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Natural Resources Canada

Sustainable Development Strategy

Safeguarding our Assets

Securing our Future



Natural Resources Canada
Ressources naturelles Canada
Canada

Sustainable Development Strategy

Safeguarding our Assets

Securing our Future

Ensuring the Sustainable Development of Canada's Natural Resources



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Message from the Minister



Natural Resources Canada (NRCan) is proud to be the first federal department to have sustainable development defined in its legislation and written into its mandate. With this new Sustainable Development Strategy, NRCan is determined to continue to seek practical ways to promote the sustainable development of Canada's natural resources.

Public consultations conducted during the development of this strategy revealed that Canadians of all ages and from all walks of life, representing a diversity of values and viewpoints, increasingly recognize our collective responsibilities and the enormous possibilities that sustainable development presents.

There is a growing conviction among Canadians that we must integrate environmental thinking into all aspects of development decisions in order to diminish adverse environmental impacts of resource development and use, and to ensure Canada's natural resources can continue to provide economic and social benefits to present and future generations.

There are no quick or easy answers to this complex challenge. However, there is a growing need to work together to ensure ongoing economic growth and more equitable distribution of its benefits, the protection of human health and the conservation of our natural heritage.

In the next century, Canada must become the world's "smartest" resource developer: the most high tech; the most environmentally friendly, the most productive. Innovation will be required if we are to be global leaders in introducing green technologies, adopting alternative and renewable resources, creating environmentally-sound and value-added industries, and increasing productivity to improve our international competitiveness while respecting our global environmental obligations.

Canadians clearly want a strong economy that includes resource development as long as that development respects the land and the people. We have a collective duty to strike the right balance in managing, wisely using and protecting Canada's natural resources.

We have both the opportunity and responsibility to make the right choices that will benefit Canadians for generations to come. NRCan is committed to ongoing public consultations, and to greater coordination of sustainable development policies and practices among governments, to achieve those goals. I am confident that, with all stakeholders working together, we will find lasting solutions.

"Sustainable development means integrating social, economic, and environmental goals. It is a matter of sharing ecological resources fairly within society and between generations. It is also a matter of using natural, human, and economic resources responsibly and efficiently."

Securing our Future Together, 1997



Ralph Goodale

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Executive Summary

Natural resources epitomize the very essence of sustainable development. Few sectors have more direct impact on the natural environment. Yet few are more integral to the economic and social well-being of every region in Canada.

Sustainable development – the integration of environmental, economic and social considerations – necessarily means reconciling sometimes competing interests when deciding whether and how development should proceed. It requires that we factor in social concerns such as health, equity and community sustainability when making environmental and economic decisions.

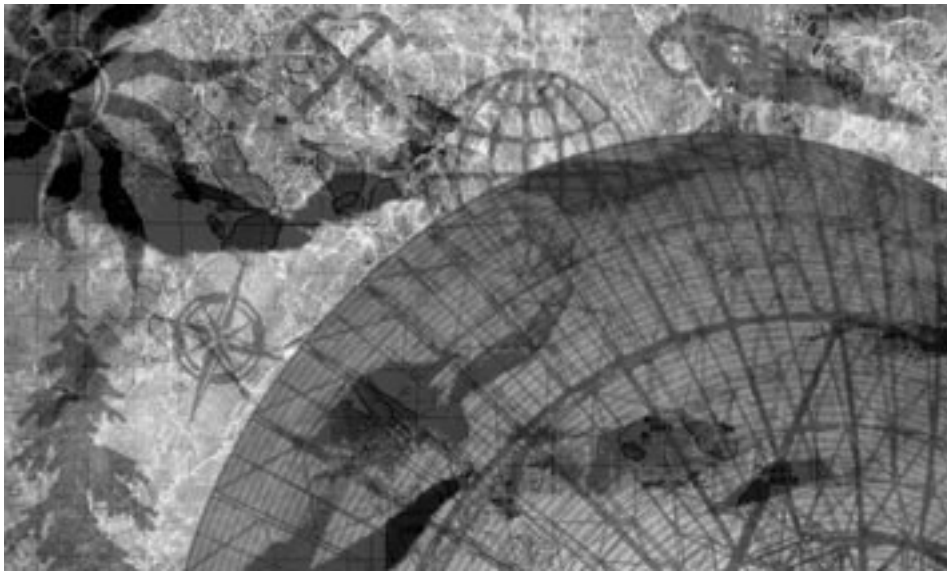
In a country as resource dependent as Canada, this is a major challenge. Resource development is crucial to the Canadian economy, generating $95 billion or nearly 14 per cent of Gross Domestic Product and 38 per cent of this country's exports. The energy, mining and forestry sectors employ 0.75 million people across the country. Natural resources provide the essential raw materials for products used by all segments of society, from the lumber to build our houses and metals to manufacture machinery, to the oil and natural gas to heat our schools and offices.

Canada's natural resources are equally important environmental assets. They are essential to the air we breathe, the water we drink and the food we eat. Ecosystem health is pivotal to the life support systems of the planet.

Canada accounts for almost 10 per cent of the world's fresh water, 10 per cent of its forests and an estimated 300,000 species of wildlife. Our wilderness lands provide recreational areas for all Canadians and international visitors.

The issue confronting Canadians is how to continue to develop our resources for the benefit of both present and future generations. Natural Resources Canada (NRCan) sees sustainable development as the key to protecting the health of the natural environment and landmass, while efficiently meeting human needs for energy, forest and mineral-based products, and providing similar opportunities for future generations.

The federal role in natural resources complements the work of the provinces, which own and control much of Canada's land and resources. NRCan is mandated to promote sustainable development in all areas of its jurisdiction including: international and interprovincial trade; science and technology; federal regulatory duties; Aboriginal issues; federal Crown lands and offshore; environment; national statistics; and, public health and safety in areas including nuclear energy, explosives and natural hazards.





Satellite dishes collect data from satellites such as RADARSAT. Such remote-sensing information can be crucial informed decision making on resource exploration and management, land use planning and environmental protection.

The Department has shifted away from financing resource megaprojects to funding research and facilitating partnerships that result in action on sustainable development. Its role is to advance scientific knowledge, develop and transfer technology, and formulate policies that foster sustainable development. NRCan promotes the research, development and use of clean and energy-efficient technologies, renewable energy, the sustainable management of mineral, energy and forest resources, and the protection of biological diversity. The Department is also building a national knowledge infrastructure on Canada's land and resources that will provide Canadians with ready access to economic, environmental and scientific information from a wide variety of national and international sources.

Following consultations with other federal government departments, provincial governments, utilities, industry and environmental organizations, NRCan has prepared this Sustainable Development Strategy to guide departmental activities over the coming three years.

This document provides:

- a summary of the key issues surrounding the sustainable development of natural resources;
- a framework of goals and objectives; and,
- an action plan for the next three years.

The paper provides a view of sustainable development which recognizes Canada will continue to use and develop its resources, in a way that protects the health of the natural environment and landmass, and ensures a legacy for future generations.

NRCan endorses a series of principles to guide its work, including a commitment to: integrate social, economic and environmental considerations into its decisions; rely on sound science as the basis for decision-making; protect the health of the environment by maximizing the efficient use of resources and reducing adverse impacts on the environment; and, consult with Canadians and work in productive partnerships to achieve sustainable development.

This strategy identifies four key areas where NRCan will focus its activities:

Making Better Decisions – Enabling Canadians to make balanced decisions regarding natural resources by: creating easily accessible and integrated knowledge on the state and use of Canada's landmass and natural resources, and the economic, environmental, and social dimensions of their use; promoting greater national and international cooperation and consensus on sustainable development issues and actions; and, developing and promoting the fiscal, regulatory and voluntary approaches that encourage the sustainable development of natural resources.

Enhancing Long-term Social and Economic Benefits – Sustaining the economic and social benefits from natural resources for present and future generations by creating economic opportunities and encouraging investment in innovative and higher-value uses of natural resources; maintaining and expanding access to international markets for Canadian resource-based products, knowledge, technologies and services; and, building the capacity of Aboriginal, rural and northern communities to generate sustainable economic activity based on natural resources.

Maintaining a Healthy and Safe Environment – Minimizing the impacts of natural resource development and use on the environment and the safety of Canadians by: helping them limit and adapt to climate change; promoting technologies and stewardship practices that reduce environmental impacts, conserve biodiversity and increase the efficiency of resource development and use; and, safeguarding Canadians from natural hazards and the risks associated with natural resource development and use.

Putting our House in Order – Establishing NRCan as a leader in the federal government in managing its operations in line with the principles of sustainable development by using leading-edge environmental management tools and practices for NRCan operations; reducing wastes from NRCan operations; increasing the efficiency of energy and other resource use within NRCan operations; and, promoting the use of goods and services that are eco-efficient.

Sustainable development is a work in progress. Priorities will need to be constantly updated and adapted to reflect new knowledge, technology, information and ideas.

No single party can take on the sustainable development challenge alone. This strategy will only succeed with the active participation and support of all Canadians. Each of us must assume some of the responsibility for making sustainable development a part of our daily practice.

Ultimately, sustainable development will result from our individual and collective efforts to find solutions to resource development challenges that are good for the environment, good for the economy and good for our communities.



Multi-sort and battery recycling depots are used in NRCan facilities to reduce the amount of waste being sent to landfill sites.

NRCan Sustainable Develo

Setting the Stage

Issues

- Maintaining a healthy environment
- Creating jobs and building stable communities
- Balancing demands for land use
- Changing consumption
- Meeting our global responsibilities
- Understanding and mitigating climate change
- Conserving biodiversity
- Assuring a role for Aboriginal people
- Leaving a legacy for the future
- Public participation in decisions

What is Sustainable Development

The sustainable development of natural resources enables us to protect the health of the natural environment and landmass, while efficiently meeting human needs for energy-, forest- and mineral-based products and providing similar opportunities for future generations.

The sustainable development of natural resources requires that Canada:

- Maintain up-to-date knowledge as the basis for responsible decision making;
- Locate and harvest or extract resources in a way that maintains the integrity of natural ecosystems and protects soil, water, air and wildlife;
- Produce, use, recycle and dispose of natural resource products throughout their life cycle, in the most efficient manner possible, minimizing adverse human-caused impacts on the environment;
- Maintain innovative, globally competitive and ecologically responsible resource-based industries;
- Respect the needs, values and property rights of diverse users of the land and resources;
- Involve local communities in making decisions that affect their quality of life and long-term viability; and
- Safeguard the well-being of Canadians in developing and using natural resources.

NRCan's Role

NRCan will provide leading-edge science, knowledge and expertise to position Canada as a world leader in the sustainable development of its land, energy, forest and mineral resources, and a quality producer of resource-related products, technologies, services and research.

NRCan provides service to Canadians in four principal areas:

- Science and technology;
- Federal policies and regulations;
- Knowledge infrastructure; and
- Doing business in a global market.

Principles

- Partnership and consultation
- Integrated decision-making (socio-economic and environmental)
- Decisions based on sound science
- Ecosystem integrity
- Efficient use of resources
- Continuous improvement and innovation
- Accountability
- Equity

pment Strategy – Summary

A Framework for Action

Goals	Objectives	Action Highlights
1 Enabling Canadians to make balanced decisions regarding natural resources.	1.1 Creating easily accessible and integrated knowledge on the state of Canada's landmass and natural resources, and the economic, environmental, and social dimensions of their use. 1.2 Promoting greater national and international cooperation and consensus on sustainable development issues and actions. 1.3 Developing and promoting fiscal, regulatory and voluntary approaches that encourage the sustainable development of natural resources.	• National dialogue on natural resources • Knowledge Initiative • Canadian Geospatial Data Infrastructure • Criteria and indicators • Renew National Forest Strategy • Baseline study (taxes, grants and subsidies) • Regulatory reform and innovation • UN Intergovernmental Forum on Forests
2 Sustaining the economic and social benefits from natural resources for present and future generations.	2.1 Creating economic opportunities and encouraging investment in innovative and higher-value uses of natural resources. 2.2 Maintaining and expanding access to international markets for Canadian resource-based products, knowledge, technologies and services. 2.3 Building the capacity of Aboriginal, rural and northern communities to generate sustainable economic activity based on natural resources.	• S&T for value added • International trade missions • Competitiveness of frontier areas • Safe use of minerals internationally • Legal surveys for land claims • First Nation Forestry Program • Renewable energy for remote communities • Northern geoscience
3 Minimizing the impacts of natural resource development and use on the environment and the safety of Canadians.	3.1 Helping limit and adapt to climate change. 3.2 Promoting technologies and stewardship practices that reduce environmental impacts, conserve biodiversity and increase the efficiency of resource development and use. 3.3 Safeguarding Canadians from natural hazards and the risks associated with natural resource development and use.	• Update Canada's National Action Program on Climate Change • Launch a new renewable energy program • S&T to reduce greenhouse gases and understand climate change • Implement Phase 2 of Model Forests • Modernize regulations governing nuclear industry • Metals and Environment Research Program • Atlas of geological hazards
4 Establishing NRCan as a leader in the federal government in managing its operations in line with the principles of sustainable development.	4.1 Using leading-edge environmental management tools and practices for NRCan operations. 4.2 Reducing wastes from NRCan operations. 4.3 Increasing the efficiency of energy and other resource use in NRCan operations. 4.4 Promoting the use of goods and services that are eco-efficient.	• Upgrade Environmental Management System to international standards (ISO 14000 series) • Reduce energy and water consumption • Reduce and convert automobile fleet • Safely dispose of remaining PCBs • Purchase green power

x

Sustainable Development and Natural Resources

Making Better Decisions

The World Commission on Environment and Development (the Brundtland Commission) in its 1987 report, "Our Common Future", described sustainable development as:

"Development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

Canadians are coming to understand that the national environmental agenda can no longer be separated from the national economic agenda. Sustainable development, therefore, demands that we integrate social, economic and environmental considerations into decision-making in a way that enhances productivity and prosperity without compromising the integrity of the environment.

