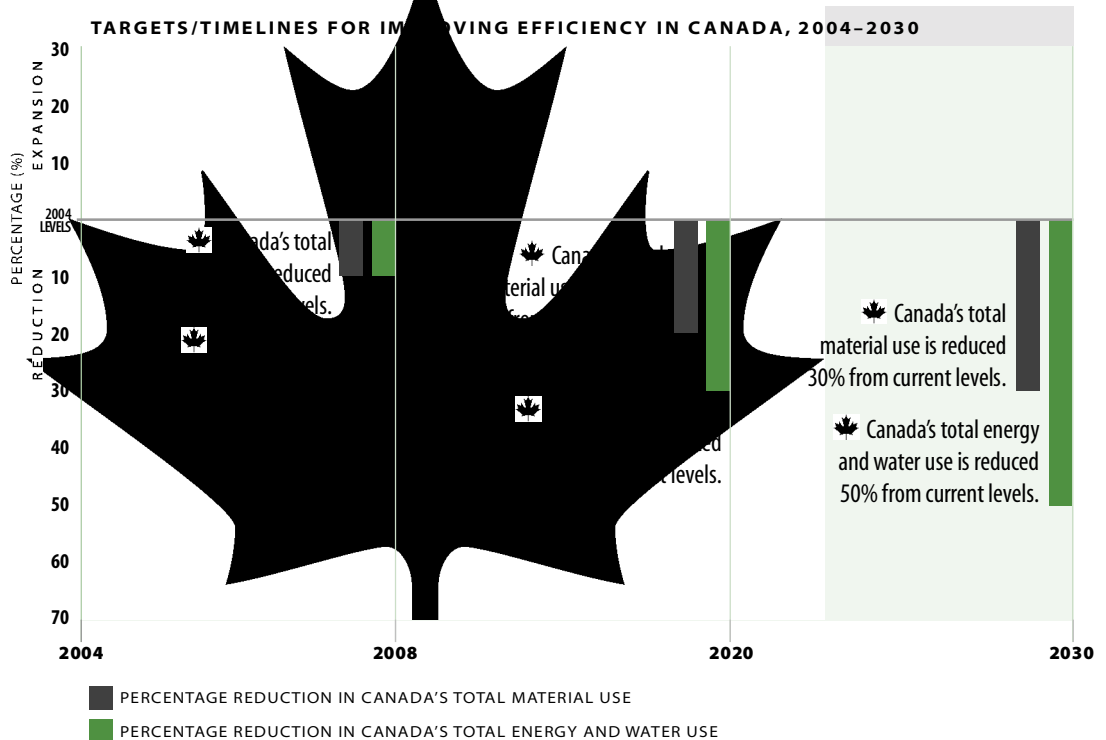
Promote research and development in resource efficiency technologies (e.g. water treatment and recycling) with challenge grants, accelerated depreciation, and other policies. Facilitate diffusion of successful technologies to the rest of the world.

Enact extended producer responsibility laws.

- Widely used in Europe where laws make producers responsible for both the full life-cycle of packaging and products that they produce. Producers must redesign their products (from cars to electronics) so that they can be returned from consumers to producers for re-use or recycling. This is known as take-back legislation.

Encourage programs and organizations that lease and share products (e.g. car co-operatives) so that people are purchasing services, not goods.⁴⁴

Provide Canadians with better information by mandatory labeling of products to indicate the amounts of energy, water, and resources consumed in both manufacturing products and using products.



Japan increased its GDP by 81% between 1973 and 1991 without increasing its total use of energy.⁴⁵

Between 1980 and 1997, total water withdrawals fell 52% in the Netherlands, 34% in Finland, 34% in Sweden, and 31% in the United Kingdom.⁴⁶

German sustainability experts suggest that Germany can reduce its total material use 50% by 2050.⁴⁷

3

Shifting to Clean Energy



People and nations behave wisely – once they have exhausted all other alternatives.

WINSTON CHURCHILL

GOAL

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

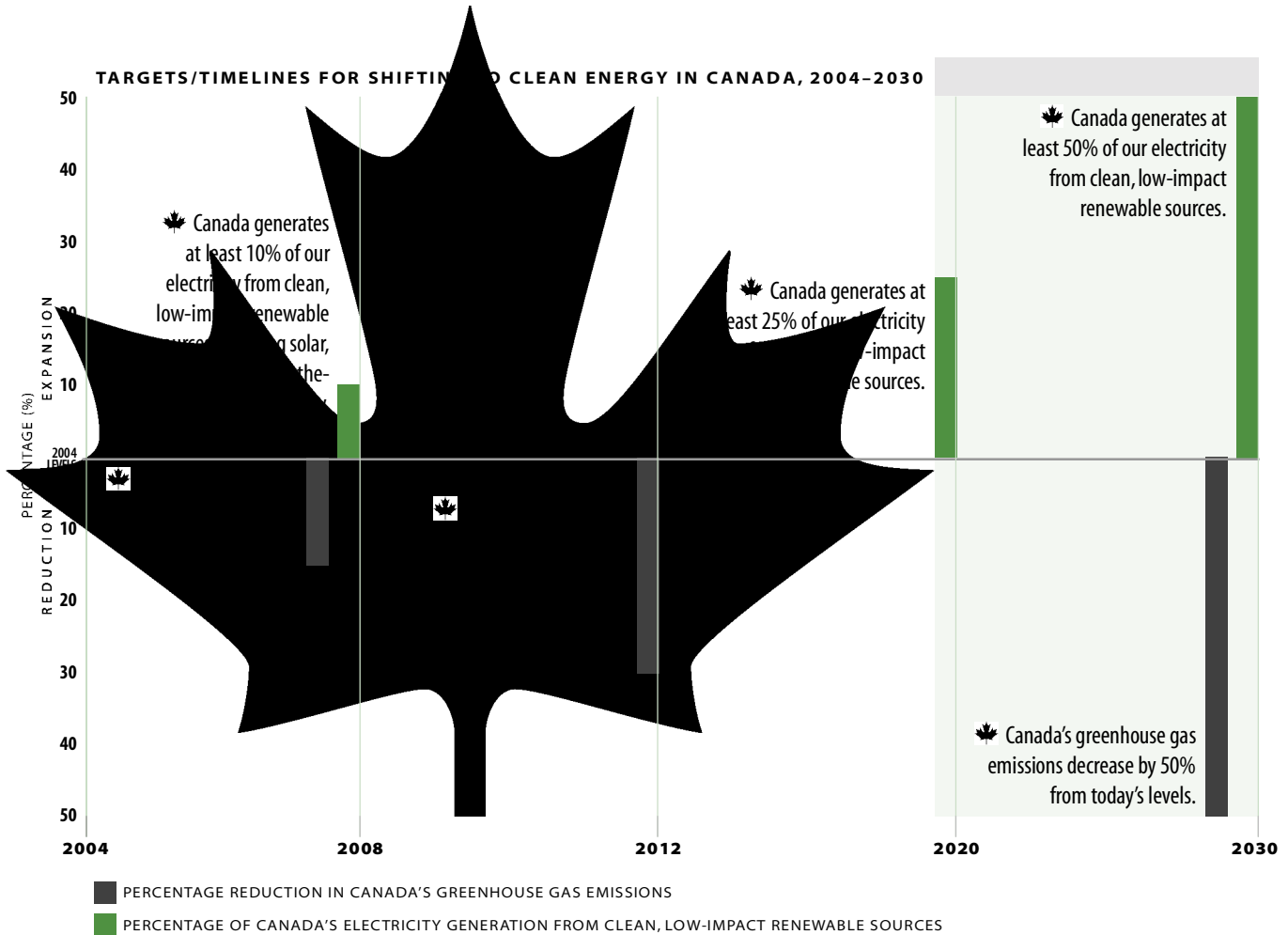
CONTEXT

At present, Canada depends heavily on fossil fuels – like coal and oil – for transportation and to produce electricity. This dependence is the main reason for our high levels of greenhouse gas emissions (contributing to climate change) and air pollution (causing thousands of premature deaths annually). Less than 20% of Canada’s total energy supply comes from renewable sources (including large-scale hydro, which is not sustainable because of large social and environmental impacts). Only 1% of Canada’s electricity currently comes from low-impact renewable energy sources.⁴⁸

Despite our huge potential with renewable energy sources like wind, solar, and run-of-the-river hydro, Canada is falling behind other nations in these rapidly growing energy futures. Denmark generates 20% of its electricity needs with wind power while Canada generates 0.1%. Even the U.S. has 20 times as much installed capacity for wind power as Canada. Globally, between 1995 and 2001, solar power grew at 21% annually while wind grew even faster, at 32% per year.⁴⁹ Yet in Canada the federal government invested \$4.3 billion in non-renewable energy but only \$118 million in renewable energy between 1988 and 1997.⁵⁰

The Alberta government is committed to purchasing 90% of its electricity from low-impact renewable energy sources by 2005.⁵²

In 2001, Iceland announced that it planned to become the world’s first hydrogen economy, relying exclusively on renewable energy. In 2002, the European Union embraced a strategy to spend billions of dollars on an intensive research and development effort directed toward making the transition from fossil fuel dependency to a decentralized, renewable-based hydrogen economy.⁵¹ The advantages of decentralized energy generation include more jobs, greater reliability, and enhanced security.



Iceland already relies on renewable energy for two-thirds of its total energy needs.

Europe intends to produce 12% of its electricity from renewable sources by 2010, and at least 20% by 2020.⁵³

Canada’s industry-based Clean Air Renewable Energy Coalition has set targets for generating 7% of Canadian electricity from low impact renewable sources by 2010 and 15% by 2020, without including offshore wind power generation.

Great Britain and Sweden are committed to 60% reductions in greenhouse gas emissions by 2050.

DuPont reduced greenhouse gas emissions from its global operations by 65% between 1990 and 2001.⁵⁴

POTENTIAL POLICIES

Major and sustained federal investment in renewable energy research and development along with significant production tax incentives.

- Revenue could be generated through changes to federal fuel excise tax. Parliament's Technical Committee on Business Taxation recommended restructuring the fuel excise tax as a more broadly based environmental tax based on the carbon content of various energy sources.⁵⁵
- Increase the Wind Power Production Incentive and extend it to other forms of low impact renewable energy.