Sustainable development provides a framework for managing economic development and human growth while maintaining the life support systems of the planet. None of these objectives can be achieved in isolation. Canadians' health and economic prospects depend on the health of the environment. At the same time, human development and social needs must be met; the elimination of poverty and development of sound economies strengthen our ability to protect the environment.

The Department of Natural Resources Act, which came into force in January 1995, established sustainable development as a responsibility of the department. The challenge is to make that legislated requirement a reality – moving from concept to action, identifying and developing practical methods to implement sustainable development.

This section examines some of the key concepts and issues related to applying sustainable development to natural resources.

Natural Resources and Sustainable Development

Canada's minerals and metals, energy resources, forests and landmass epitomize the sustainable development challenge. They provide important economic, environmental and social benefits to all Canadians (Table 1).

Today, 38 per cent of our exports and the livelihood of 0.75 million Canadians and 500 communities, from coast to coast to coast, depend on our energy, mineral and forest resources. Yet, Canada's natural resources are equally important environmental assets. Canada's landmass harbours almost 10 per cent of the world's fresh water, 10 per cent of the world's forests and an estimated 300,000 species of wildlife. Canadians have a strong attachment to the lakes, forests, mountains, oceans and open spaces that form our physical and psychological landscape. How we manage these resources today will determine our quality of life, both now and in the future.

Table 1

Sustainable Development Benefits from Canada's Natural Resources

Social

- 0.75 million jobs
- Livelihood for over 500 communities coast to coast
- 30 million visits annually to national and provincial parks
- Aboriginal cultural and spiritual ties to the land
- Safe, dependable and affordable supply of energy, forest and mineral products
- 19 million Canadians involved in wildlife activities

Economic

- 38 per cent of all Canadian exports ($97 billion)
- 22 per cent of all capital investment ($29 billion)
- $95 billion contribution to Canada's economy (14 per cent)
- Canada is the world's:
  - largest exporter of forest products
  - largest exporter of minerals
- Backdrop for Canada's $26 billion tourism industry and $9 billion spent on wildlife activities

Environmental

- 10 per cent of world's forests
- Estimated 300,000 species of wildlife
- Almost 10 per cent of world's fresh water
- 12 per cent of the world's protected area
- Estimated 20 per cent of the world's remaining wilderness areas
- The world's largest coastline at 250,000 kilometers

*** Source: NRCan, Based on 1996 figures, wildlife figures from 1991**

SD VIGNETTE

The Economics of Sustainable Development

Increasingly, we realize there is an intimate connection between the economics of development and the environment. This is based on a recognition that markets (consumers and producers) are key to deciding which resources are developed and used.

Markets, and therefore consumer demands for goods and services, provide signals that encourage producers to do more exploration or less, to utilize environmentally friendly materials, to use recycled over new materials, or to invest in technologies and produce products that use resources more efficiently. Markets also provide signals, such as a change in price, that encourage consumers to buy one good over another. Thus, markets generally provide the most efficient means of allocating resources among different uses.

Consequently, the economics of sustainability are critically important. Ultimately, excessive environmental damage can usually be traced to inappropriate policies affecting markets, or problems in the way markets operate.

Markets may not encourage sustainable development for a number of reasons. Traditionally, many environmental goods such as air, nutrient cycling or climate regulation, have fallen outside the consideration of markets. Unowned, unaccounted for and effectively priced at zero, the "external costs" of these goods are not reflected in the prices paid for products that use them.

For example, each of us who drives a car is allowed to emit exhaust, free of charge, into the atmosphere. The cost of that practice is borne by others in the form of lost income or higher medical bills from poor health caused by smog, the costs of adapting to changes in our climate (e.g. floods, droughts, etc.) due to the accumulation of greenhouse gases, or the increased costs of maintenance on our homes due to pollution. If the price we pay for transportation reflected its environmental costs (for example, an additional licence fee equivalent to the full cost of emitting exhaust into the atmosphere), we would have a financial incentive to choose less polluting modes of transportation and, perhaps, to use personal vehicles less often.

Sustainable development promotes a shift in economics, toward the internalization of these "external" costs rather than transferring them to others or to future generations. Environmental costs are internalized when they are borne by those who generate them rather than by bystanders, society at large or future generations. Achieving this objective is easier said than done; the techniques required to assess the costs and benefits of many environmental goods, and the means to factor them into market decisions, are still evolving.

Markets may also fall short of supporting sustainable development goals when they do not encourage sufficient investments in science and technology, do not incorporate long-terms costs and benefits that are absorbed by future generations, or do not fully incorporate other social and economic benefits.

Thus, sustainability will not be achieved by a complete reliance on markets. Government can play a role by designing policies that try to correct for these market failures.

However, such intervention must be exercised cautiously. Governments, often for other good reasons, can introduce policies that act as disincentives to sound environmental practice. For example, subsidizing the price of certain goods will result in people consuming more than they otherwise would if they were paying the full cost.

Governments must also provide an appropriate climate and infrastructure to encourage sustainable development. For instance, without a system of legally enforceable property rights, resources will be subject to free and open access – with no management – resulting in over consumption and degradation of the resource.

The most cost-effective method to correct for these market failures is to identify and remove barriers to the efficient operation of markets, establish secure property rights over resources, internalize the costs of external side effects through pricing and fiscal instruments, and encourage competition and the free flow of information.

These actions will lead to better decisions that integrate economic and environmental concerns.

Renewable and non-renewable resources

The concept of sustainable development is perhaps more easily understood in the case of renewable resources such as forests, fisheries or some forms of energy such as wind, solar and hydro. Development of a renewable resource is sustainable if it remains within the capacity of the resource to renew itself and maintains the overall health of the ecosystem on which the resource depends.

In the case of forests, this has traditionally meant harvesting timber at a level that does not exceed the annual growth of the forest, taking into account losses from natural causes such as fires, insects and disease (Figure 1).

In this way, the "interest" is harvested while leaving the natural "capital" intact. However, sustainable development is far more complex. It requires that we manage forests to sustain a broad range of different values and products that forests provide. These include not only timber, but ensuring viable habitat for wildlife, protecting the quality of soil and water, maintaining the ecological functions of forest ecosystems, and providing for other uses of the forest such as parks, recreation and wilderness.

This notion of harvesting only the growth without depleting the capital is more difficult to apply in the case of non-renewable resources such as minerals, oil, gas and coal. Concerns are often expressed about the rate of consumption of non-renewable resources and their long-term availability for future generations. Applying the concept of sustainable development takes on different dimensions when dealing with non-renewable resources.

In the case of energy, sustainable development does not necessarily imply the preservation of one particular form of energy or another. Figure 2 shows how Canada's energy supply has changed over time, moving from a reliance on wood, to coal, to today's reliance on oil and gas, hydro electricity, nuclear power and other sources. The challenge of sustainable development is not to provide

Figure 1

Allowable Annual Cut and Actual Harvest of Canada's Forests

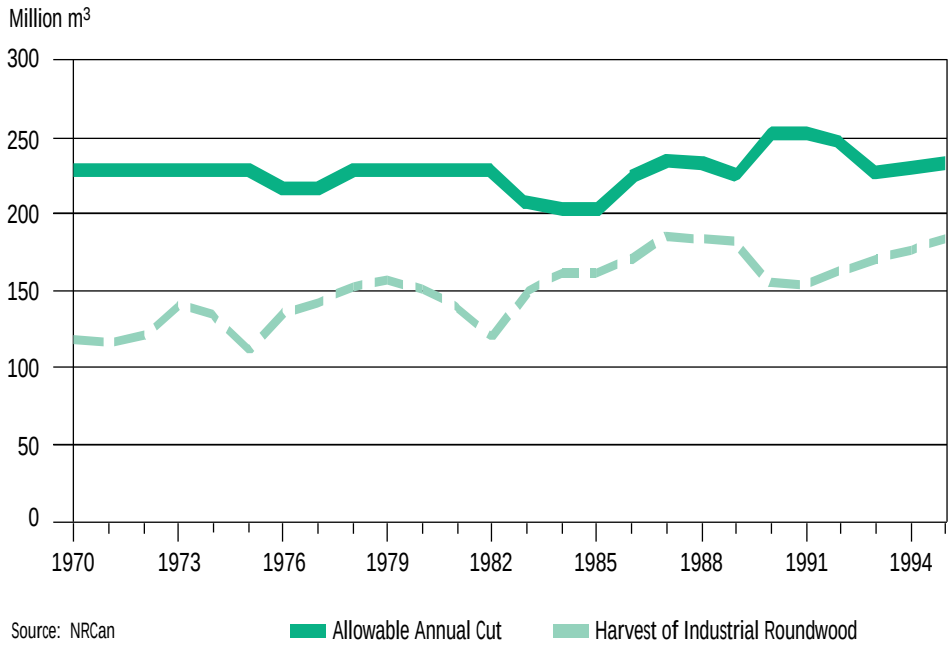
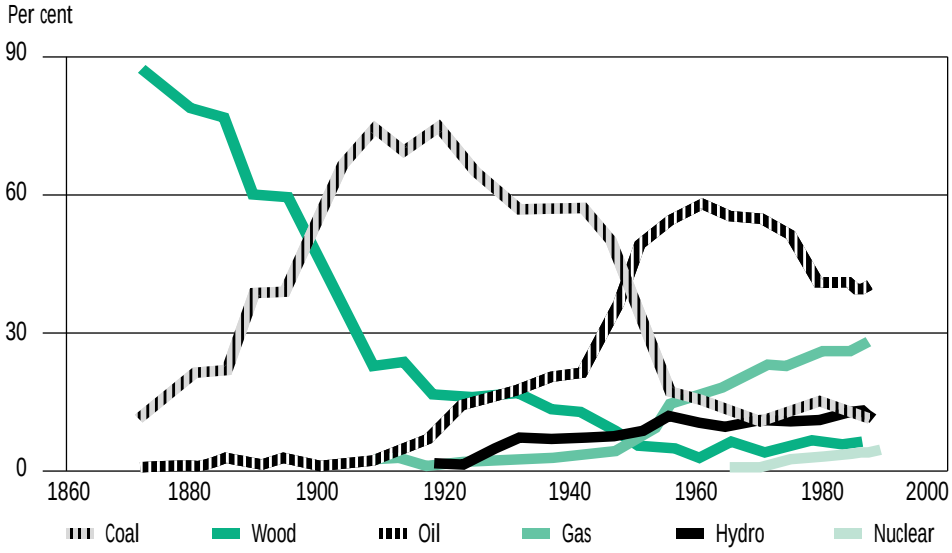


Figure 2

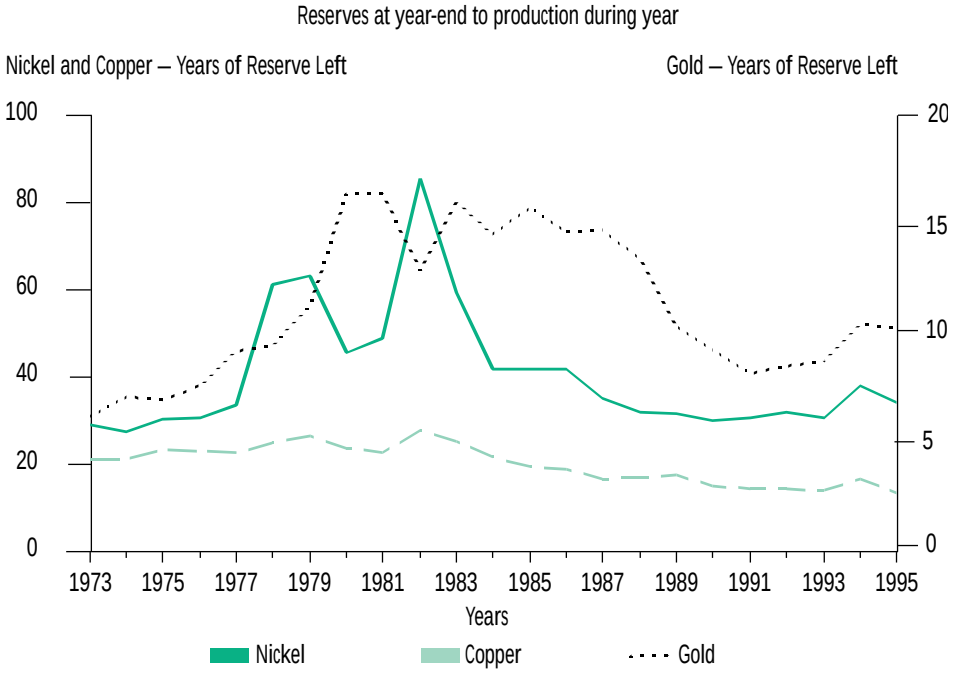
Primary Energy by Source, Canada (% of Energy Consumption) 1871–1992



Source: *Energy Policy*, Vol. 6, No. 3, "Energy Consumption in Canada Since Confederation", E.R. Stewart.
Energy Statistics Handbook, Natural Resources Canada.

Figure 3

Canadian Gold, Nickel and Copper Reserves to Production Ratio



future generations with ample reserves of any one form of energy, but with a secure, safe, efficient and increasingly environmentally clean mix of energy options.

Similarly, the concern is often expressed that the world may use up its remaining reserves of precious mineral resources such as copper, zinc or nickel. However, known mineral reserves are only a fraction of the earth's mineral inventory. The quantity of known reserves at any given time is a function of both the demand and price for a given mineral, as well as the costs and technology associated with its extraction and processing (Figure 3). In addition, the development of alternative materials can reduce the future value and demand for certain minerals. Increasingly many minerals and metals, such as nickel and copper, are being recycled and reused, thereby reducing the need for new extraction. These recycled minerals and metals, along with known and undiscovered mineral deposits, form the natural capital we pass onto future generations.

Sustainable development does not imply preserving existing resources for the future, nor does it imply that the planet's resources are limitless, to be used at ever increasing rates. All resource extraction and use has an impact on the environment. Sustainable development requires that we limit resource development to a level that remains within the capacity of natural ecosystems, reduce the environmental impacts of resource development and use, continually develop cleaner and more environmentally efficient alternatives, recycle and re-use resources to reduce the need for new extraction, and reduce our consumption of products that deplete the planet's environment and resources.

Sustainable development challenges come to life

These concepts of sustainable development present a very real challenge for Canadians. We rely on resources for a high standard of living and quality of life but, at the same time, want to ensure that they are used efficiently and that our natural environment is protected. Sustainable development does not come down to a simple either/or equation. It does, however, demand a greater scientific understanding of our environment.

There are few "easy" answers. Some recent high-profile examples across Canada illustrate the complex decisions we face. These situations are not readily resolved and often result in considerable public debate, or, in some cases, protests and legal challenges.

The massive nickel, copper and cobalt deposit discovered at **Voisey's Bay, Newfoundland** characterizes the challenge facing a community when confronted with balancing the need for job creation, economic growth, wildlife protection and traditional lifestyle preservation. One of the largest known nickel reserves in the world, the $4.3 billion Inco mine site at Voisey's Bay has the potential to increase the province's personal income levels by 3 per cent and its GDP by 11 per cent. The mine and refinery will create 3,700 jobs during construction and could provide an eventual 2,000 jobs during operation, thereby reducing unemployment by 2-3 per cent in a province with chronic high unemployment. A further $2 billion may be spent before the proposed mine/mill and smelter/refinery projects are fully operational, creating spin-off economic opportunities throughout the province.

On the other side of the equation are the social and environmental considerations related to the mine's development. Seven Aboriginal communities in Labrador want to conclude land claims and other agreements prior to the development proceeding. These negotiations address questions such as future land and surface rights, economic benefits and environmental safeguards. There are fears that acid drainage from mine tailings may destroy several local lakes and some fisheries habitat. Concerns have also been raised that caribou herds which range throughout Labrador and Quebec will be adversely affected by the mine's development. At the time of writing, an environmental assessment was underway to address these potential problems.

The decision on logging in **Clayoquot Sound in British Columbia** presents another illustration of the varied interests involved in sustainable development. The 260,000 hectare region harbours the largest intact watershed on Vancouver Island. It contains 29 rare plant species and areas of old-growth temperate rain forest, with trees up to 1,000 years old, that are important habitat for wildlife and a mainstay for forestry and tourism – both important contributors to the local economy. The area has a long history of residence, cultural and resource use by First Nations. The provincial government has opted to protect 34 per cent of the area and to implement more restricted logging on the remaining lands, based on the advice of an international scientific panel. The panel included Nuu-Chah-Nulth elders and experts in their traditional knowledge. Forestry companies in the region will try alternative logging practices, which will increase their costs but better protect aesthetic, tourism and environmental values. The implementation team's plan is to involve the Nuu-Chah-Nulth elders in forest management activities. To satisfy all parties, the compromises arrived at must be economically and environmentally viable, and socially acceptable.



Aerial photo of the rust coloured outcrop that led to the discovery of the Voisey's Bay nickel deposit.

Canada's nuclear industry represents another example of the complexity of sustainable development. Nuclear energy offers some significant economic and environmental benefits. For example, nuclear power does not produce carbon dioxide (CO_2), which contributes to global warming, or other air pollutants. Since 1971, nuclear power in Canada has avoided the release of more than one billion tonnes of CO_2. If all of Canada's nuclear power were replaced with power from fossil fuels, Canada's CO_2 emissions from electricity generation would double and total greenhouse gas emissions would be 15 per cent higher. The nuclear power sector also makes a major contribution to the economy; it is a $6 billion a year industry, employing 30,000 people directly, and 10,000 in indirect jobs in supplies and services.

Nonetheless, nuclear power faces economic, social and environmental challenges. Recently, it was announced that seven of the 19 nuclear reactors in Ontario will be taken out of service temporarily as part of a comprehensive plan by Ontario Hydro to revise its management practices and focus its resources on restoring the operation of its reactors to world-class standards. This decision has raised questions about the management of Hydro's nuclear plants and the ability of nuclear power to compete in the deregulated electricity market which is to be introduced in Ontario in the year 2000.

As well, while the nuclear industry is closely regulated by the Atomic Energy Control Board (AECB) to protect the health and safety of the public, Canadians remain concerned about the safety of nuclear power plants. Unlike other energy sources, all wastes associated with nuclear power plants are designed to be captured and contained on site. However, the public continues to be apprehensive about the environmental and health impacts of radioactive waste, particularly used nuclear fuel.

A permanent solution to waste disposal is key to the long-term viability of the industry. Atomic Energy of Canada Limited (AECL) has developed a concept for the deep underground disposal of spent nuclear fuel. An environmental assessment panel is reviewing this proposal and its report is expected to be completed in 1998.

Sustainable development issues: the public view

In establishing our sustainable development priorities, Canadians must decide – as a society – just what it is we want from our natural resources and what we are willing to do to ensure their sustainability. The following are what we believe to be the public's key issues and concerns regarding the sustainable development of natural resources. The issues are described in more detail in Appendix A.

Maintaining a healthy environment:

Canadians increasingly understand the relationship between the environment and human health, and recognize that ecosystems that support life must be safeguarded.

Creating jobs and building stable communities:

Canadians want to maintain the contribution of the resource sectors to the economy, employment and livelihood of 500 communities.

Balancing demands for land use:

Communities are struggling to reconcile often competing demands on the land base for development, wilderness, recreation or urbanization. In some areas, Aboriginal title to the land is still being determined.

Changing consumption:

The buying public must adopt more sustainable patterns of consumption (i.e. reducing consumption, recycling and reusing products).

Meeting our global responsibilities:

As a steward of a significant part of the earth's environment and resources, Canada has a responsibility to develop its natural resources in a sustainable manner.

Climate change:

Emissions of greenhouse gases, largely from the burning of fossil fuels, are having an impact on the world's climate (see The Climate Change Challenge).

Conserving biodiversity:

Maintaining diversity in our natural environment helps keep the planet's ecological systems strong and healthy enough to withstand stresses and changes from human intervention and nature.

Assuring a role for Aboriginal people:

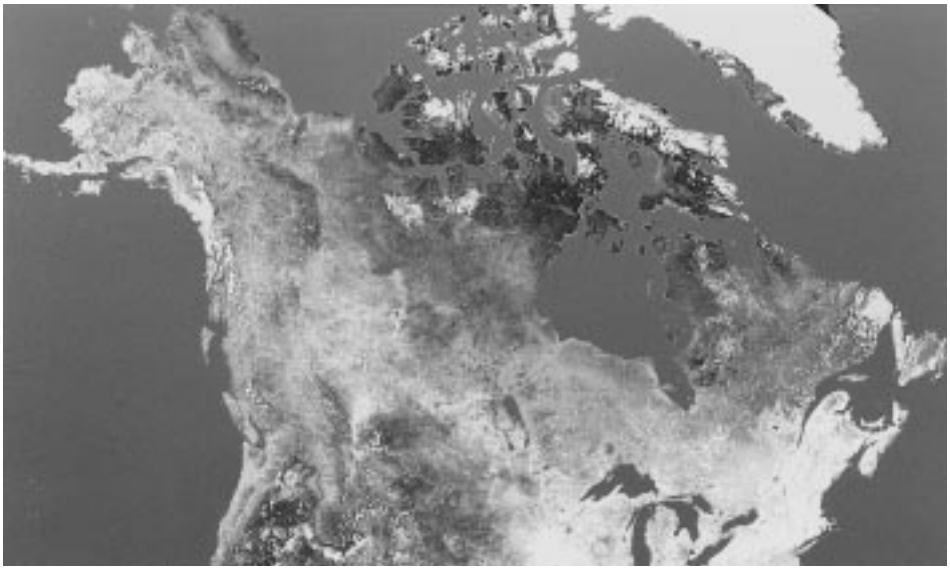
The sustainable development of Canada's resources is closely linked to issues including Aboriginal self-government, land claims, Aboriginal and treaty rights in traditional territories, and the responsibility of the Crown for Indian lands.

Leaving a legacy for the future:

Canadians want the assurance that the country's physical beauty is being safeguarded, their continued access to natural areas is assured, and that they will leave a legacy to their children and grand-children.

Playing a part in sustainable development:

Communities want to be directly involved in decision-making about development, and want greater cooperation among different government agencies.



A composite image of Canada produced by the Canada Centre for Remote Sensing.

The Climate Change Challenge

"Greenhouse" gases such as carbon dioxide (CO_2) and methane exist naturally in the atmosphere, trapping heat and warming the air much the way glass warms the air inside a greenhouse. These gases are part of natural cycles involving plants and animals on land and in the oceans.

However, human activities – primarily those that use energy, but also global deforestation and poor agricultural practices – release additional greenhouse gases into the atmosphere, threatening to raise global temperatures and change the planet's climate. Estimates project that the Earth's average temperature might increase from 1 to 3.5 degrees Celsius during the next 100 years. This could lead to more frequent extreme global weather events, longer droughts, changes to agriculture and forests, and a sea level rise anywhere between 15 and 95 cm.

The vast majority of human-caused greenhouse gases generated in Canada, an estimated 89 per cent, are related to how we produce and use energy. Most greenhouse gases result from fossil fuels – used in motor vehicles, manufacturing and residential and industrial heating (Figure 4).

The increasing industrialization of the developing world, coupled with rapid global population growth, have resulted in a dramatic rise in the use of fossil fuels this century. Since 1900 the world's population has tripled, the global economy has grown twenty-fold and the consumption of fossil fuels has increased thirty-fold.

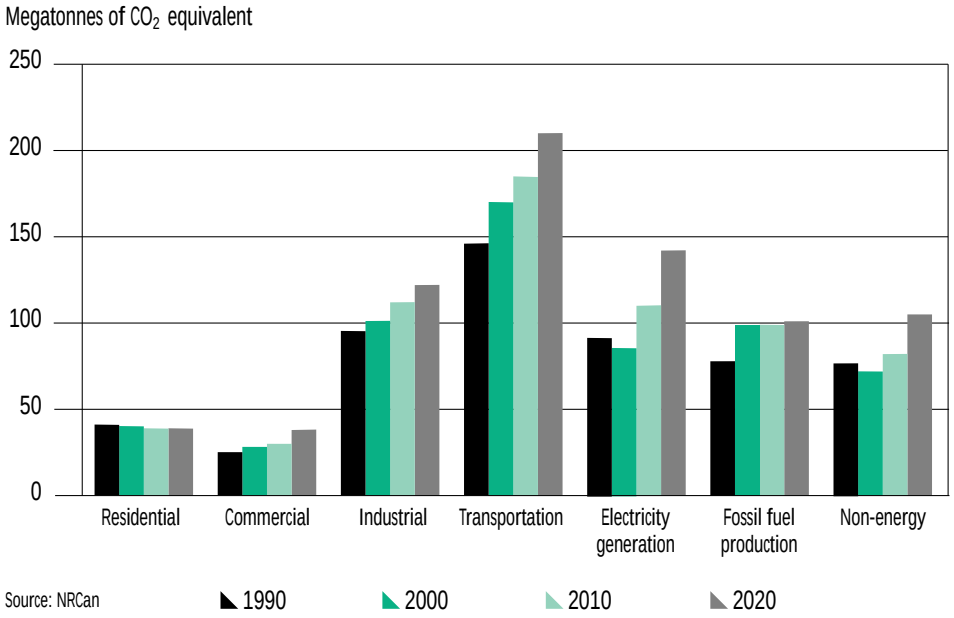
Reducing the rate of human-caused greenhouse gas emissions is an important challenge for all nations, including Canada. Canada accounts for about 2 per cent of global emissions although it has less than one per cent of the world's population. This reflects the country's immense size and cold climate, as well as the importance of energy to Canada's economy and trade, standard of living and more energy intensive resource based industries. Climate change is an especially complex challenge for Canada.