Increase government procurement of renewable energy, moving rapidly towards 100% for electricity needs. The Clean Air Renewable Energy Coalition is calling for governments to purchase 30% of their electricity from low impact renewable energy sources by 2010 and 80% by 2020.

Enact renewable energy portfolio standards at the federal level and support the development of such standards for the provinces, territories, and First Nations.

Implement a domestic greenhouse gas emissions permit trading system, with a fixed emissions cap.

Work with provinces to require the capture of methane from landfills, sewage treatment facilities, and factory farms.

Phase out the use of coal burning to generate electricity, as Ontario is committed to doing by 2007.

Establish and maintain a permanent moratorium on new offshore oil and gas exploration on Canada's coasts.

Support and develop research in hydrogen generated from renewable, non-nuclear sources in partnership with other nations.

End all subsidies to the nuclear energy industry with the goal of phasing out nuclear energy in Canada and ending the export of this technology to other nations. Nuclear has no place as an energy source in Canada's future because of nuclear wastes, high costs, and security problems.

Offer financial incentives to encourage and promote the sale of alternative fuel vehicles (AFVs), hybrids, and fuel cell vehicles. Support public and private partnerships that use AFVs and build renewable fuel infrastructure. Support the development of these technologies by mandating governments to alter their fleet procurement policies to include these vehicles.



We need to abandon the very concept of waste. This will require a fundamental shift in our thinking – away from linear models of production and closer to the example that nature sets for us. The traditional model takes in virgin materials at one end, creates waste and emissions during production, and throws away potentially valuable materials after consumer use. But nature long ago came up with a superior design. One where all waste is reused as food or energy elsewhere. . . . We would do well to expand our powers of imitation.

FINANCE MINISTER PAUL MARTIN, 2000⁵⁶

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.

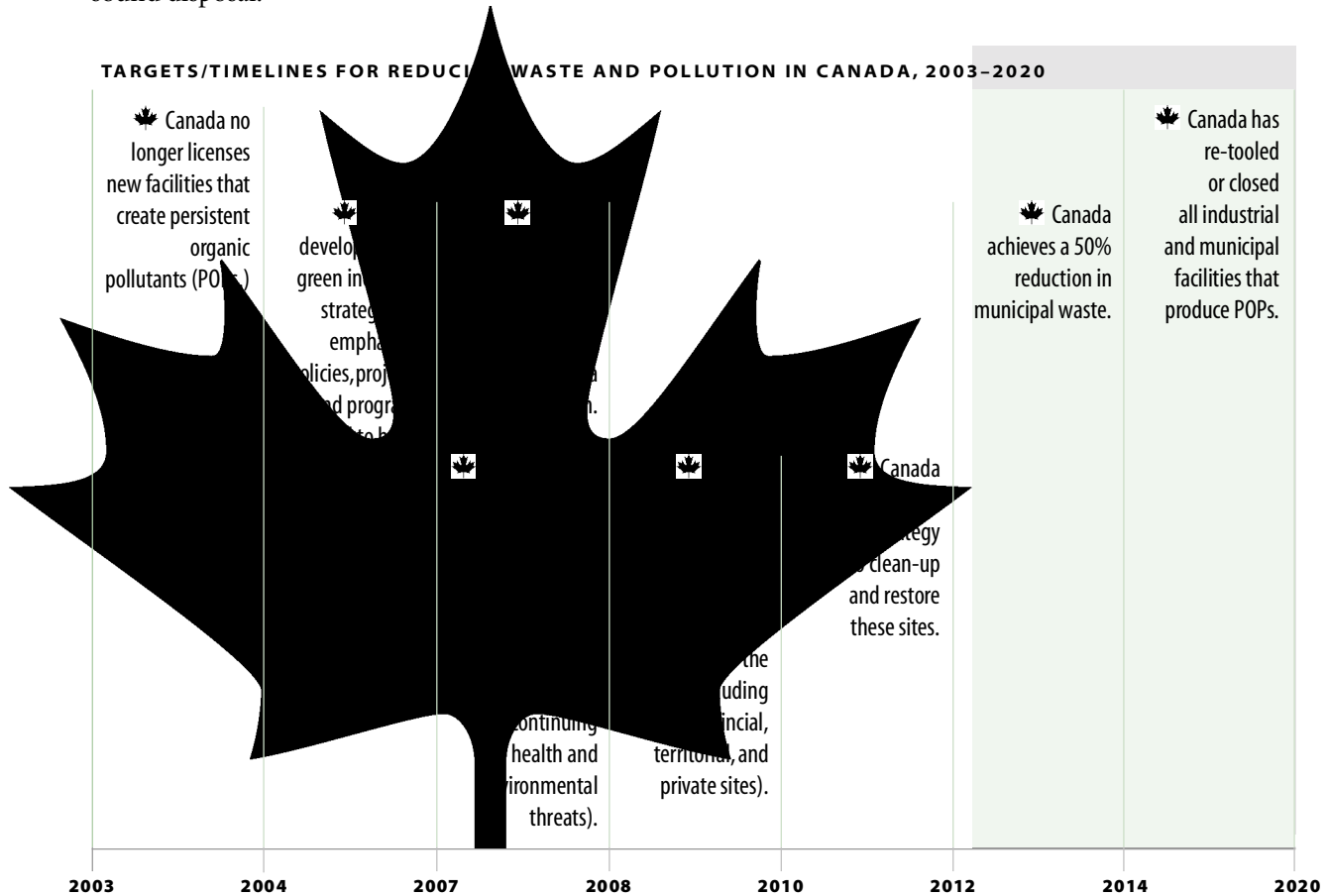
CONTEXT

All forms of waste (solid, liquid, and gaseous) are signs of either poor design or inefficiency. Eliminating waste means designing our production and consumption processes and patterns so that waste is not left over. In addition to reducing environmental impacts, reducing waste can produce economic opportunities, create jobs, and save money. The amounts of waste generated by Canadian society today are staggering. Each year we collectively produce tonnes of nuclear and hazardous wastes, billions of kilograms of solid waste, and trillions of litres of liquid effluent.

Canadian government data estimates that between 5,000 and 16,000 Canadians die prematurely each year because of air pollution.⁵⁷ In 2001 almost 400 million kilograms of toxic pollutants were released by the facilities covered by Canada's National Pollutant Release Inventory (NPRI), including more than 120 million kilograms spewed into the air

and more than 20 million kilograms dumped in water. This inventory covers only a fraction of the total pollution generated in Canada annually because it includes a limited number of substances, a limited number of facilities, and completely overlooks non-point sources of pollution such as agricultural and urban runoff.

The key to eliminating waste is smart design. We need to design things so that end products and byproducts can enter one of two streams – the biological stream or the industrial stream.⁵⁸ Items placed in the biological stream must be capable of safely biodegrading, while most items in the industrial stream, such as metals, must be used over and over again in our industrial economy. Ideally, everything should be designed for disassembly into these two streams, but in the interim proper procedures must be established for handling remaining toxins, pharmaceutical wastes, and sludge and slurries that cannot be further used or recycled. Producers must bear the cost of safe and environmentally sound disposal.



New Zealand is rapidly moving towards Zero Waste, with half of local governments in that nation endorsing the goal of Zero Waste by 2015.⁵⁹ Many cities and companies around the world are also moving in this direction, including Toronto, Halifax, Edmonton, San Francisco, Canberra (Australia), Hewlett Packard, Xerox, 3M, and Interface.

Sweden is legally obligated to completely remediate at least 50 of the 100 highest priority contaminated sites by 2005.⁶⁰

CANADIAN SUCCESS STORY

Canada reduced the production and use of ozone-depleting substances by 95% in the past decade because of effective science, the advocacy of environmental groups, strong regulations, government leadership, and industry cooperation.⁶³

POTENTIAL POLICIES

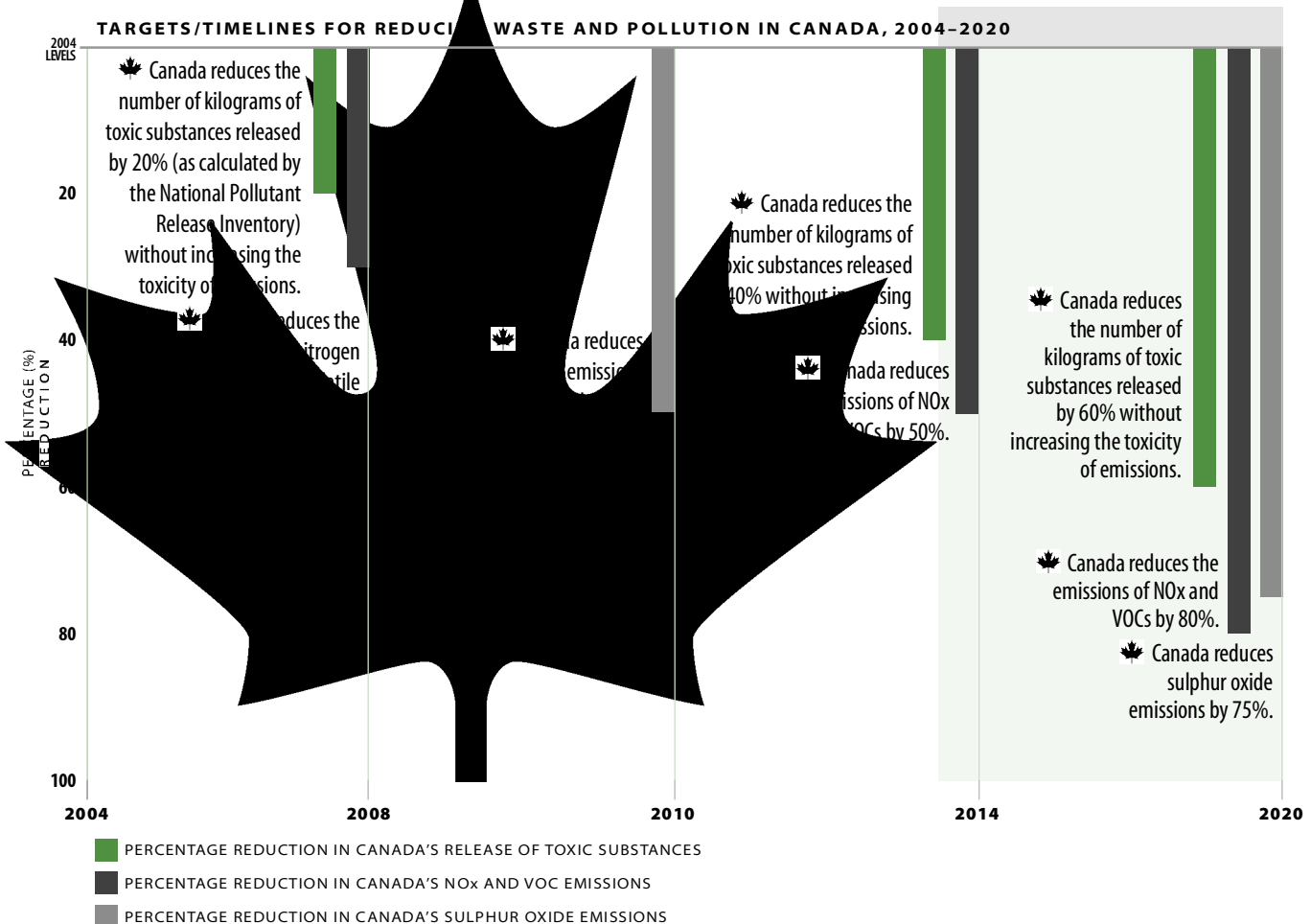
Enact toxics reduction legislation with mandatory participation for industrial facilities that are part of the National Pollutants Release Inventory.