Canada is part of an international effort to address climate change through the United Nations Framework Convention on Climate Change, signed at the Conference on Environment and Development (UNCED) in Rio de Janeiro in 1992. Under this agreement Canada, along with other developed nations, committed to work toward stabilizing greenhouse gas emissions at 1990 levels by the year 2000. Few countries will meet this commitment (Figure 5). Although progress has been made, current estimates indicate that Canada's emissions levels will be approximately 8 per cent above 1990 levels by the year 2000 (Figure 6).

In December 1997, Canada will participate in the next round of international negotiations – the Third Conference of Parties (COP_3) in Kyoto, Japan. These negotiations are intended to reach agreement on legally binding targets for beyond the year 2000.

Figure 4

Canada's Greenhouse Gases Emissions Outlook — by Sector



Source: NRCan

Climate Change and NRCan

In 1991-92, prior to UNCED, NRCan announced a new Efficiency and Alternative Energy Program as a first step to limit greenhouse gas emissions.

In April 1995, Canada released its National Action Program on Climate Change, a strategy for all levels of government and for decision-makers in all sectors of Canada's economy. In November, 1995, the Government of Canada released its Federal Action Program on Climate Change. The Program outlined actions across a number of departments to surpass the national goal of stabilizing greenhouse gas emissions from federal operations at 1990 levels by the year 2000, and to reduce them by at least

20 per cent by 2005, relative to 1990. In December 1996, the federal government announced a set of 45 initiatives to enhance its response to climate change.

NRCan's climate change program focuses on three main priorities:

1) Climate Change Science

Understanding the causes and potential effects of climate change is critical to developing actions to mitigate and adapt to climate change. With their expertise in earth sciences, energy and forestry, NRCan scientists are actively:

- Investigating past periods of warming and cooling to see what the potential consequences of future changes may be (e.g. changes in coastal erosion, soil erosion, permafrost degradation, river flow etc.) so that suitable choices for adaptation or mitigation can be made;
- Providing detailed reconstructions of past climates to calibrate climate models that predict the climates of the future; and,
- Investigating the role of northern forests in sequestering and releasing CO_2.

2) Energy Measures

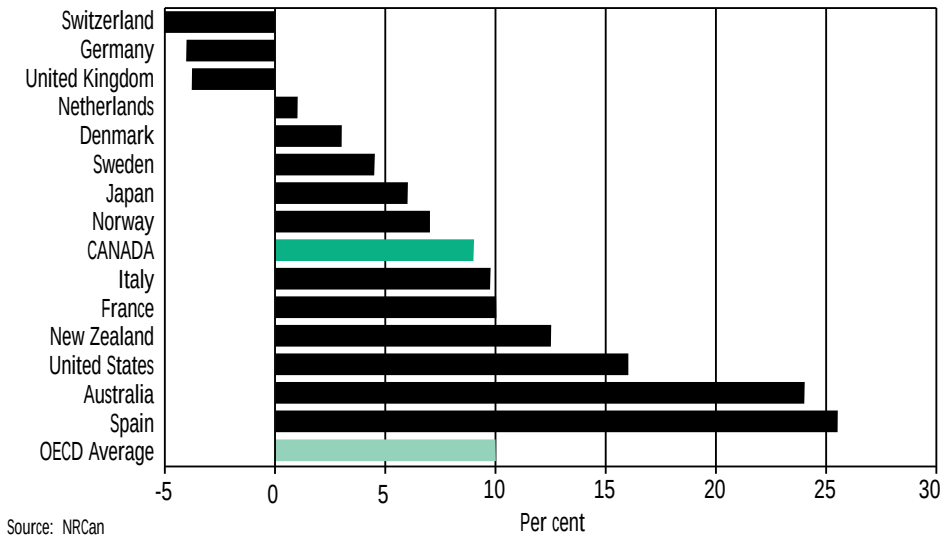
NRCan's energy initiatives include regulatory and voluntary approaches, public information, as well as research and development to promote energy efficiency, alternative transportation fuels and renewable energy. In addition, NRCan provides detailed analyses and forecasts of Canada's energy production and use as well as Canada's energy-related greenhouse gases.

Highlights of the program include:

- Launching the Voluntary Challenge and Registry (VCR). More than 700 organizations have registered, agreeing to develop and implement plans of voluntary actions to reduce greenhouse gas emissions;

Figure 5

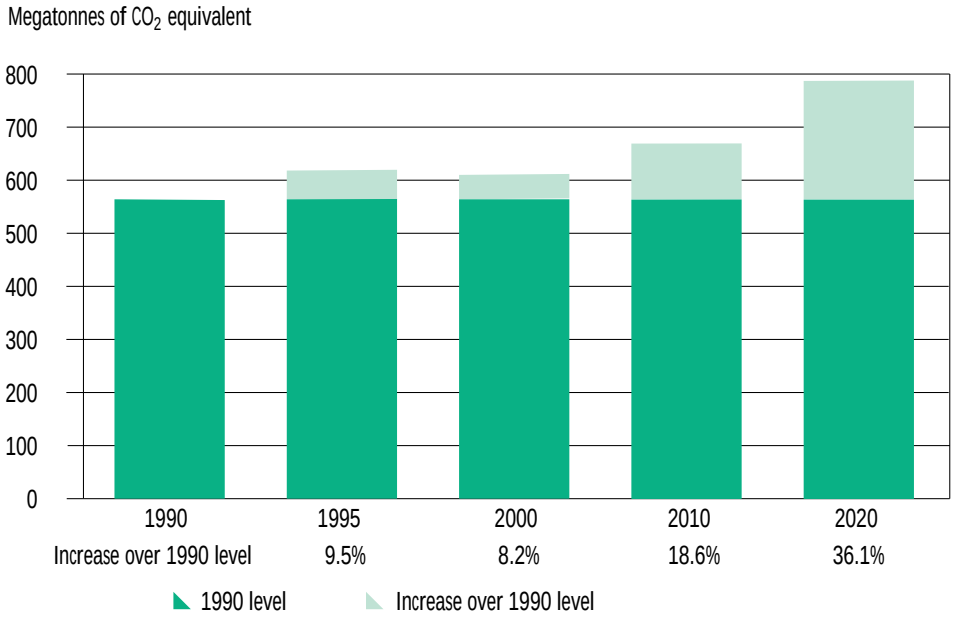
Canada's Emissions Outlook — Selected OECD Countries: Projected Increase in CO_2 1990–2000



Source: NRCan

Figure 6

Canada's Emissions Outlook — Greenhouse Gas Emissions

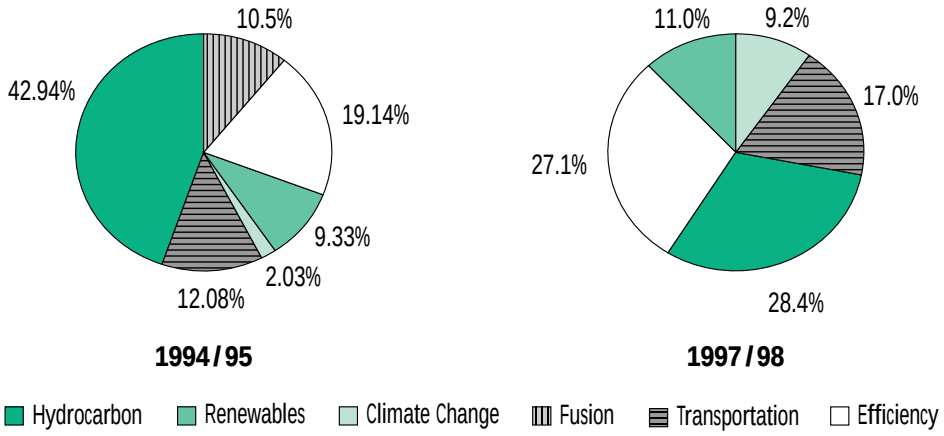


- Re-orienting support for energy to focus more on energy efficiency and alternative energy (Figure 7);
- Setting performance standards for lighting, energy-using equipment and appliances. New regulations governing fluorescent lighting will reduce CO_2 emissions by 5.3 million tonnes by the year 2000 – the equivalent of the annual emissions from one million vehicles;

- Improving the tax treatment of investments in renewable energy and energy efficiency through changes announced in recent budgets;
- Improving the energy efficiency of residential, government and commercial buildings. More than 600 organizations are upgrading their facilities to save energy through the Energy Innovators Initiative;
- Encouraging Canadians to use energy wisely through programs like Auto$mart which educates drivers and car buyers on energy efficiency;
- Supporting the development of zero-emission vehicles (ZEVs), including electric and hydrogen fuel cell vehicles; and,
- Partnering with industry and governments to develop and promote renewable energy technologies, including bioenergy, small hydro, biomass, wind, solar, and energy from waste.

Figure 7

Changing Priorities in Energy Research — Shifts 1994/95–1997/98 (% of funds)



• Includes funds for Panel on Energy Research and Development only. Does not include coordination or administration.

Source: NRCan

3) Forestry Measures

Forests absorb CO_2 from the atmosphere. When trees decompose after death or serious damage, or are used for fuel, they release the gas into the atmosphere. NRCan works to understand the role of forests in climate change, and to promote sound forest management to ensure our forests become net sinks of carbon rather than net sources.

This work includes:

- Developing a carbon budget model to measure carbon sequestration and releases from forests;
- Supporting the Tree Canada Foundation program, which has planted 57 million trees across the country since 1992; and,
- Promoting sustainable forest management through Canada's network of Model Forests.

All of these initiatives are designed to increase our understanding of the nature and effects of climate change, and to help us develop and implement logical options to mitigate climate change.

NRCan's Contribution to Sustainable Development

Our Business

In Canada, the Constitution gives the provinces jurisdiction over much of the land and resources. As a result of the 1996 Speech from the Throne, the government has withdrawn from areas of forestry and mining that are more appropriately the responsibility of others. The federal role in promoting the sustainable development of natural resources complements the work of the provinces, industry and the public (Table 2).

NRCan provides a national and international perspective, along with scientific and policy expertise, to foster a resource sector which is environmentally responsible, economically viable and globally competitive (See Appendix D: NRCan Departmental Profile). The federal government's national and international responsibilities related to natural resources include: international and inter-provincial trade; science and technology; federal regulatory duties; Aboriginal issues; federal Crown lands and offshore; environment; and, national statistics.

The Department and Crown agencies also work to protect public health and safety in areas including nuclear energy and explosives, and with respect to natural hazards such as earthquakes. Crown agencies are not, however, included as part of the action plans in this strategy.

NRCan provides services to Canadians in four principal areas by:

1) Conducting **leading-edge science** to generate and transfer the ideas, knowledge and technologies Canada needs to use its resources wisely and efficiently, reduce costs, protect the environment and help Canadians create new products and services.
2) Ensuring that **federal policies and regulations** – in areas such as the environment, trade, the economy, science and technology, Aboriginal matters and Canada lands – enhance the contribution of natural resources to Canada's economy, while protecting the environment and the health and safety of Canadians.
3) Building a national **knowledge infrastructure** on Canada's land and resources, providing Canadians with easy access to the latest economic, environmental and scientific information from a variety of sources.
4) Promoting Canada's **international interests** in cooperation with international agencies and other nations to meet our global commitments, and to maintain access to world markets for Canadian products, technologies and services.

A Commitment to Partnerships

The challenge of sustainable development requires action not just by governments, but by industry, communities and individuals.

The Whitehorse Mining Initiative, for instance, is the result of joint efforts of the mining industry, unions, Aboriginal peoples, the environmental and academic communities as well as federal, provincial and territorial governments. The Initiative used a non-adversarial approach to develop a strategic vision to address issues surrounding the sustainable development of Canada's mineral resources.

Consensus has been the cornerstone of the Model Forests Network which includes 11 sites covering more than 6 million hectares. This initiative involves over 250 organizations in a national experiment to design and test new

Natural Resources Canada provides leading-edge science, knowledge and expertise to position Canada as a world leader in the sustainable development of its land, energy, forest and mineral resources, and a quality producer of resource-related products, technologies, services and research.