- The U.S. government and 36 states already have toxic reduction legislation.⁶¹

Accelerate the phase-out of toxic and harmful substances, including chlorine.

- Sweden is reviewing thousands of substances by 2010 and will phase out the production and use of substances that are carcinogenic, endocrine-disrupting, persistent, bioaccumulative or acutely toxic.⁶²

Approve new chemicals based on a process which places the burden of proof on the producer. The onus must be on chemical companies to provide reliable, independent evidence that new substances are safe and cause no damage to human health or to the environment.



Since Massachusetts enacted the *Toxics Use Reduction Act* in 1989, companies in the state have decreased their toxic chemical use by 40%, are generating 58% less waste per unit of product, and have reduced releases of chemicals governed by the U.S. Toxics Release Inventory by 90% (all figures adjusted to reflect production increases).⁶⁴

Germany's Council of Experts on Environmental Issues called for an 80% reduction in German NOx and VOCs emissions by 2005.⁶⁵

Canada has already committed to the 2010 goal for sulphur oxide emissions.⁶⁶ Scientists believe that a 75% reduction is required to adequately protect ecosystems in Eastern Canada.⁶⁷

Enact extended producer responsibility laws.

- Europe has passed laws that make producers responsible for both the packaging and products (from vehicles to electronics and office equipment) that they produce. Producers must redesign their products so that all components can either be reused or recycled.

Require all packaging materials to be either safely biodegradable or safely reusable/recyclable. Offer incentives for manufacturers to create products that are either safely biodegradable or reusable/recyclable, or that can be easily divided into these two streams.

Enact federal contaminated sites cleanup legislation and/or provide sufficient financial resources to fund a cleanup program. Whenever possible, make the polluter reimburse the government for the costs of clean-up.

Impose a chemical tax to fund contaminated site cleanup and restoration.

- This was recommended by the OECD, and has been implemented in European nations. A chemical tax could be based on Canada's National Pollutants Release Inventory, as proposed by the Green Budget Coalition.⁷⁰

Create a revolving fund administered by the Federation of Canadian Municipalities to support local governments in developing and implementing Zero Waste policies.

- See New Zealand's Zero Waste Trust, which has already distributed \$1.7 million to support community pilot projects.⁷¹ For example, encourage municipalities to add collection of organic materials to blue box recycling programs for use in producing bio-fuels and fertilizers.

**CANADIAN
SUCCESS STORIES**

✳ Sulphur dioxide emissions declined by almost 50% in Eastern Canada due to government regulation and industry investment.⁶⁸

✳ Lead emissions are down 95%, due to the prohibition of leaded gasoline and tougher standards for lead smelters.⁶⁹

✳ Edmonton leads Canada with a 70% reduction in the volume of waste going to landfill, while the province of Nova Scotia has reduced municipal waste by 50%.⁷²



Water will become Canada's foremost ecological crisis early in this century.

DAVID SCHINDLER, KILLAM PROFESSOR OF ECOLOGY,
UNIVERSITY OF ALBERTA, 2001⁷³

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*.

CONTEXT

Despite the myth that Canada has an endless supply of fresh water, we face serious threats to both water quantity and water quality. One in four municipalities in Canada experienced a water shortage in recent years.⁷⁴ Every year, contaminated drinking water causes thousands of Canadians to become ill. The Walkerton, Ontario tragedy in 2000 that killed seven people was a sobering reminder of the threat posed by water pollution, and the vital need to protect the sources of our drinking water.

Industry, agriculture, hydroelectric facilities, poor sewage treatment, climate change, and weak laws and policies pose threats to the water supplies of Canadians and our fresh-water systems. Annually, industry dumps more than 20 million kilograms of toxic chemicals into rivers, lakes and streams and injects 135 million kilograms of toxic chemicals underground, where groundwater may be contaminated.⁷⁵ Agricultural wastes (including pesticides, fertilizers, manure, and antibiotics) pollute our streams, lakes, and groundwater, leading to unnaturally high nutrient levels, toxic algal blooms, and the presence of pathogens capable of causing human disease. Hydroelectric operations use twice as much water

as all other Canadian uses (industrial, municipal, agricultural, and commercial) combined, and cause extensive damage that harms natural ecosystems and the cultures of aboriginal peoples.⁷⁶ In Canada, only 40% of the municipal population is served by tertiary treatment, 38% is served by secondary treatment, 19% have access to crude primary treatment, and 3% have no treatment at all.⁷⁷

In the future, climate change may wreak havoc on Canadian water supplies.⁷⁸ The quality of legal protection for drinking water is uneven across Canada, and poor in some areas.⁷⁹

POTENTIAL POLICIES

Enact strong National Drinking Water Quality standards, replacing today’s system of voluntary guidelines that some provinces do not enforce. This would include a national operator certification program.

Test and expand the use of alternative drinking water treatment like ozonation, slow sand filtration, etc.

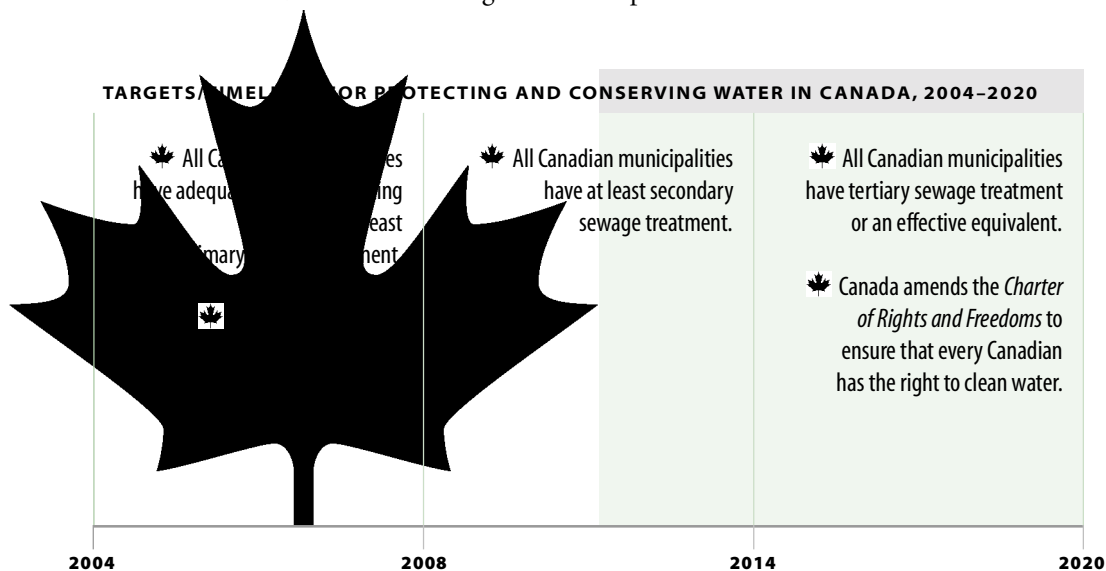
- Amsterdam has eliminated chlorine from their drinking water system.

Invest federal and provincial infrastructure funds to upgrade Canada’s drinking water and sewage treatment facilities.

- Funding to be contingent upon the implementation of demand management policies and programs, and not made available where infrastructure is privatized.
- Provide a 100% GST rebate for green municipal infrastructure.

SUCCESS STORY

New York City recently avoided spending \$3.8 billion on new water treatment plants (with \$700 million annual operating costs) by investing \$1.5 billion in conserving land around the reservoirs in upstate New York.⁸⁰ Protecting watersheds from development and logging protects water quality.



The European Union (EU) has a directive requiring secondary sewage treatment by 2010.

In Sweden, 87% of the municipal population is already served by tertiary sewage treatment.⁸¹

Enact a new regulation under the federal *Fisheries Act* requiring a minimum of secondary sewage treatment for all outflows affecting fish stocks by 2010.

Renegotiate the North American Free Trade Agreement (NAFTA) to clearly and specifically exempt water altogether. Explicitly exempt water from all future trade and investment agreements, such as the proposed *Free Trade Agreement of the Americas*.

Implement a comprehensive national water policy to address the protection of freshwater systems.

Encourage provinces and territories to phase in full-cost pricing (including environmental costs) for all water users – industrial, commercial, agricultural, and municipal, along with water metering.

- See Ontario's *Sustainable Water and Sewage Systems Act*.

Maintain the moratorium on bulk water exports.

- Work with provinces to close loopholes in their diversion and export laws.

Ensure that there is no depletion of groundwater beyond natural recharge rates.

Increase resources for research into freshwater systems. Substantial, coordinated programs are needed for collection of baseline data. Of particular importance are groundwater and the Great Lakes basin.

Fully enforce *Fisheries Act* provisions requiring adequate stream flows for fish.

Avoid large-scale hydroelectric developments because of the unacceptable social and environmental impacts (particularly where the electricity generated is being exported).