Minister Goodale signing the agreement for the Aboriginal Model Forest Program.

forestry practices and tools, all of which are being developed through multi-stakeholder approaches to decision-making.

Meeting Canada's climate change goals depends on productive partnerships. More than 600 companies have joined the Energy Innovators program to promote greater energy efficiency in the commercial and industrial sectors.

NRCan is strengthening partnerships within government as well. For example, four federal departments – Agriculture and Agri-food, Environment, Fisheries and Oceans and NRCan – have signed a Memorandum of Understanding on Sustainable Development. The departments are coordinating their science and technology efforts to ensure their programs are better coordinated, more efficient and cost effective. The Intergovernmental Geoscience Accord, between the Geological Survey of Canada and the provinces/territories, ensures the best possible understanding of the nation's geology through a coordinated effort.

During consultations on this strategy, two concerns were expressed strongly and repeatedly (Appendix C).

The first emphasized the need for greater cooperation among federal departments, as well as with provincial agencies, on sustainable development issues. The second concern was the need for NRCan to build better and more open partnerships with environmental and Aboriginal groups.

As part of its sustainable development strategy, NRCan is committed to further expanding its stakeholder base beyond government and business interests. For example, NRCan is broadening the membership of its Ministerial advisory bodies to include environmental organizations.

Another message put forward during the consultations was that, given NRCan's non-operational role in the management of natural resources and its strong scientific knowledge, the Department should act as an 'honest broker' in providing balanced information and in facilitating consensus among the different views that Canadians hold about the future for their natural resources. To achieve this, it was suggested that NRCan should take more action to make its information available to Canadians, and to develop more open consultative processes.

Table 2

Roles and Responsibilities – Canada's Natural Resources

Federal

- National economic policies and taxation
- International relations and agreements
- Trade (International and inter-provincial)
- Northern Canada, federal lands and offshore
- Indian lands and Aboriginal land claims
- Wildlife – migratory birds, fisheries habitat and oceans
- National Statistics
- Science and Technology (in the national interest)
- Environmental protection (International and inter-provincial)
- Nuclear energy policy, research and regulation
- National Parks

Provincial

- Provincial economic policies and taxation
- Land use planning and allocation
- Resource ownership and royalties
- Resource management
  - regulation and licencing
  - allocation and control of harvesting and extraction
  - conservation
  - protection
- Aboriginal land claims
- Fish and wildlife
- Provincial parks
- Environmental protection (provincial and local)
- Science and technology
- Provincial/territorial statistics and resource inventories

Private Sector

- Investment
- Payment of taxes and royalties
- Operational resource management and planning
- Resource exploration, extraction and harvesting
- Resource processing and manufacturing
- Pollution prevention and waste management
- Product development and marketing
- Research and development
- Private land stewardship

Public

- Social values
- Input into decision-making
- Consumer choices and purchasing
- Political choices and advocacy
- Investment
- Recreation
- Private land stewardship

Our Strategy for the Future

The challenge facing all federal departments developing their sustainable development strategies is to translate ideas and principles into a workable framework with measurable goals and plans of action. This part of the paper identifies the steps required to move from concepts to concrete activities. Specifically, this section proposes:

- a series of operating principles for sustainable development;
- a framework of goals and objectives; and,
- an action plan for the next three years.

Defining the Challenge

A starting point for our strategy is to develop a more precise explanation of how we will apply the concept of sustainable development to our work in the field of natural resources. In applying the Brundtland definition of sustainable development, we propose the following interpretation shown below.

Operating Principles

NRCan adopts and endorses the following principles to guide its work in promoting the sustainable development of natural resources:

Partnership and consultation:
Sustainable development demands cooperation and open consultation. We will pursue federal responsibilities that contribute to sustainable development in partnership with a diverse array of stakeholders. We will consult with our partners to understand their needs and to build consensus on common objectives and actions. An informed, involved and aware public is essential to achieving sustainable development.

Integrated decision-making:
A sound economy and a healthy environment are mutually supportive. We will make decisions based on sound economic, environmental and social principles, relying on tools such as environmental assessment and scientific assessments of risk. We will

Sustainable Development of Natural Resources – What It Means

The sustainable development of natural resources will enable us to protect the health of the natural environment and landmass, while efficiently meeting human needs for energy, forest and mineral-based products and providing similar opportunities for future generations.

The sustainable development of natural resources requires that Canada:

- maintain up-to-date knowledge as the basis for responsible decision-making;
- locate and harvest or extract resources in a way that maintains the integrity of natural ecosystems and protects soil, water, air and wildlife;
- produce, use, recycle and dispose of natural resource products throughout their life- cycle in the most efficient manner possible, minimizing adverse human-caused impacts on the environment;
- maintain innovative, globally competitive and ecologically responsible resource-based industries;
- respect the needs, values and property rights of diverse users of the land and resources;
- involve local communities in making decisions that affect their quality of life and long-term viability; and,
- safeguard the well-being of Canadians in developing and using natural resources.



Ecosystem health is pivotal to the life support systems of the planet.

improve our ability to analyze decisions for their life-cycle environmental impacts, their full costs and benefits, and their implications for society.

Science as the basis for decision-making:

As a science and technology department, we recognize the importance of basing our decisions, policies and programs on the best scientific information available. Science is an important part of risk assessment. However, we also endorse the precautionary principle: where there are threats of serious or irreversible damage, we will not use a lack of full scientific certainty as a basis for postponing cost-effective measures to prevent environmental degradation.

Ecosystem integrity:

We recognize that resource development must remain within the capacity of natural ecosystems to respond, adapt and recover from human disturbance while maintaining the basic ecological functions that support life.

Efficient use of resources:

We will promote policies, practices and technologies that reduce consumption and make the most efficient use of natural resources in order to support a sound economy, while minimizing wastes and adverse impacts on the environment. We will promote pollution prevention, as opposed to clean-up, to avoid or minimize the creation of waste and pollution and to make more efficient use of resources.

Continuous improvement and innovation:

Sustainable development is not a fixed state, nor will it be achieved through a one-time effort. Our commitment to sustainable development will be based on an openness to new approaches and will continually be updated and adapted to reflect new knowledge, technology, information and ideas.

Accountability:

Within our defined role, we will develop clear action plans outlining what we propose to do, by when, and provide indicators to measure results. We will monitor the outcomes of our activities, taking corrective action where necessary, and publicly report on our progress.

Equity:

We will uphold our responsibility to provide a legacy for future generations in terms of their natural heritage, economic opportunities and social well-being.

Our Goals and Objectives

This section outlines the goals and objectives that reflect the issues we think need to be addressed, within the context of NRCan's mandate. These are the areas where we will focus our energies and activities:

NRCan's Sustainable Development Goals

- Making Better Decisions
- Sustaining Economic and Social Benefits
- Maintaining a Healthy and Safe Environment
- Putting Our House in Order

The strategy outlines each of the four goals. For each goal we identify the specific objectives we are proposing to help us reach them. We also describe the actions we will undertake by the year 2000 (unless stated earlier) to achieve these objectives. Appendix B identifies the indicators we will use to measure and track our progress.

Making Better Decisions

Goal 1: Enabling Canadians to make balanced decisions regarding natural resources.

Sustainable development is, ultimately, about making better decisions. This requires open and balanced debates about the social, economic and environmental impacts of development. People need access to the best available scientific and community-based knowledge – in an easily understood format – on which to base their decisions. Sharing knowledge and expertise will improve dialogue among all parties and lead to better decision-making.

NRCan's role is to influence the resource development decisions of federal and provincial governments as well as industry and consumers. It does so by providing information and scientific knowledge, by promoting consensus on key issues and actions, and by supporting innovative policies that actively promote sustainable development.

NRCan's Sustainable Development Objectives:

1.1 Creating easily accessible and integrated knowledge on the state of Canada's landmass and natural resources, and the economic, environmental, and social dimensions of their use.

1.2 Promoting greater national and international cooperation and consensus on sustainable development issues and actions.

1.3 Developing and promoting fiscal, regulatory and voluntary approaches that encourage the sustainable development of natural resources.

1.1 Knowledge for Sustainable Development

Broadening our knowledge base

NRCan collects and provides a vast array of data on Canada's natural resources. This information ranges from national statistics on resources, production and use, to geological data on Canada's landmass, to remote sensing data and satellite imagery, to topographical maps and national atlases of Canadian geography.

Traditionally, information on Canada's natural resources has focused more on the physical and economic dimensions of resource development – estimating the volume of timber in a given area, the size of mineral and oil deposits, or projecting energy consumption. We need to expand the information available to include the environmental aspects of resource use, as well as social considerations such as the importance of forests for recreation, and the vast wealth of traditional ecological knowledge that resides in many rural, Aboriginal and northern communities.

Monitoring the state of the environment is a growing challenge. Environment Canada and the provinces play the lead role but NRCan also contributes to this work through its geoscience and mapping of Canada's geology, and by monitoring the health of forest ecosystems. Remote sensing also provides a means to monitor the effects of natural or human activities, and provide permanent records of environmental change.

Criteria and indicators are another important tool. They identify and measure the key environmental, economic and social values essential to achieving sustainable



Partial view of the Earth from the Global Enviro Monitoring Satellite



Generating knowledge through advanced analytical tools.

development. In 1996, the Canadian Council of Forest Ministers (CCFM), after a broad two-year consultation, released a national framework of 6 criteria and 83 indicators to measure and report on the key components of sustainable development of Canada's forests. Canada's first report on these indicators was released in the Fall of 1997.

Sustainable development also demands that we expand our analytical tools to provide better information on the environmental and economic outcomes of development, the impacts of different products over their entire life-cycle, the full environmental costs and benefits of decisions, and benchmarks by which to measure progress.

Knowledge made easy

It is not enough to generate knowledge; it must be put in the hands of decision makers in an accessible and easily understood form. For example, the Standing Committee on Natural Resources, in its 1997 report, *Think Rural!*, highlighted access to the Internet and information networks as critically important for the development of Canada's rural communities.

Assembling and integrating the vast array of information about the interplay of soils, water, vegetation, air and climate, geology, land use, energy, social and economic considerations – currently collected by numerous organizations – is complex and time consuming.

New initiatives, using digital data and technologies such as the Canadian Geospatial Data Infrastructure, will make it possible to exchange geographic data on the information highway among user groups, stakeholders, resource managers and academia on all the factors which go into development decisions.

With new information technology, the potential exists for the public to have user-friendly access to the most up-to-date data from various sources. Through the National Atlas Information Service (http://www-nais.ccrc.nrcan.gc.ca) and SchoolNet

Action Plan 2000

1.1 Creating easily accessible and integrated knowledge on the state of Canada's landmass and natural resources, and the economic, environmental and social dimensions of their use.

NRCan will:

1. Launch a new Knowledge Initiative to better integrate and make publicly accessible its knowledge across the Department; by 1998, consult with stakeholders and complete an inventory of our knowledge holdings.
2. Develop the Canadian Geospatial Data Infrastructure (CGDI) to provide national access to geographic information, in partnership with provinces, territories, and other federal departments; by 1999, complete the NRCan portion of the CGDI.
3. Undertake the first national survey of energy use in commercial buildings; by 1998, finalize the design of the survey.
4. Launch new reporting on the health of Canada's forest ecosystems; by 1998, publish the First National Forest Health Assessment.
5. Report on progress in the sustainable development of Canada's resources: with CCFM, report on 6 criteria and 49 indicators of sustainable forest management; in consultation with various stakeholders develop sustainable development indicators for energy and minerals and metals.

(http://www.schoolnet.ca) on the Internet, students and the public have access to information about all aspects of Canada's geography and resources. Increasingly, technologies will provide powerful tools to improve dialogue among Canadians, leading to more environmentally and economically sound decisions.

1.2 Building Consensus and Cooperation

A major theme throughout the consultations on this strategy was the need for greater cooperation among different levels and departments of government, communities, industry and other organizations. This reflects, in part, the public's desire to have a more direct say in the development and use of Canada's resources, most of which are owned by governments on behalf of Canadians.

Reconciling competing social, economic or environmental values can be difficult. It demands increased collaboration among government departments and enhanced public participation and decision-making processes.

NRCan can contribute to sustainable development by bringing together diverse interests to forge national consensus on key issues, develop common strategies and promote cooperation in areas of national concern. For example, the National Forest Strategy and the Whitehorse Mining Initiative resulted in a broad consensus among different stakeholders on key issues and actions to promote sustainable development in forestry and mining. The national network of Model Forests is also exploring new approaches in decision-making by involving over 250 organizations in the management of ten large forest areas.

The need for cooperation is not restricted to Canada. Nations can no longer ignore the impacts of their development on the world's environment but must address common issues through joint action. Such action must recognize the globalization of world economies and markets, as well as the wide differences among nations.

Canada plays an active role in discussions to address global environmental concerns. Our country was an active participant in the Earth Summit (UNCED) in Rio de Janeiro in 1992. Commitments from UNCED, such as *Agenda 21*, as well as legal agreements on biodiversity and climate change, and a voluntary statement of principles on forestry, have particular significance for natural resource development.

NRCan, in partnership with the Department of Foreign Affairs and International Trade Canada (DFAIT), is actively involved in a number of fora to promote cooperation on natural resource issues as well as to encourage the exchange of knowledge and the transfer of science and technology. For example, in 1997, Canada hosted a meeting of the Asia Pacific Economic Cooperation (APEC) Energy Ministers to discuss key sustainable development issues. Canada played an important leadership role in the United Nations (UN) Intergovernmental Panel on Forests, established to examine global forest issues and, with many other countries, continues to press for immediate negotiations on an international convention on forests. NRCan was also active in organizing a 1997 workshop and meeting of Mines Ministers of the Americas to promote more sustainable mining practices in Canada and South America.

Canada cooperates with international bodies including the International Energy Agency, the UN Commission on Sustainable Development, the UN Food and Agriculture Organization, the International Forum for Chemical Safety, the Organization for Economic Cooperation and Development, and others.

MODEL FOREST NETWORK
RÉSEAU DE FORÊTS MODÈLES

Action Plan 2000

1.2 Promoting greater national and international cooperation and consensus on sustainable development issues and actions.

NRCan will:

1. Promote a national dialogue with provinces and territories, and stakeholders on key sustainable development issues facing the natural resource sectors, such as climate change, energy futures and technology, and value-added industries.
2. Prepare, with CCFM, a new National Forest Strategy based on public consultations; in 1998, the strategy will be released at a "National Forest Congress."
3. With DFAIT, consult and present Canadian positions on the sustainable management of forests at meetings of the United Nations Intergovernmental Forum on Forests, due to report in 2000.
4. Promote international cooperation on the sustainable development of minerals and metals; in consultation with the provinces and stakeholders; by 1998:
   - Pursue the implementation of the Arequipa Declaration of the Mines Ministers of the Americas and Action Plan, including a workshop on the Safe Use Principle; and,
   - Host the third annual meeting of APEC's Groups of Experts on Mineral and Energy Exploration and Development, to be focused on sustainable development.

1.3 Creating A Climate for Sustainable Development

The federal government – through its policies, regulations and research, its promotion of non-regulatory initiatives and its use of financial incentives – helps set the rules by which resource development decisions are made.

Economic and market-based instruments

In 1994, the government created a Task Force on Economic Instruments and Disincentives to Sound Environmental Practices to review federal taxes, grants and subsidies.

Since then, significant reforms have been undertaken, particularly with respect to energy.

In response to a report by the Standing Committee on Environment and Sustainable Development ("Keeping a Promise: Towards a Sustainable Budget"), the Government of Canada committed departments to continue their examination of the environmental impacts of taxes, grants and subsidies (baseline study) as part of their sustainable development strategies. (See NRCan's Baseline Study.)

Environmental regulation

Environmental regulation through legislation such as the *Canadian Environmental Assessment Act (CEAA)*, the *Canadian Environmental Protection Act (CEPA)*, the *Fisheries Act* and the *Navigable Waters Protection Act*, is another key means by which the federal government can influence sustainable development decisions.

S D V I G N E T T E

NRCan's Baseline Study of Taxes, Grants and Subsidies

In cooperation with the Department of Finance and others, NRCan has been assessing federal taxes, grants and subsidies to ensure they better support sustainable development. NRCan's efforts to examine and address any disincentives to sustainable development include the following:

- In 1996, NRCan and Finance Canada jointly released *The Level Playing Field: The Tax Treatment of Competing Energy Investments*, which examines the tax treatment of non-renewable, renewable and energy efficiency options.
- The 1994 Budget announced measures to stimulate the market for certain types of energy conservation equipment. The 1995 Budget announced an end to direct financial support for energy megaprojects. The federal government has withdrawn from the Newgrade Upgrader and Bi-Provincial Upgrader initiatives, and its final contribution to the Hibernia project was made in 1995/96. The 1996 Budget introduced measures to treat renewable and non-renewable energy more equitably.
- The 1997 Budget announced that $20 million per year, for three years beginning in 1998, would be set aside to promote energy efficiency and renewable energy measures. NRCan and Finance Canada conducted consultations in the Fall of 1997 on new measures to encourage investment in energy efficiency in commercial buildings as well as heating and cooling from renewable energy sources.
- NRCan, in concert with the departments of Finance, Industry and Environment, released a December 1996 discussion paper entitled, *Federal Income Tax Treatment of Virgin and Recycled Material*. A consultation session with the recycling industry, environmental groups and the National Round Table on Environment and the Economy was held to assess whether federal tax policies provide equitable treatment of both virgin and recycled materials.



Gulf Canada Square in Calgary, Alberta – an example of energy efficiency in commercial buildings.

NRCan provides scientific and technical expertise to support the development of sound environmental regulations and policies. It has actively contributed to a number of recent initiatives such as the federal government's new *Minerals and Metals Policy of the Government of Canada*, *the Toxic Substances Management Policy*, the renewal of *CEPA*, the management of toxic substances under the Strategic Options Process, and the transboundary shipment of hazardous waste. NRCan supports the development of an efficient regulatory system, based on sound science and the assessment of risk to human or environmental health.

In response to the 1996 report of the House of Commons Standing Committee entitled *Streamlining Environmental Regulations for Mining*, NRCan is working with the Departments of Environment,







Health, Fisheries and Oceans, and others to provide a more efficient and effective regulatory regime for mining. The goal of this work is to streamline the regulatory process while ensuring a high level of environmental protection. NRCan is also supporting efforts underway, through the Canadian Council of Ministers of the Environment (CCME) and within the federal government, to better harmonize federal and provincial environmental legislation to reduce delays, costs and uncertainty while ensuring a high standard of environmental protection.

Environmental assessment plays a particularly important role in integrating environmental considerations into development decisions. Under the *Canadian Environmental Assessment Act (CEAA)* the federal government is required to do an assessment of projects where it provides funding or land, issues a licence or permit, or a strategic environmental assessment of its policies and programs.

NRCan has provided expert advice (in geology, chemistry, engineering, biology, etc.) to public review panels conducting environmental assessments of over 50 major development projects. These include off-shore oil and gas projects such as Hibernia, Terra Nova and Sable Island, as well as pipelines, uranium mines, and major new mining developments including Voisey's Bay and the BHP diamond mine.

An emerging challenge, particularly for projects in Canada's North, is the integration of traditional knowledge into environmental assessment. NRCan will work with DIAND and others to develop practical approaches.

Voluntary and other instruments

Voluntary environmental programs provide a proactive commitment to protect the environment beyond what is required in legislation or regulation. NRCan promotes voluntary measures as a complement to efficient regulation and contributes to a number of voluntary initiatives such as:

- the development of standards on sustainable forest management, under the auspices of the Canadian Standards Association;
- the Voluntary Challenge and Registry (VCR) to reduce emissions of greenhouse gases;
- the Energy Innovators program to upgrade the energy efficiency of industrial and commercial buildings; and,
- Environment Canada's Accelerated Reduction/Elimination of Toxics (ARET) program to reduce emissions of key pollutants.

Action Plan 2000

1.3 Developing and promoting fiscal, regulatory and voluntary approaches that encourage the sustainable development of Canada's natural resources.

NRCan will:

1. In cooperation with Finance Canada, continue the baseline study of taxes, grants and subsidies in the resource sectors:
   - compile a detailed catalogue of federal, provincial and territorial fiscal systems applying to the upstream oil and gas industry by 1998; and,
   - with the CCFM, the National Round Table and others, review income tax polices related to private woodlots to determine their impact on sustainable forest management practices.
2. Promote the use of voluntary and innovative policy instruments for environmental management, as a complement to regulation:
   - examine the feasibility of a national system of tradeable permits for greenhouse gas emissions, with Environment Canada and others, by 1998;
   - contribute to the Conference Board of Canada's research program to assess the optimal mix and use of policy tools for environmental protection in 1998 and 1999; and,
   - promote voluntary measures within the resource sectors to conserve wildlife habitat and protect endangered species, in cooperation with Industry Canada and Environment Canada.
3. Report to federal and provincial mining ministers on a national review to improve the regulatory system related to mining, by 1998.
4. Complete the Energy Chapter of the Agreement on Internal Trade (AIT), which will include provisions for cross-territory electricity transmission and increase the efficiency of electricity markets across Canada, in cooperation with provinces, by 1998.
5. Develop with other government departments, an international seabed mining code as well as a plan to produce the marine geoscience information required to ratify the United Nations Convention on the Law of the Sea, by 1999.



NRCan will promote voluntary measures within the resource sectors to conserve wildlife habitat and protect endangered species, in cooperation with other federal departments.

Enhancing Long-term Social and Economic Benefits



Kiers Roelof

Energy from waste facility in Prince Edward Island.

Goal 2: Sustaining the economic and social benefits from natural resources for present and future generations.

The resource sector is a cornerstone of our economy, integral to job creation and community development. Sustainable development should result in resource-based industries that make fewer demands on the environment, create new economic opportunities and provide greater stability to Canadian communities.

Sustainable development is also grounded in the reality that we must maintain our ability to compete on world markets and have assured access to those markets if Canadians are to continue to enjoy our high standard of living and quality of life.

NRCan's Sustainable Development Objectives:

2.1 Creating economic opportunities and encouraging investment in innovative and higher-value uses of natural resources.

2.2 Maintaining and expanding access to international markets for Canadian resource-based products, knowledge, technologies and services.

2.3 Building the capacity of Aboriginal, rural and northern communities to generate sustainable economic activity based on natural resources.

2.1 Sustainable growth and investment

Long-term resource supplies

To "meet the needs of the present without compromising the ability of future generations to meet their own needs" requires long-range planning to assure a long-term supply of natural resources.

In the case of mineral and energy resources, this involves encouraging exploration to find new reserves and developing technologies to extend the life of existing reserves. NRCan provides the geological information to identify potential new sources of minerals and energy as well as environmentally-sensitive areas. An estimated $876 million was spent on non-fuel mineral exploration in Canada in 1997. While NRCan will continue to provide information necessary to locate new reserves of minerals and energy, it must also work to reduce the need for resource development by promoting alternative sources, increased efficiency, reduced consumption and recycling (as identified elsewhere in this strategy).

Another opportunity is the development of less traditional sources of energy resources such as in the off-shore areas of Nova Scotia and Newfoundland, the oil sands in Alberta, or renewable energy alternatives including wind and solar power (Figure 8). Again, sustainable development requires that we develop these resources in such a way as to address environmental and social concerns.

For example, the federal government's response to the national Oil Sands Task Force resulted in important regulatory and tax changes that the Task Force estimates could lead to $25 billion in new investment over the next 25 years. Production of oil sands is expected to double by 2020, and will account for 36 per cent of our oil production, up from its current 20 per cent. NRCan is a partner

in the Canadian Oil Sands Network for Research and Development to address environmental issues related to expansion of the oil sands.

In forestry, assuring a long-term supply of wood fibre for products demands that harvests remain within levels the forest can regenerate, while reducing losses due to fire, insects and disease, and increasing yields. NRCan conducts research into biotechnology to develop new trees that grow faster and are more resistant to insects and disease, and new harvesting practices that better protect the biodiversity of forest ecosystems.

Innovation and value added

Canada will continue to be an important and competitive supplier of traditional resource commodities including oil, natural gas, pulp, lumber, uranium, iron ore and base metals such as nickel. However, our ability to provide long-term economic and social benefits for Canadians is directly linked to the resource sector's competitiveness and its capacity to develop innovative, greater value and environmentally-sound products and services.

The Standing Committee on Natural Resources, in its report *Think Rural!*, concluded that value-added processing can be a key generator of jobs in rural regions. It noted that the challenge is to expand resource-based primary industries and complement them with new economic opportunities. For example, in 1996, value added products made up less than 5 per cent of exports of Canadian forest products. Technology, innovation and research were identified as being particularly important in generating value-added industries.