Encourage provinces, territories and First Nations to implement watershed planning and drinking water source protection. Maintaining water quality for water supply and ecological needs should trump all other potential activities in watersheds.



Food security exists when all people at all times have physical and economic access to sufficient, safe, and nutritious food to meet their dietary needs and food preferences for an active and healthy life.

WORLD FOOD SUMMIT, ROME, 1996

GOAL

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

CONTEXT

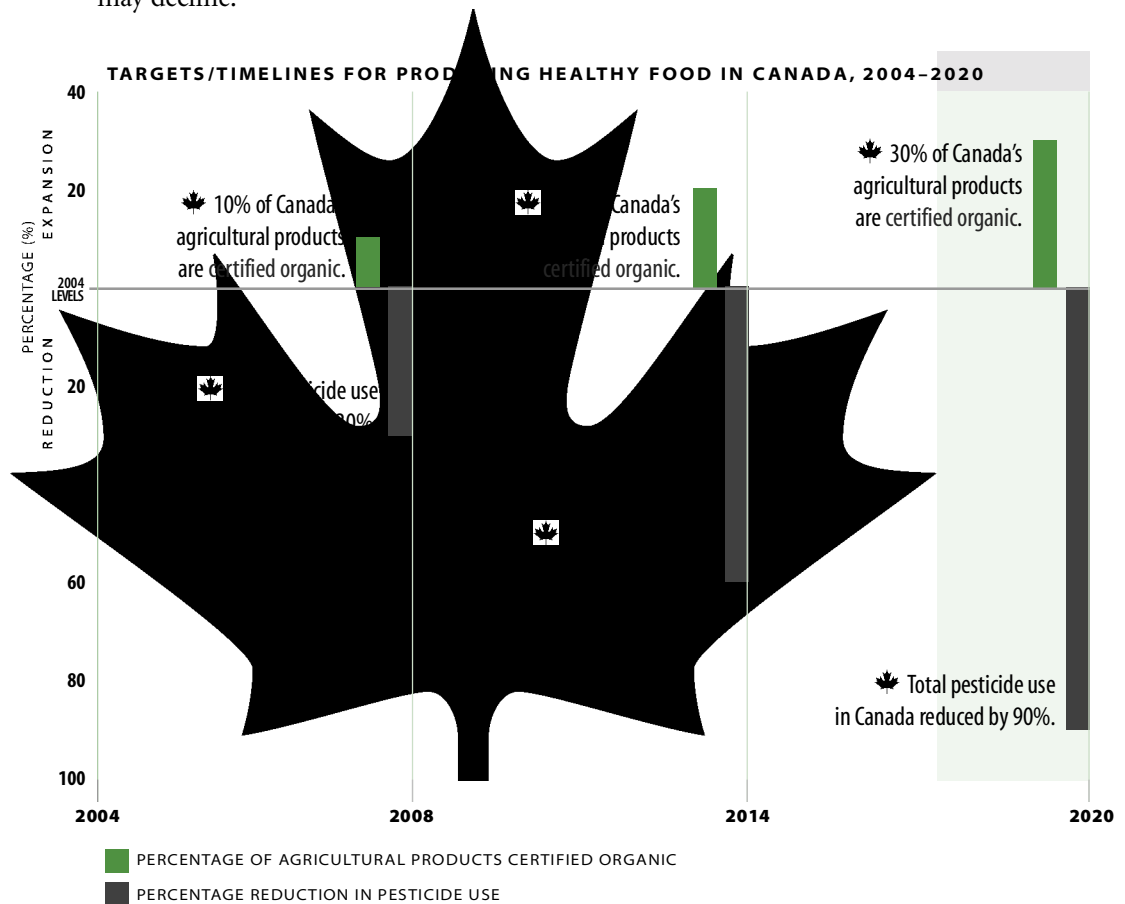
Industrial agriculture can cause far-reaching and long-lasting environmental damage through pesticide contamination, soil erosion, falling water tables, salinization, eutrophication, surface and groundwater contamination, and the uncertain impacts of genetically modified organisms.⁸² Pesticides, fertilizers, manure, pathogenic organisms, endocrine-disrupting compounds,⁸³ and veterinary pharmaceuticals pose a threat to Canadian water quality. Production of meat comes at a particularly high environmental cost because of intensive livestock operations that use large volumes of water, energy and other resources and often lack adequate strategies for coping with vast quantities of manure. Livestock operations generate 132 billion kilograms of manure annually – about 4,000 kilograms per Canadian.⁸⁴

Over 7,000 pesticide products containing 500 active ingredients are registered in Canada. Many pesticides were approved when the standards were much less stringent than they are today. At least 60 pesticides approved for use in Canada, such as 2,4-D, lindane, atrazine, and carbofuran, have already been banned by other countries because of health and environmental concerns. Agriculture accounts for approximately 90% of pesticide use in Canada.

According to Statistics Canada, the area treated with herbicides in 1995 was 18 times as big as the area treated with herbicides in 1970, while the area treated with insecticides grew by 3.5 times during the same period. About three-quarters of Canadian croplands now receive treatment with pesticides.⁸⁵

To reduce pesticide use, there are two management options for farmers. One is a move to organic farming, which uses absolutely no synthetic pesticides or fertilizers. The other option is integrated pest management (IPM), where synthetic pesticides are only used as a last resort.

Consumers in Canada and around the world are increasingly concerned about pesticides and other residues in their foods as well as genetically modified foods. Unless Canadian farmers and governments take action to address these concerns our market share may decline.



Germany plans to produce 20% of its agricultural output organically by 2010.⁸⁶

Close to 30% of milk sold in Denmark is organic.⁸⁷

Sweden decreased the volume of pesticides used by more than 80% between 1980 and 2000.⁸⁸

POTENTIAL POLICIES

Encourage local food connections between producers and consumers.

Phase out the use of pesticides banned in other OECD nations for health and environmental reasons.

Replace the GST exemption for agricultural pesticides (and exclude pesticides from the Input Tax Credit) and introduce a specific tax on pesticides. Revenues raised could then be used to support organic agriculture and integrated pest management.

Implement mandatory labeling policies that include comprehensive nutritional information, country of origin, fair trade, organic standards, and GM content.

Work with provinces to:

- Regulate the runoff from industrial agriculture, particularly from factory farms.
- Protect valuable farmland through the designation of agricultural land reserves.
- Phase out the use of chemical fertilizers.
- Implement no/low till and other practices to prevent soil erosion.
- Ensure riparian buffer strips to protect water resources.
- Develop regional plans for nutrient management to ensure that manure production does not exceed the local environment's carrying capacity.

Eliminate the non-therapeutic use of anti-microbials in livestock and fish-farming operations.

Promote healthy diets, including low meat consumption with an emphasis on low-impact sources of protein.



7

Conserving, Protecting and Restoring Canadian Nature

Biological diversity is the key to the maintenance of the world as we know it.

DR. E.O. WILSON, HARVARD UNIVERSITY & WINNER OF TWO PULITZER PRIZES

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.

CONTEXT

Despite our extraordinary natural legacy, in numerous ways Canada is not living up to its stewardship responsibilities. With just over 10% of our land protected by federal, provincial, and territorial laws, Canada ranks a surprisingly poor 60th among nations of the world in terms of the proportion of our land area that is protected from development.⁸⁹ Our performance in terms of marine-protected areas is even worse, as less than 0.1% of Canada's vast marine realm has legal protected status.⁹⁰

Our record in "managing" fisheries and forestry leaves much to be desired. The collapse of Atlantic cod is a globally notorious symbol of poor fisheries management. Preeminent scientists believe that Canadian fisheries on both the East and West Coasts are still unsustainable.⁹¹ Wild salmon on the West Coast are threatened by over-fishing, diseases and parasites from fish farms, and poor logging practices and urban developments that destroy the streams in which they spawn.

Despite years of vocal public demands for better care of our forests, the total rate of logging in Canada recently reached an all-time high, clearcutting continues to predomi-

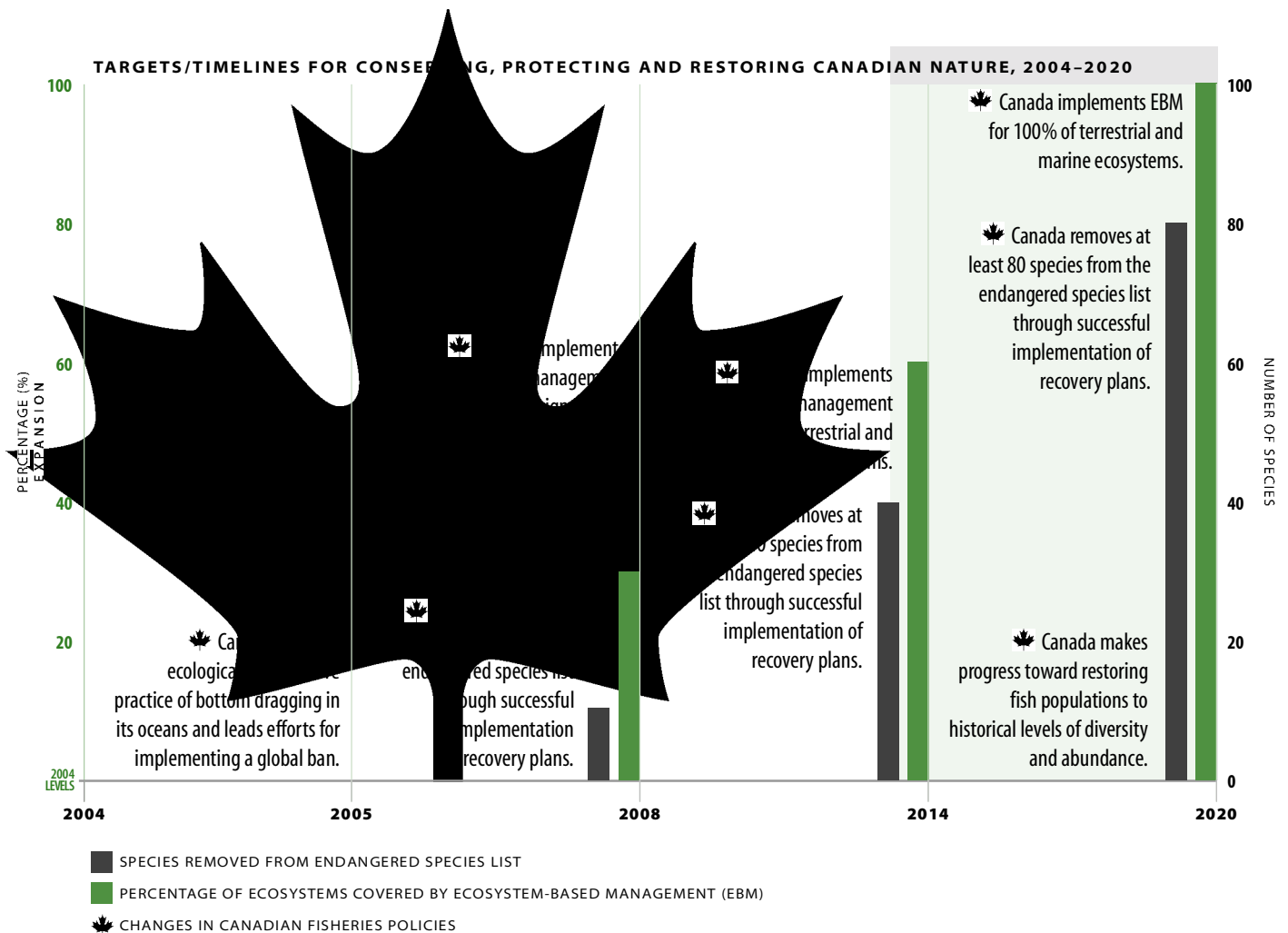
nate, and old-growth forest continues to be cut.⁹² The culmination of over a century of logging, clearing, and urbanization has led to fragmented ecosystems, threatening far-ranging species such as grizzly bear and caribou, and isolating many other species into small pockets of habitat where they are more susceptible to fires, disease, hunting, and predation.