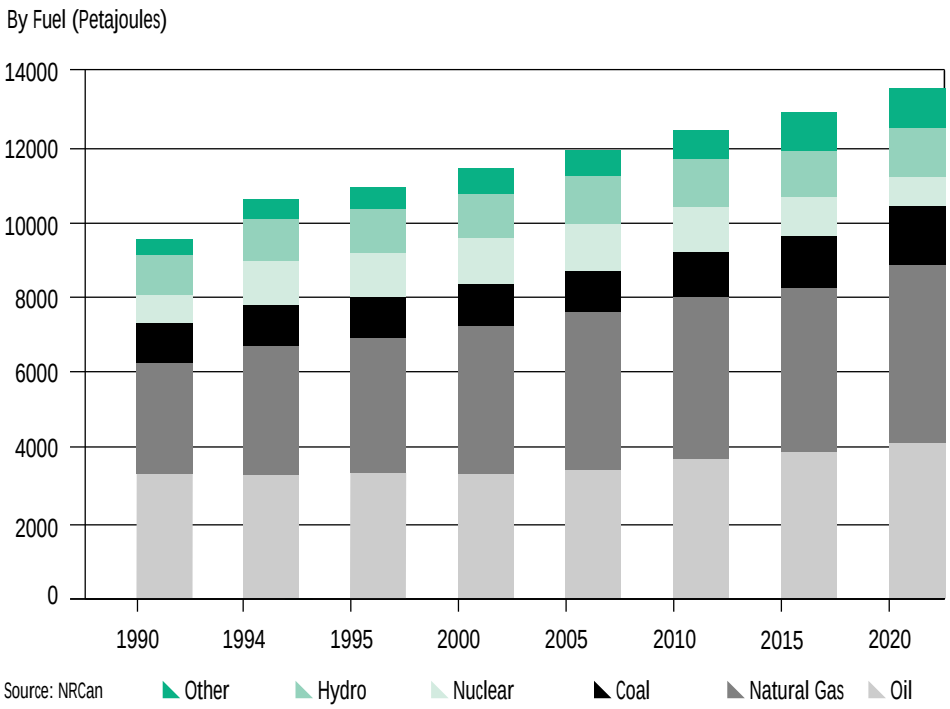
This potential is, in part, demonstrated by the growth of the geomatics industry. Canada is a leading developer and user of computerized geographic information systems which integrate satellites, computer networks and other high-tech tools for mapping and planning in land and resource management. Canada's geomatics industry is growing 20 per cent annually and now includes 1,500 firms with 15,000 employees generating over $1 billion in annual sales.

Another example is Canada's renewable energy industry. This sector includes 200 companies employing 4,000 people who, in 1994–95, produced $800 million of goods and services, 23 per cent of which were exported.

Natural gas – used both as a fuel and in the production of higher value-added transportation fuels and chemicals – is an area with great potential. However, the technology to convert natural gas is energy intensive. NRCan has formed an international consortium to develop new processing technologies, and to share risks and costs.

Figure 8

Canada's Energy Demand



Another growth area is the metals recycling industry, a $3 billion a year business involving 1,000 companies employing an estimated 15,000 Canadians. Similarly, Canada has emerged as the leading center for financing and investment in mining, and is an important supplier of engineering informatics and legal services specialized in natural resources.

The resource sectors can continue to be a major part of Canada's emerging knowledge-based economy by developing innovative products and services that are more environmentally sound and which capitalize on new technologies and scientific research.

2.2 Trade and markets

In 1996, Canada's energy, minerals and metals, forest and geomatics industries exported products worth $98 billion, contributing over $65 billion to Canada's

Action Plan 2000

2.1 Creating economic opportunities and encouraging investment in innovative and higher value uses of natural resources.

NRCan will:

1. Promote greater value added-processing of Canada's natural resources by developing:
   - new, higher value products and processes for minerals and metals such as a high-performance steel and a non-explosive rock breaking technology (electric pulse blasting);
   - viable, more energy efficient technologies for the conversion of natural gas to value-added liquid fuels, fuel components, petrochemicals and synthetic gas; and,
   - a strategy to increase value-added for Canadian forest products, in cooperation with industry and governments, by 1999.
2. Encourage the growth of industries using innovative and environmental technologies for natural resource development by:
   - implementing a federal strategy on forest biotechnology, including technology transfer and use of biotechnologically-engineered forest products, by 1998;
   - completing a study to analyze the links and opportunities between environmental industries and the resource sectors, by 2000; and,
   - assessing the potential for a national strategy to promote greater recycling of metals, in consultation with other departments, industry, provinces and municipalities, by 1999.
3. Develop technologies that reduce energy consumption, lower carbon dioxide emissions and reduce costs of producing transportation fuels, oil sands and heavy oil, in partnership with the province of Alberta and industry.
4. Promote the sustainable development of energy from Canada's off-shore and frontier areas, by:
   - passing 14 regulations regarding exploration;
   - reviewing all offshore oil and gas developments to ensure that local and Canadian companies are given the opportunity to bid on contracts and apply for available jobs; and,
   - providing worker training to upgrade skills to qualify for employment in the emerging offshore oil and gas industry, in partnership with Newfoundland and Nova Scotia.

positive balance of trade (Canada's trade surplus in 1996 was $41.9 billion) (Figure 9).

With increasingly liberalized trade as a result of the World Trade Organization (WTO) Agreement, the North American Free Trade Agreement (NAFTA) and APEC, Canada is widening its network of trading partners and broadening opportunities for trade, technology development and investment.

Traditional barriers to markets – such as tariffs – are falling. However, there are concerns that new barriers may be erected as environmental issues become important trade issues. NRCan, in cooperation with DFAIT, encourages expanded trade and investment that is environmentally responsible, and is based on a level playing field and sound science.

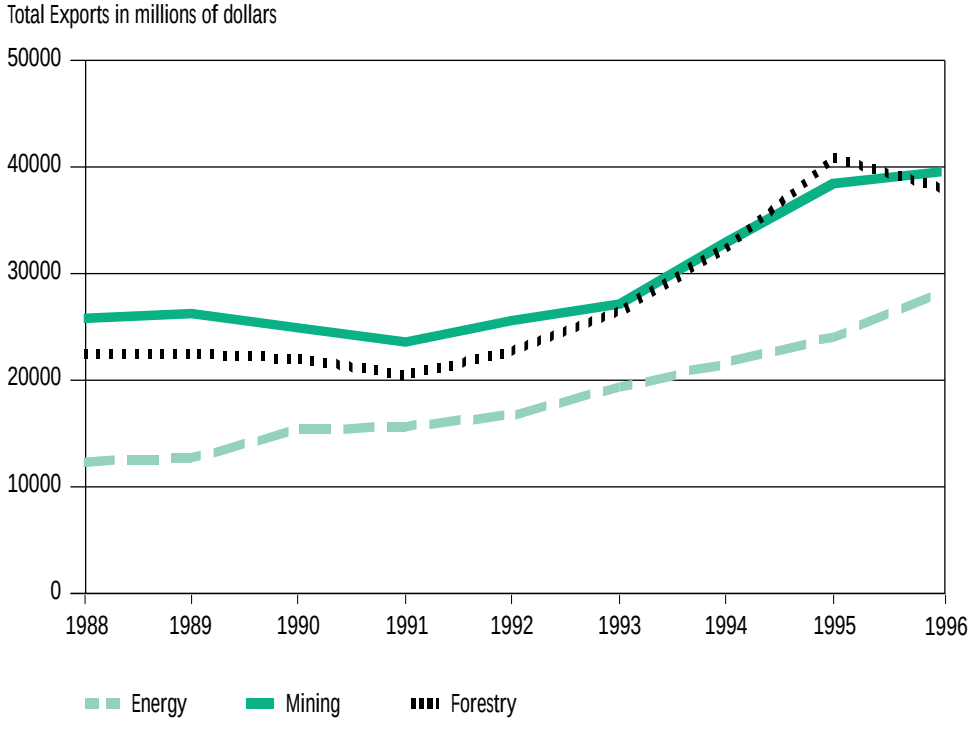
For example, a major problem has developed regarding international trade in recyclable metals related to regulations under a global agreement known as the Basel Convention. Two-way trade in metal recyclables for Canada is worth $3 billion annually (See The Basel Convention).

Similarly, some countries are seeking to ban specific minerals (e.g. asbestos). In accordance with the *Safe Use Principle*, the Government of Canada has stated that "minerals and metals, in and of themselves, are not candidates for bans, phase-outs or virtual elimination." The Government recognizes, however, that "there are instances where certain products containing minerals and metals, or their uses, because of the associated risks, may be candidates for bans, phase-outs or virtual elimination of releases from specific anthropogenic sources."

Hundreds of millions of dollars of lumber exports to the European Union are threatened by a ban due to a small pest, called the Pinewood Nematode. Science is playing a key role in addressing issues, such as these, that may restrict trade.

Figure 9

Total Exports for Mining, Energy and Forestry
1988 to 1996



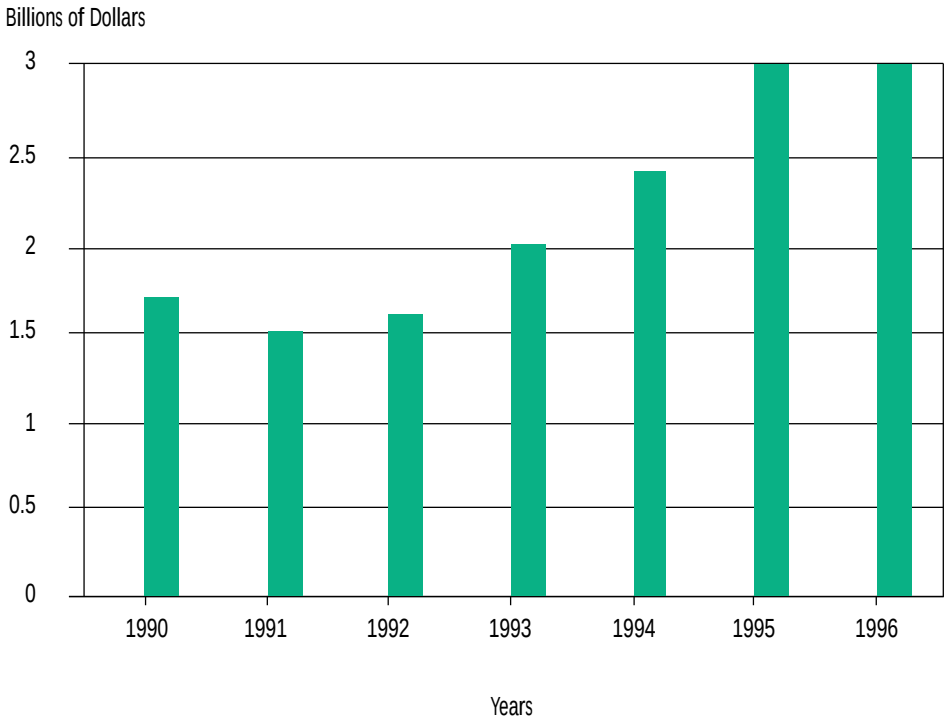
S D V I G N E T T E

The Basel Convention

The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal addresses problems associated with the international movement of hazardous wastes, particularly into developing countries. However, some of its requirements are having unintended impacts on the recycling of some materials. For example, a proposed amendment to the Convention would ban the export of hazardous recyclable materials from developed countries to most developing countries. This could restrict their ability to recycle these materials into new and safe products and to compete internationally. Most metal products made in Canada are made from a mix of primary and recycled metals; 300 recycling companies, employing 15,000 people, handle over 11 million tonnes of metals valued at more than $3 billion annually. NRCan is promoting the need to redefine "wastes" to ensure valuable recyclable metals are not sent for disposal in landfills. This is a sound practice that can benefit both the environment and the economy.

Figure 10

Canada's Trade in Recycled Metals



Source: NRCan
Includes recyclable metals and metal bearing materials



Aluminum and steel cans destined for recycling.

Action Plan 2000

2.2 Maintaining and expanding access to international markets for Canadian resource-based products, knowledge, technologies and services.

NRCan will:

1. Safeguard and improve Canada's trade and investment position in natural resources; the Minister of Natural Resources, in cooperation with DFAIT, will lead two *Team Canada* international trade missions with an emphasis on small and medium sized companies in natural resource and related industries.
2. Promote the sustainable development of minerals and metals internationally:
   - providing technical training on acid mine drainage and life cycle assessment, and advice on ISO 9000 accreditation for the Canada-Brazil Project for Sustainable Development in the Minerals Sector, by 1998;
   - providing baseline assessment and technical training in chemical analysis and environmental management, and by showcasing Canadian technologies and expertise for the Canada-Argentina Project for Technology Transfer in the Minerals Sector, by 1999;
   - developing internationally-recognized protocols for heavy metals and the classification of risks posed by persistent organic pollutants, by 1999; and
   - negotiating provisions for the sound management of minerals and metals in the "Prior Informed Consent Convention", and the UNEP – sponsored global convention on 'persistent organic pollutants'.
3. Increase international acceptance of Canadian wood product standards by supporting research by Forintek Canada Corporation that generates data for input into national and international building codes.
4. Provide key markets with balanced and accurate information on Canadian forestry practices, in partnership with CCFM and DFAIT, through the International Forest Partnerships Program; participate in a series of 6 workshops in Germany and, host a Forestry Fact Finding Mission of foreign stakeholders by 1998.
5. Implement a business development strategy to support and promote the geomatics industry's access to international contracts and markets.
6. Under APEC, encourage harmonization of testing methods for energy efficiency standards throughout the region and promote best practices in energy regulation; negotiate lower tariffs and eliminate unsound non-tariff barriers to trade and investment for natural resources.
7. Develop and adopt, for use in Canadian and international policies, a new definition of "waste" that will not restrict the recycling of low risk, metal-containing materials.