Due to a wide variety of stresses including habitat damage, over-exploitation, the introduction of exotic or alien species, pollution, and global atmospheric problems (climate change and ozone depletion), the list of endangered species in Canada grows annually and is now over 400 species.⁹³

A new orientation to protecting biological diversity and ecosystem integrity must be adopted that goes beyond merely protecting the habitat of endangered species whose plight resonates with the public (e.g. killer whales) or landscapes of great aesthetic and monumental appeal (e.g. glaciers or old-growth rainforests). To accomplish this an ecosystem-based management (EBM) approach⁹⁴ to land-use planning must be implemented throughout Canada in which significant areas are set-aside from industrial development in perpetuity. (For further information on EBM, see Appendix 3).

CANADIAN SUCCESS STORY

During the 1990s, Canada added over 40 million hectares to our system of parks, reserves and protected areas.



POTENTIAL POLICIES

Necessary budget allocations for the designation and management of land and marine parks and protected areas, as well as for the protection of species at risk and their habitat. Ensure a comprehensive and integrated approach to the federal protected areas including national parks, national wildlife areas, and migratory bird sanctuaries.⁹⁵

Complete transparent land use planning processes to implement ecosystem-based management, including designation of protected areas, buffer zones, and wildlife corridors prior to issuing new permits for industrial development activities (as recommended by the National Round Table on the Environment and the Economy).⁹⁶

Federal legislation to address problems of invasive or alien species.

- The U.S. has the *National Invasive Species Act of 1996*.⁹⁷

Exert federal leadership in managing the larger ecosystems in which federal protected areas exist. Encourage co-management arrangements with shared jurisdiction and cooperative decision-making between federal/provincial/territorial governments, aboriginal people, and local communities.

Protection and restoration programs for keystone and umbrella species in protected areas.

Improve incentives for landowners to protect and restore wildlife habitat.

- Remove remaining capital gains tax on gifts of ecologically sensitive lands.

Implement and enforce net gain policy into environmental assessment, park management, fisheries management, etc., so that all proposed developments or activities must provide a demonstrable net environmental benefit.

Strengthen the federal *Species at Risk Act* to protect all species at risk and their critical habitat throughout Canada wherever they are found.

Increase enforcement of federal legislation, including the *Fisheries Act* and the *Species at Risk Act*.

Protect sufficiently large area of habitats through ecosystem-based management plans to ensure that species do not become endangered/threatened.

Fish farms should raise herbivorous species and use containment methods that ensure wastes, chemicals, medications, and fish are not released to the environment.

8

Building Sustainable Cities



Whenever and wherever societies have flourished and prospered, rather than stagnated and decayed, creative and workable cities have been at the core of the phenomenon.

JANE JACOBS, AUTHOR OF *THE DEATH AND LIFE OF GREAT AMERICAN CITIES*

GOAL

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

CONTEXT

Canadian cities have changed dramatically in the past half-century. The most obvious changes include urban sprawl, a car-dependent culture, air pollution, gridlock, and on the positive side, much greater cultural diversity. Over 80% of Canadians now live in cities.

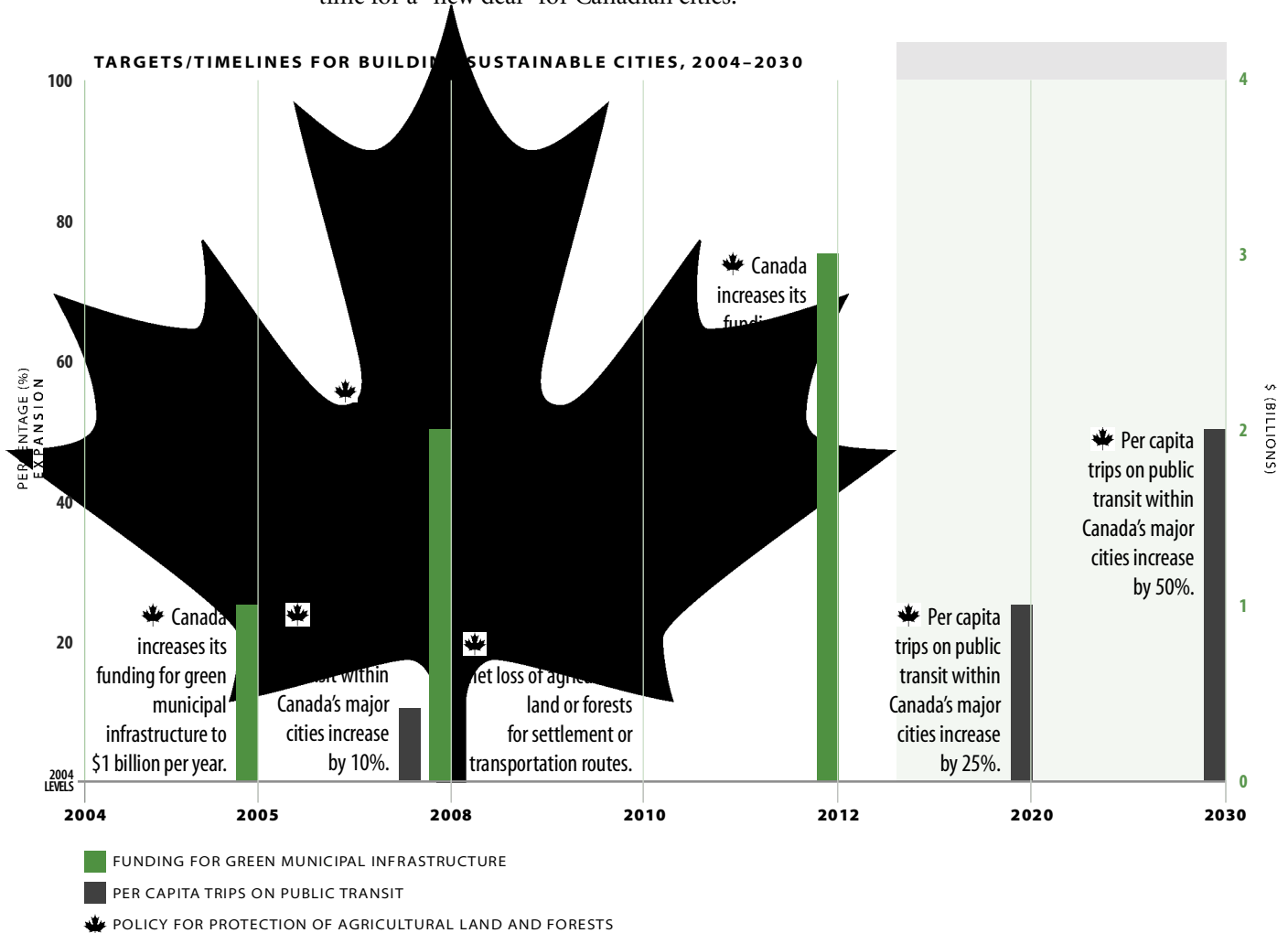
Sprawl has severe economic, social and environmental costs. Sprawl causes air pollution, water pollution, habitat destruction, climate change, congestion, traffic accidents, and loss of productive farmland. It is estimated that 5,000 to 16,000 people die prematurely each year in Canadian cities because of air pollution. Between 1966 and 1986, more than 3,000 square kilometers of rural land, mostly prime agricultural land, was lost to sprawl. It costs more to accommodate growth by building new roads, electrical lines, sewer and water infrastructure for new subdivisions and shopping centres, than to integrate people into existing areas.⁹⁸

Urban sprawl will cost Greater Toronto \$69 billion in the next 25 years, unless steps are taken to make the city more compact, to improve transportation, and to ameliorate air quality.⁹⁹ Gridlock alone costs Greater Toronto \$2 billion per year in lost productivity. Other costs of sprawl include: lost farmland and lower food production; increased greenhouse

Calgary takes up as much land as New York City with only a tenth of its population.

gas emissions from cars and trucks; increased respiratory diseases, impaired lung function, and rising rates of asthma. Air pollution costs billions of dollars annually in hospital administration, emergency room visits, and absenteeism from jobs.¹⁰⁰ Urban sprawl is a result of poor policies, inadequate public transportation, perverse subsidies that encourage suburban development, and a lack of long-term planning.

The current political framework in Canada hampers municipalities' ability to improve infrastructure and revitalize themselves. Only 8% of Canadian tax dollars go to municipal governments.¹⁰¹ According to the Federation of Canadian Municipalities (FCM), there is a \$60 billion infrastructure gap.¹⁰² Revitalizing Canadian cities will require cooperation among the three levels of government. Canada is the only OECD country without a national program for supporting urban transit. As many politicians have recognized, it is time for a "new deal" for Canadian cities.



This stabilization goal of no net loss of agricultural lands or forests was recommended for Germany by environmental experts concerned about the incremental effects of sprawl.¹⁰³

POTENTIAL POLICIES

Promote regional and national planning that integrates transportation, land use and environmental planning.

Provide federal funding for green municipal infrastructure that is contingent upon performance-based smart growth¹⁰⁴ and sustainability criteria.

- Increase the municipal GST rebate to 100% for green infrastructure spending.
- Support provincial and municipal programs to establish urban growth boundaries that protect farmland and wildlife habitat.
- Encourage provincial governments to protect valuable farmland through the designation of agricultural land reserves.
- Amend *Income Tax Act* regulations to make community energy systems eligible for accelerated capital cost allowance.

Initiate a national public transportation funding program.

- National Round Table on the Environment and the Economy (NRTEE) recommended \$1 billion per year for ten years.¹⁰⁵
- Use a portion of the federal gas tax that currently generates close to \$5 billion annually to finance transit infrastructure and operations.
- Tax exemption for employer-provided transit passes.
- Support for high-speed inter-urban rail service.

Encourage brownfield remediation and redevelopment.¹⁰⁶

- Changes to tax system.
- Provide mortgages, guarantees, and revolving loans for brownfield sites that meet restoration criteria.

Develop a National Affordable Housing Program built to meet improved R-2000 standards, to reduce operating costs for residents.

Work with the Federation of Canadian Municipalities to implement a standard set of sustainability indicators. Currently, hundreds of different sustainability indicators are used in communities across Canada.



The new electronic interdependence recreates the world in the image of a global village.

MARSHALL MCLUHAN, 1962¹⁰⁷

GOAL

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.

CONTEXT

Canada cannot achieve a sustainable future by itself because of the global nature of environmental problems such as climate change, ozone depletion, and the long-range transport of air pollutants. Although Canada likes to think of itself as a compassionate and generous nation, in recent years our actions have fallen far short of our aspirations. For example, Canadian development assistance, as a percentage of GDP, fell from 0.49% in 1991 to 0.22% in 2001.¹⁰⁸ This dismal level of aid puts Canada 19th of the 22 major donor nations of the OECD. Canada lags far behind European nations like Denmark, Norway, the Netherlands, and Sweden who meet or exceed the international target of 0.7% of GDP, meaning these countries provide double, triple, and even quadruple the level of Canadian foreign aid.¹⁰⁹

Canada's record is mixed on other important development issues including trade liberalization, debt forgiveness, tying aid to the purchase of Canadian goods and services, and supporting environmentally destructive projects such as large dams and nuclear power. Canada has taken anti-environmental positions in trade disputes, such as attacking France's ban on asbestos imports, undermining the precautionary principle, and supporting the

ill-conceived Multilateral Agreement on Investment. Major policy changes in all of these areas are required to make Canada a global leader in pursuing sustainability.

POTENTIAL POLICIES

Emphasize the transfer of locally appropriate technologies and approaches to the rest of the world, focusing on areas of Canadian expertise such as small-scale water treatment and sanitation technologies, high efficiency wood stoves, etc.

Legislate and fulfill Canada’s commitment, made at the UN Cairo Conference on population, to contribute \$200 million annually to funding reproductive health services and family planning in developing countries.

Eliminate tied aid (aid that must be used to purchase Canadian goods and services), for the world’s poorest countries.

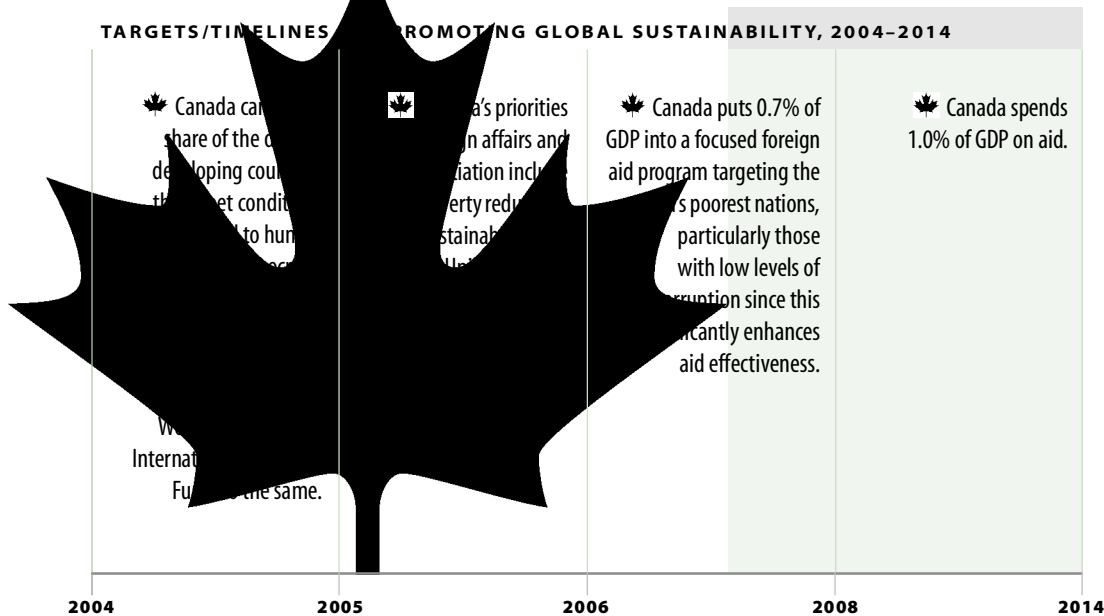
Remove all remaining trade barriers that are having a negative effect on poor countries, and support developing countries’ efforts to reduce agriculture subsidies.

Provide funding to developing countries to ensure that they are able to adequately represent their interests in international forums like the World Trade Organization.

Ensure that trade agreements such as the *Agreement on Trade-Related Aspects of Intellectual Property Rights* are amended to prioritize the needs of developing countries for public health and access to affordable medicines, specifically generic drugs, and respect the rights of indigenous peoples.

CANADIAN SUCCESS STORY

Canada has placed a moratorium on debt service payments from eleven countries that are improving governance and targeting poverty reduction.¹¹⁰



Foreign aid from Norway, Sweden, and the Netherlands already meet or exceed 0.7% of their GDP.¹¹¹ Denmark already spends more than 1.0% of its GDP.¹¹²

✳ **CANADIAN
SUCCESS STORY**

In 2003 Canada eliminated most of the tariffs and quotas affecting imports from the poorest 47 countries in the world.

Actively promote international action on population, poverty, and sustainable development through Canada's role in the U.N., the G-8, La Francophonie, and the Commonwealth.

Ensure that Canadian efforts to reduce domestic energy and resource consumption do not have unintended adverse consequences for poor nations.

Convert the mandate of the Department of National Defense so as to ensure that efforts to upgrade Canada's armed forces are re-directed toward providing the equipment required for peacekeeping, not war.

Amend the *North American Free Trade Agreement* (NAFTA) to remove Chapter 11, and similar clauses in all other trade agreements, which give corporations an unprecedented tool for suing governments, and ensure that similar provisions are not entrenched in future agreements, such as the proposed *Free Trade Agreement of the Americas* (FTAA).

Addressing the foregoing challenges will require a host of innovative policy initiatives that cut across jurisdictions and departmental mandates and provide benefits at multiple levels. Isolated, compartmentalized environmental policies and actions will not work. Significant policy shifts are required in areas such as ecological fiscal reform (e.g. tax shifting, the elimination of perverse subsidies, and increased investment in the environment), constitutional environmental rights, corporate law reform to require triple-bottom-line performance, just transition strategies for workers and communities, and recognition of aboriginal rights.

FUNDAMENTAL PRINCIPLES

All existing and future environmental laws, regulations, and policies must incorporate the precautionary principle as a key element in decision-making. This is important with respect to new and emerging technologies that propose to alter the very building blocks of life – biotechnology, nanotechnology, and reproductive technology. Caution is imperative in approaching these new technologies because their long-term impacts are unknown and likely unknowable, yet their potential impacts are profound. The next generation of environmental laws and policies must embody other fundamental principles including intergenerational equity, polluter pays, user pays, pollution prevention, ecological design, extended producer responsibility, and adaptive management.¹¹³

Another essential step is to amend the *Canadian Charter of Rights and Freedoms* to provide Canadians with a constitutional right to clean air, clean water, and a healthy environment. The *Charter* represents the highest expression of fundamental Canadian values and provides the strongest guarantee of protection available in our legal system. Unlike many countries, Canada's Constitution remains silent on this vital matter. Although amending the Constitution is complex and difficult, this is an important long-term objective, with profound and positive consequences.

ECOLOGICAL FISCAL REFORM

Ecological fiscal reform is the use of various financial incentives and disincentives to achieve ecological sustainability. These are tools that continue to allow the market to send price signals but overcome market distortions that ignore environmental costs. Three key policies that are part of ecological fiscal reform are tax shifting, eliminating perverse subsidies, and increasing investment in the environment.

A. Ecological tax shifting

The basic premise behind ecological tax shifting is that society should stop taxing activities it wants to encourage and start taxing activities it wants to discourage. Instead of taxing employment, work, and investment, taxes should gradually be redirected toward resources, pollution, and waste. Environmental tax shifting is an economically efficient and cost effective way to incorporate the ‘user pays’ and ‘polluter pays’ principles while enabling us to move towards ecological sustainability without necessarily increasing the flow of revenues to governments. Tax shifting begins to correct the market’s failure to reflect the full costs of resource depletion and pollution by using the market to send appropriate pricing signals, internalizing externalities, creating incentives to invest in new technology and efficiency, and promoting continuous improvement. For example, taxing sulphur content in fuels creates incentives to reduce the use of fuels containing sulphur and to find cleaner substitutes. According to the OECD, “if properly conceived and implemented, green tax reforms can contribute to a real structural adjustment of economies” towards sustainability.¹¹⁴ According to Parliament’s Technical Committee on Business Taxation, replacing existing income, payroll, and investment taxes with environmental taxes “can improve incentives to invest and create jobs” as well as “stimulating innovation and technological change.”¹¹⁵

Ecological tax shifting can take two forms. The first is imposing new taxes on bad environmental practices while reducing taxes on more desirable activities like employment or investment. The second involves restructuring existing taxes to reflect environmental goals. Potential new environmental taxes include carbon taxes, where energy is subject to a tax based on the amount of carbon dioxide released, and pollution taxes on the release of toxic substances. A revenue neutral tax shift would then involve a reduction in taxes elsewhere in the government portfolio. An example of restructuring existing taxes to reflect environmental goals would be changing Canada’s federal fuel excise tax, which currently favours coal and diesel fuel over cleaner energy sources.¹¹⁶ Alternatively, these revenues can be directed to improving environmental quality (e.g. to fund the clean-up of contaminated sites), or to compensating affected workers and businesses.

European nations are far ahead of Canada in implementing ecological tax shifting. For example, tax shifting is being used to address climate change through carbon taxes in Denmark, Finland, Norway, Sweden, Switzerland, the United Kingdom, and the Netherlands.¹¹⁷ As a result, Norway has reduced greenhouse gas emissions from some industrial sectors by more than 20%.¹¹⁸ Sweden stabilized its greenhouse gas emissions between 1990 and 2000.¹¹⁹ Over the period 1998–2002, Denmark gradually increased energy taxes, based on the carbon content of different energy sources. The revenue generated was used to reduce social security contributions and subsidize investment in new energy technology.¹²⁰

B. Eliminating perverse subsidies

Perverse subsidies occur when governments subsidize environmentally destructive behaviour, meaning that Canadians are penalized twice. First, Canadians pay for subsidies that may take the form of direct financial payments or tax credits. For example, both federal and provincial governments continue to subsidize the exploration and development of fossil fuels. Second, Canadians bear the direct and indirect costs of ecological damage (e.g. degradation of natural resources, environmental restoration expenses, losses suffered by other sectors, and increased health care costs).

There are literally billions of dollars of federal and provincial subsidies in Canada that are contributing to excessive resource use and environmental degradation, including:

- subsidies to the forest industry of between \$3 billion and \$8 billion annually;¹²¹
- subsidies to the mining industry of approximately \$600 million annually;¹²²
- fishing subsidies of \$553 million in 1997 and \$694 million in 1996;¹²³
- agricultural subsidies of \$5.6 billion in 2000;¹²⁴
- annual subsidies to the fossil fuel industry of \$5.9 billion;¹²⁵
- transportation subsidies (air, marine, rail, and highway) from the federal government alone ranged from \$600 million to \$2 billion annually between 1995 and 2000;¹²⁶ and
- subsidies to the nuclear industry of \$211.2 million in 2002.¹²⁷

In Europe, implementation of the ‘user pays’ and ‘polluter pays’ principles has meant significant decreases in the subsidization of some environmentally damaging activities.¹²⁸ In the U.S., an unlikely coalition of fiscal conservatives and environmentalists has successfully persuaded the U.S. government to cut \$26 billion in wasteful and environmentally destructive spending.¹²⁹

C. Increasing investment in the environment

A nation’s commitment to sustainable development is measured in a tangible way by examining the amount of money budgeted for environmental protection. Sweden spends more than 3% of its GDP on environmental protection while Canada spends under 1%.¹³⁰ In the past decade, environment budgets in Canada have been cut extensively at both the federal and provincial levels. Although in recent budgets the federal government has reversed this trend, it is ongoing at the provincial level. In contrast, Sweden has consistently increased environment budgets in recent years, and plans to increase spending on environmental protection by more than 50% by 2004.¹³¹

GOVERNMENT PROCUREMENT

Governments can spur sustainability through their own purchasing and procurement policies. Governments are one of the largest spenders in the Canadian economy. In Canada, roughly 20% of GDP involves government expenditure, and the federal government is the nation’s largest employer.¹³² Although Canada has repeatedly pledged to become a model of environmental excellence, efforts to “green” Canada’s federal government have fallen far short.¹³³ By requiring the purchase of clean, low-impact power, recycled products, efficient

vehicles, and other environmentally friendly products, as well as the construction of energy-efficient buildings, the government could help create a market that would dramatically change the profile of the goods and services produced and used in Canada toward sustainability.

CORPORATE LAW REFORM

The corporate drive for short-term profits is often identified as a major impediment to improved environmental performance.¹³⁴ Although some corporations have made great strides in becoming sustainable, the majority of corporations have not. Law reform is vital to require corporations to pursue the “triple-bottom-line” of economic, social, and environmental responsibility instead of merely maximizing financial returns to shareholders.

JUST TRANSITION FOR WORKERS AND COMMUNITIES

It is a basic tenet of fairness that if Canada as a whole will benefit from changes in the way we protect and use natural resources, the costs of those changes must be widely shared and not borne by one particular group, community, or region. Consultation with potentially impacted workers and communities should be conducted as early as possible, before irreversible decisions are made. Retraining, education, relocation, and temporary assistance must be made available with the objective of a better quality of life for all concerned.

RENEWED COMMITMENT TO GOVERNMENT’S DUTY TO USE REGULATIONS TO PROTECT THE PUBLIC INTEREST

In recent years there has been a decline in government’s willingness to enact, implement, and enforce environmental regulations, supplanted by an increased preference for voluntary approaches. For example, instead of passing laws or regulations to govern greenhouse gas emissions, reduce smog, increase motor vehicle fuel efficiency, or require energy efficient buildings, the federal government uses voluntary approaches.

A large body of studies concludes that regulations are more effective than voluntary approaches in achieving environmental goals although there are specific circumstances where voluntary policies may produce additional benefits.¹³⁵ Greenhouse gas emissions continue to rise despite the Voluntary Challenge and Registry Programme. Smog alerts are more frequent despite voluntary efforts undertaken pursuant to the 1990 joint federal-provincial management plan. Overall motor vehicle fuel efficiency is getting worse, not better, despite a voluntary agreement between Ottawa and vehicle manufacturers. Only a tiny fraction of new homes are energy efficient despite the voluntary R-2000 standard. Reductions in toxic releases, which some industries have ascribed to voluntary programs, have in fact largely been compelled by regulations.¹³⁶ As the OECD concluded in 2000, Canadian “voluntary agreements have not proved up to the task of dealing with resource and environmental challenges.”¹³⁷

RECOGNITION OF ABORIGINAL RIGHTS

Aboriginal people have a long history of respectful stewardship of the land. Recognition of the constitutional rights of aboriginal people is forcing governments to change the way some environmental and natural resource decisions are made in Canada.¹³⁸ The trend in parts of the country, particularly in the northern territories but in some provinces as well, is to implement co-management of natural resources.¹³⁹ Co-management means sharing the responsibility for decision-making between governments and aboriginal people. There are expectations that aboriginal involvement in co-management will result in more sustainable decisions, because of traditional values and knowledge about local ecosystems. In the Supreme Court of Canada's landmark *Delgamuukw* decision, the Court stated that because of the special relationship between aboriginal people and the land, there is an "inherent limit" on the kinds of activities that can take place on lands subject to aboriginal title.¹⁴⁰ The Court used strip mining in a traditional hunting area and paving of a burial site as examples of activities prohibited by the unique nature of aboriginal title. At a minimum, co-management systems present an opportunity to diversify the range of institutions involved in environmental management in Canada.¹⁴¹ It is also vital that disputes about aboriginal title and rights be properly resolved before further industrial development proceeds.



Conclusion

Three oceans, millions of lakes, vast plains, virgin forests, the Rockies, the shores of the St. Lawrence River and four well-defined seasons: these gifts from the gods form a great nation. Add to them a soul sculpted by three thousand years of Amerindian, Greco-Latin and western culture, and the result is Canada, a shining hour in the history of the world.

ANTONINE MAILLET, ACADIAN NOVELIST

In addition to the obvious environmental and health benefits of the changes proposed in this document, there are tremendous and genuine economic and social dividends to be reaped by investing in the stewardship of the genuine wealth of Canada. Investments in renewable energy and energy efficiency create more jobs than similar investments in fossil fuel energy. The United Kingdom's plan to create 6,000 megawatts of offshore wind generating capacity by 2010 will create employment for 20,000 people, while the wind industry already employs 35,000 people in Germany.¹⁴² Organic agriculture and integrated pest management are more labour-intensive than conventional agriculture but reduce other input costs for farmers. Diverting useful material from landfills and incinerators creates jobs. Increases in efficiency, lower levels of waste, and the removal of perverse subsidies will save Canadians billions of dollars annually. Improvements in air, water, and food quality will boost the health of Canadians and reduce the pressure on our health care system. By greening municipal infrastructure, from sewage treatment to public transit, thousands of jobs will be created. Communities will benefit from the new focus on generating genuine wealth, with its emphasis on human, social, economic, and natural capital.

To be successful in achieving the goals outlined in this document, Canadians must demand a renewed commitment from all levels of government and their elected officials. We can no longer accept talk when action is required or voluntary programs where standards

and enforcement are necessary. Nor can environmental priorities continue to be subservient to economic growth, debt reduction, deregulation, and trade liberalization. Leadership, not stonewalling, from the business community is needed. Non-governmental organizations and voters must continue to hold government and industry's feet to the fire. And finally, individuals have a vital stewardship role to play in making informed choices, demanding accountability, and exercising their democratic rights.

Canadians are stewards of substantial portions of the world's fresh water, oceans, wetlands, forests, wildlife, and wilderness. Canadians are also one of the wealthiest, healthiest, and best-educated peoples in the history of human society. These facts impose an obligation on Canada to improve its environmental record.

The overall thrust of the vision embodied in this paper is to ensure that Canadians' quality of life improves in the years and decades ahead. Major changes are required to fulfill the vision of achieving sustainability and generating genuine wealth. These changes will require Canadians to summon unprecedented ingenuity, wisdom, and compassion, yet our track record of innovation and success on issues like protecting the Earth's ozone layer and banning land mines inspires confidence that we can achieve our goal of a prosperous, sustainable future.

Appendix 1. Canada's environmental ranking vs. other OECD nations

ENVIRONMENTAL INDICATOR	CANADA'S OECD RANKING	
	PER CAPITA	TOTAL
AIR POLLUTION		
Sulphur Oxides (kilograms)	27th out of 28	27th out of 28
Nitrogen Oxides (kilograms)	25th out of 28	25th out of 28
Volatile Organic Compounds (kilograms)	25th out of 26	25th out of 26
Carbon Monoxide (kilograms)	26th out of 27	25th out of 27
CLIMATE CHANGE		
Greenhouse Gas Emissions (tonnes of CO ₂)	27th out of 29	25th out of 29
OZONE DEPLETION		
Consumption of Ozone-depleting Substances (kilograms)	13th out of 16	13th out of 16
WATER		
Water Consumption (cubic metres)	28th out of 29	26th out of 29
Municipal Sewage Treatment (% of population served)	N/A	9th out of 28
ENERGY USE		
Energy Consumption (tonnes of oil equivalent)	27th out of 29	26th out of 29
Energy Efficiency (tonnes of oil equivalent /\$1000 U.S. GDP)	N/A	28th out of 29
WASTE		
Municipal Waste (kilograms)	18th out of 29	18th out of 29
Recycling (% of glass and paper recycled)	N/A	23rd out of 27
Hazardous Waste (kilograms)	24th out of 27	23rd out of 27
Nuclear Waste (kilograms)	28th out of 28	27th out of 28
AGRICULTURE		
Pesticide Use (tonnes of active ingredients)	22nd out of 28	18th out of 28
Fertilizer Use (tonnes)	25th out of 28	25th out of 28
Livestock (number of cattle, sheep, goats and pigs)	16th out of 28	17th out of 28
BIODIVERSITY		
Species at Risk (number of species designated as at risk)	N/A	7th out of 29
Protected Areas (% of land designated as protected)	N/A	13th out of 29
Fisheries (volume caught, kilograms)	20th out of 28	20th out of 28
Forests (volume of forest logged, in cubic metres)	27th out of 29	28th out of 29
TRANSPORTATION		
Road Vehicles (number of road vehicles)	25th out of 29	22nd out of 29
Distance Traveled (road distance traveled)	26th out of 29	24th out of 29
MISCELLANEOUS		
Population (% growth/ total population)	26th out of 29	18th out of 29
Official Development Assistance (% of GDP)	N/A	11th out of 20

NOTE: Higher ranking (e.g. 1st) for better performance, lower rankings (e.g. 28th) for worse performance.

SOURCE: David R. Boyd. 2001. Canada vs. The OECD: An Environmental Comparison. Victoria: Eco-Research Chair in Environmental Law and Policy. Available at www.environmentalindicators.com

Appendix 2. The Principles of Ecological Sustainability¹⁴³

The principles of sustainability warrant further attention because they represent the basis for rethinking Canadian environmental laws, policies, and institutions.

1. Nature cannot withstand a systematic buildup of materials extracted from the Earth's crust. As part of nature's cycles, substances flow from the Earth's crust to the ecosphere (the layer of earth, water, and sky where life occurs) through processes like erosion and volcanic eruptions. These substances are eventually reabsorbed into the Earth's crust through other processes, such as sedimentation. The first limit imposed by the finite nature of the Earth is that the natural flows of a given substance (e.g. carbon from decaying organic matter, forest fires, etc.) plus human-generated flows (e.g. carbon released from burning fossil fuels) must not exceed the planet's ability to assimilate that substance.

Human activity can add to the natural flow of a substance so that total emissions exceed nature's absorption rates and, as a result, the substance begins to accumulate. The ensuing disruption of natural cycles has environmental consequences. For example, increasing levels of carbon dioxide in the atmosphere due to the burning of fossil fuels disrupt the carbon cycle, contributing to climate change. Increasing levels of sulphur in the atmosphere from industrial activities contribute to acid rain. Increasing levels of heavy metals (e.g. lead, mercury, and cadmium) contaminate soil, poison wildlife, and threaten human health.

Fulfilling the first condition of ecological sustainability will require Canada to reduce our dependence on fossil fuels, replace non-renewable resources with renewable resources, substitute abundant minerals for scarce minerals, and use all mined materials as efficiently as possible.

2. Nature cannot withstand a systematic buildup of anthropogenic substances.

Through advanced technology, humans are creating thousands of substances previously unknown on Earth. There are more than 110,000 chemicals in use globally and approximately 1,000 new chemicals are added annually. Nature has not evolved the capacity to assimilate many of these substances. Therefore, scientists conclude, the second natural limit is that society must not emit these substances at a rate that is faster than they are degraded into substances that can be incorporated into natural cycles.¹⁴⁴

Of particular concern are human-made substances that are persistent, bioaccumulative, or toxic at very low levels of exposure, such as chlorofluorocarbons (CFCs), polychlorinated biphenyls (PCBs), dichlorodiphenyltrichloroethane (DDT), other pesticides, and endocrine-disrupting chemicals. These human-made chemicals also pose challenges because of the complexity of their interactions with each other and the potentially long period of time between the release of these substances into the environment and scientific recognition of their negative health and environmental impacts. CFCs, PCBs, DDT, and many pesticides were thought to be safe for decades before scientists identified their harmful impacts and persistence. Human-made chemicals that do not break down in nature or that degrade over long periods of time should be used with extreme caution, if at all. Fulfilling the second condition of ecological sustainability will require substituting abundant, natural, and biodegradable substances for persistent, unnatural substances, and using all substances produced by society as efficiently as possible.

3. Nature cannot withstand a systematic deterioration of its diversity, productivity or its capacity for renewal.

The third natural limit addresses the harvesting and manipulation of ecosystems. Harvesting includes activities like fishing, logging, hunting, and groundwater extraction. Manipulation includes displacing natural ecosystems (e.g. by building cities or roads); reshaping the structures of nature (e.g. by damming a river or replacing an old growth forest with a plantation); and modifying natural processes (e.g. by breeding or genetic engineering).

Society depends upon the natural world for invaluable, irreplaceable goods and services including food, raw materials, energy, medicines, pest control, pollination, soil formation, waste disposal, climate regulation, flood prevention, and nutrient recycling, as well as cultural inspiration.¹⁴⁵ In order to avoid impairing these vital ecosystem functions, the rate at which renewable resources are consumed must not exceed their rate of regeneration. Care must be taken to avoid reducing natural productivity, diversity, or resilience by manipulating ecosystems. Examples of such reductions include soil erosion, deforestation, the loss of species or genetic diversity to extinction, destruction of fresh water supplies, and the use of productive land for cities, roads, or landfill sites. Fulfilling the third condition of ecological sustainability will require using land, water, and all natural resources as efficiently as possible, and minimizing the modification of natural ecosystems.

4. Basic human needs must be met worldwide

The social, economic, and environmental challenges facing the developing world are daunting. For example:

- one billion people lack access to clean water;
- 2.4 billion lack access to basic sanitation;
- 1.2 billion live on \$1 per day;
- 2.8 billion live on \$2 per day; and
- 30,000 children under five die *daily* from preventable causes.¹⁴⁶

The world's population surpassed 6.1 billion in the year 2000 and is expected to reach 9 billion people by 2050. Almost all population growth in the next 50 years will take place in the developing world. From an environmental perspective, continued population growth will increase pressure on biodiversity, fisheries, forests, agricultural lands, and water. While the human population has tripled in the past 70 years, water use has increased six-fold.¹⁴⁷ As of the year 2000, 500 million people lived in water-stressed or water-scarce countries. By the year 2025, if current trends continue, 3 billion people will live in water-stressed or water-scarce countries.

In 2000, the global community established the Millennium Development Goals, setting ambitious, measurable objectives for improving the state of the world by the year 2015. The Millennium Development Goals include:

- attaining universal primary education;
- halving world poverty;
- halving world hunger;
- reducing child mortality by two-thirds;
- reducing maternal mortality by three-quarters;
- halting and beginning to reverse the spread of HIV/AIDS and malaria;
- eliminating the gender disparity in primary and secondary education; and
- halving the proportion of people without access to safe drinking water.¹⁴⁸

The World Bank estimates that meeting the Millennium Development Goals will cost between \$40 billion and \$60 billion annually.¹⁴⁹ The development and relief organization Oxfam estimates that the cost may be as high as \$100 billion annually.¹⁵⁰

Appendix 3. An Overview of Ecosystem Based Management

Parks and protected areas form the foundation of an ecosystem-approach to the conservation of biodiversity. However, in themselves, most parks are too small, isolated, or impacted by industrial activities in the surrounding landscape to maintain abundant and natural distributions of wildlife in the long-term. This is especially true for wide-ranging species such as migratory animals (e.g. salmon) or large carnivores (e.g. grizzly bear), which require large areas of land or water as habitat. The conservation of such wildlife as a cornerstone of ecosystem based management (EBM) is critical due to their role as “keystone species” in the maintenance of ecological integrity (e.g. nutrient cycling or food web dynamics).¹⁵¹

However, we may never have enough area in protection to meet the needs of such species and for this reason a comprehensive system of protected areas needs to be complemented by the sustainable utilization of the surrounding landscape in which industrial practices present a low-risk of endangerment to biodiversity (e.g. Forest Stewardship Council certification standards for forestry). Land-use decisions upon how much area in a region should be protected or where it is ecologically acceptable for resource extraction to occur need to be founded on a set of explicit conservation goals. These over-arching goals include: “(1) representing all kinds of ecosystems, across their natural range of variation, in protected areas; (2) maintaining viable populations of all native species in natural patterns of abundance and distribution; (3) sustaining ecological and evolutionary processes within their natural ranges of variability; and (4) building a conservation network that is adaptable to environmental change.”¹⁵²

In attempting to meet these goals through the twin strategies of formal protection and low-risk EBM, the most common question is “how much is enough?” There is scientific consensus that this question cannot be answered with the application of arbitrary targets such as the Brundtland Commission’s 12% recommendation for regional protection, which although popular with government is not scientifically justifiable. Rather, the total area requiring protection should be established empirically as an output of science-based conservation planning.¹⁵³

Although many different methods have been used to identify areas for protection and more recently, application of low risk EBM, most are based on a three-track approach to conservation planning, that includes: (1) protection of special elements, such as old growth forests and critical watersheds; (2) representation of all habitats within a network of well-connected and buffered reserves and (3) the provision of viable habitat for focal species, particularly those that are dependent on core intact areas or are sensitive to human disturbance. In regions where such an approach has been used, between 25 and 75% of the total region has been recommended for formal protection with ecosystem-based resource management in the remaining landscape.¹⁵⁴

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