2.3 Building capacity in resource-based communities

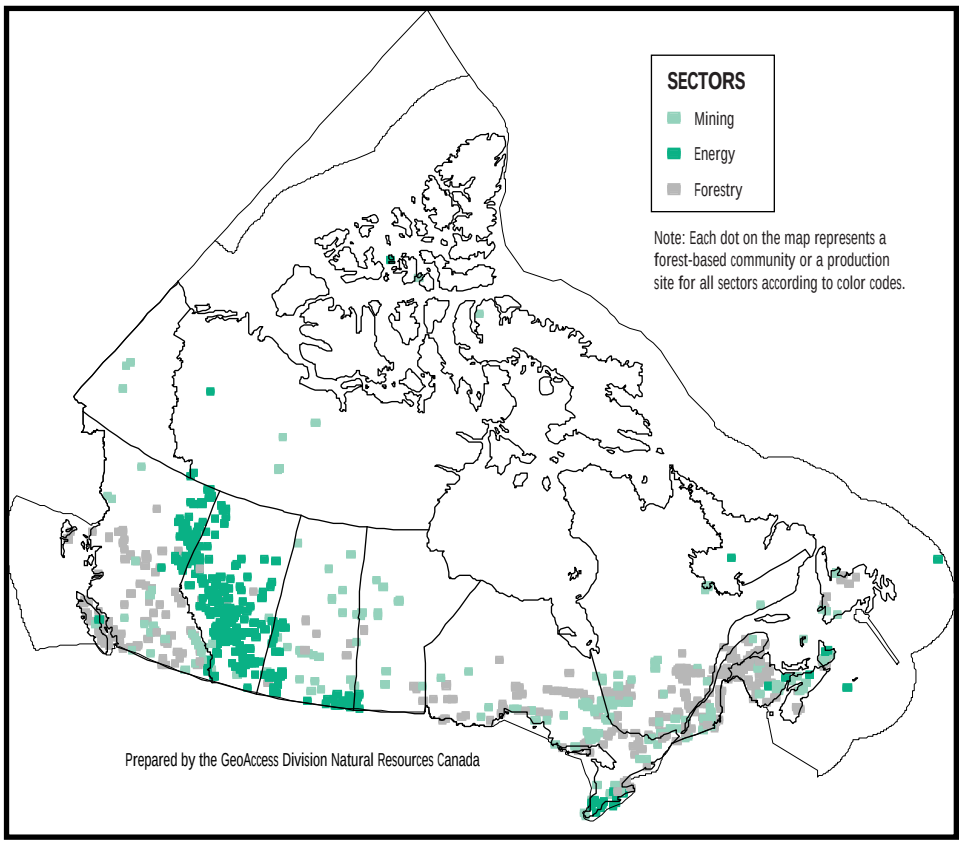
Rural communities

Rural Canada represents about 20 per cent of the employed workforce, one-third of the Canadian population and about 90 per cent of Canada's landmass. Some 500 communities across Canada are dependent on mining, forestry and energy for their livelihood (Figure 11). Although the average per capita income in rural Canada is $2,600 lower than the Canadian average, some resource-based communities – especially in mining – boast some of the highest average salaries in the country.

In its 1997 report entitled, *Think Rural!*, the Standing Committee on Natural Resources identified some of the unique constraints and priorities facing rural communities. Several of the recommendations related to natural resources including: providing greater access to information networks; encouraging renewable and community-based energy sources; promoting the sustainable harvesting of natural resources; implementing tax measures to support oil sands development; conducting research into improved resource harvesting practices; and, creating partnerships to develop new value-added products.

Figure 11

Natural Resource Communities in Rural Canada



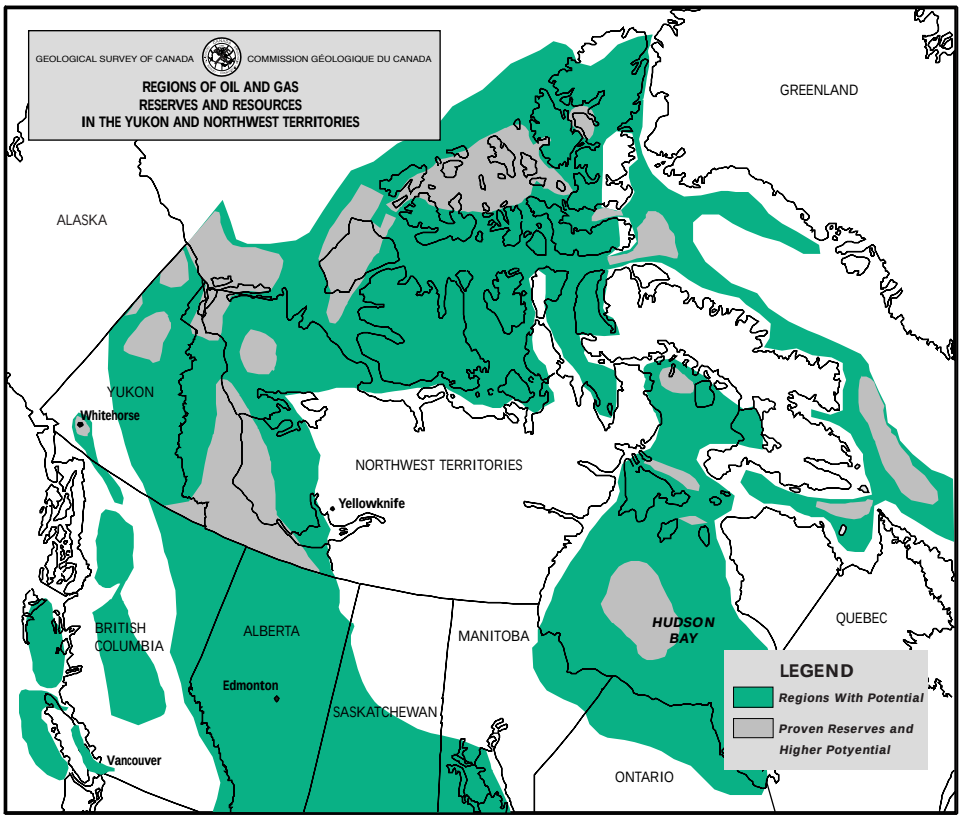
Aboriginal communities

Aboriginal people have a special relationship with the land and a unique contribution to offer to environmental decisions surrounding resource development. Sustainable development acknowledges the need to work with Aboriginal people to address issues related to land and resource use, to increase their participation in economic activity and to ensure the benefits of natural resource development are more equitably shared. Both the National Forest Strategy and the Whitehorse Mining Leadership Accord, as well as the government's new Minerals and Metals Policy, encourage a greater role for Aboriginal people in resource development in Canada.

Consultations on sustainable development with Aboriginal communities in southern Canada were coordinated and conducted by the Department of Indian Affairs and Northern Development (DIAND). The recent report of the Royal Commission on Aboriginal Peoples also provides a comprehensive review and numerous recommendations. Several of the recommendations touch on natural resources including the sharing of land and resources, economic development, self-government and financing. The Government of Canada is developing its response to the Royal Commission's recommendations.

Figure 12

Region of Oil and Gas Reserves and Resources in the North





Pierre St-Jacques

Representatives from the North Shore Tribal Council studying forest thinning at Thessalon, Ontario.

NRCan has a number of on-going partnerships to secure a greater role for Aboriginal people in the development of natural resources.

DIAND, NRCan and First Nations jointly manage a sustainable forest management program on reserve lands. There are numerous First Nations participating in this initiative. The management of reserve lands can provide jobs and income for local communities as well develop skills applicable to resource management in other areas. It is recognized that this program does not respond to the needs of Aboriginal people who do not live on reserves, such as the Métis. In addition, it is acknowledged that some reserve lands are too small to be economically viable on their own. Access to off-reserve lands and resources, through the negotiation of land claims or co-management agreements with governments and industry, can increase job opportunities and incomes for Aboriginal communities.

To further build the capacity of Aboriginal communities on sustainable forest management, the Waswanipi Cree Model Forest, Quebec, was established in September 1997.

As part of the Canadian Model Forests network, it will focus on the same objectives of self-governance, partnerships and planning for sustainable forest management, but will particularly link traditional values to conventional forestry. It is an opportunity to strengthen Aboriginal leadership in sustainable forest management.

In support of the land claim process, NRCan provides the legal surveys necessary to delineate boundaries for land claim settlements, and trains Aboriginal people in land management and survey techniques. In addition, NRCan is working with the provinces to promote greater partnerships between mining companies and Aboriginal communities. NRCan also supports Aboriginal communities' efforts to become more energy efficient through community-based, district-heating projects, such as with the Cree Nation community of Ouje-Bougoumo, which heats 150 homes using wood waste from local saw mills.

Northern communities

The north has vast mineral, oil and gas deposits (Figures 12 and 13). In the past few years, there has been a dramatic increase in resource exploration and development. After government, mining is the single largest employer in the North. However, there is also a continuing reliance on renewable resources in most communities, both for subsistence and commercial purposes including forestry, fishing, hunting, trapping, the harvesting of wild-harvested foods and the sale of art and crafts.

The Northern environment is particularly susceptible to pollution; cold conditions make the Arctic act as a sink for many pollutants. Pollutants transported over long distances are becoming evident in some wildlife populations, raising concerns about the health risks of traditionally-harvested foods which make up a large portion of the local diet.

The completion of a network of protected areas in the North will help ensure the protection of unique, representative areas, as well as bringing greater certainty for resource development in other areas.

The Department currently supports sustainable development in the Canadian Arctic by providing geoscience information for both

resource development and environmental protection, science and technology related to resource development, and community-based energy technologies that reduce demand for imported fossil fuels. In addition, NRCan provides logistical support for research in the North through the Polar Continental Shelf Project (see *The Arctic: NRCan's Polar Continental Shelf Project*).

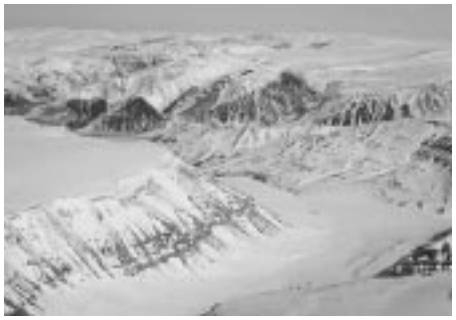
The North is undergoing extensive legislative and institutional change. Many responsibilities for resource development are being transferred from the Department of Indian Affairs and Northern Development (DIAND) to other levels of government. The changes include the devolution of powers to the territorial governments, the creation of Nunavut in the eastern Arctic, the signing of land claims agreements and the creation of Aboriginal self-government arrangements. As a consequence, local communities will have a greater voice in development decisions in the North.

Action Plan 2000

2.3 Building the capacity of Aboriginal, rural and northern communities to generate sustainable economic activity based on natural resources.

NRCan will:

1. Organize workshops on the sustainable development of natural resources as part of the Arctic Council's May 1998 International Sustainable Development Conference in Whitehorse, Yukon.
2. Assess the resource potential of frontier areas and provide a basis for sustainable development in northern communities by:
   - compiling integrated information on the geology, hazards and permafrost conditions of the Yellowknife area, by 1999; and,
   - completing a federal-territorial-Inuit supported compilation of northern Baffin Island geoscience, by 1999.
3. Deliver the First Nations Forestry Program, in partnership with Aboriginal people, to enhance self-reliance in forest management, develop forest-based businesses, and provide economic and traditional land-use opportunities on and off-reserve, between 1997 and 2001.
4. Reduce barriers that restrict the use of renewable energy in Aboriginal and remote communities through information transfer, technical training and other support.
5. Complete land surveys on Canada lands where required by DIAND for the settlement of comprehensive land claims and provide training and skills development opportunities for Aboriginal people in land management and surveying.
6. Develop, in partnership with other federal departments, provincial and territorial governments, and local communities, the ability for Aboriginal, rural and northern communities to use geospatial data and information technology to more effectively plan and manage natural resource development, land-use, and environmental and health protection.



Bryce Flynn

Aerial view of the mountains near Arctic Bay.



NRCan's Polar Continental Shelf Project coordinates aircraft and other field support in the Canadian Arctic.

During consultations in the North, views were expressed supporting the need for continued resource development but not at the expense of protecting the environment. Communities want traditional ecological knowledge incorporated into decisions surrounding resource development.

Traditional knowledge is described by the National Aboriginal Forestry Association as "a body of information about the interconnected elements of the natural environment which traditional indigenous people have been taught from generation to generation, to respect and give thanks for."

NRCan will contribute to DIAND's efforts, under its sustainable development strategy, to develop a policy for the use of traditional knowledge in resource management.

These collective changes will require NRCan to establish new partnerships in the North with emerging territorial governments and Aboriginal organizations.

S D V I G N E T T E

The Arctic: NRCan's Polar Continental Shelf Project

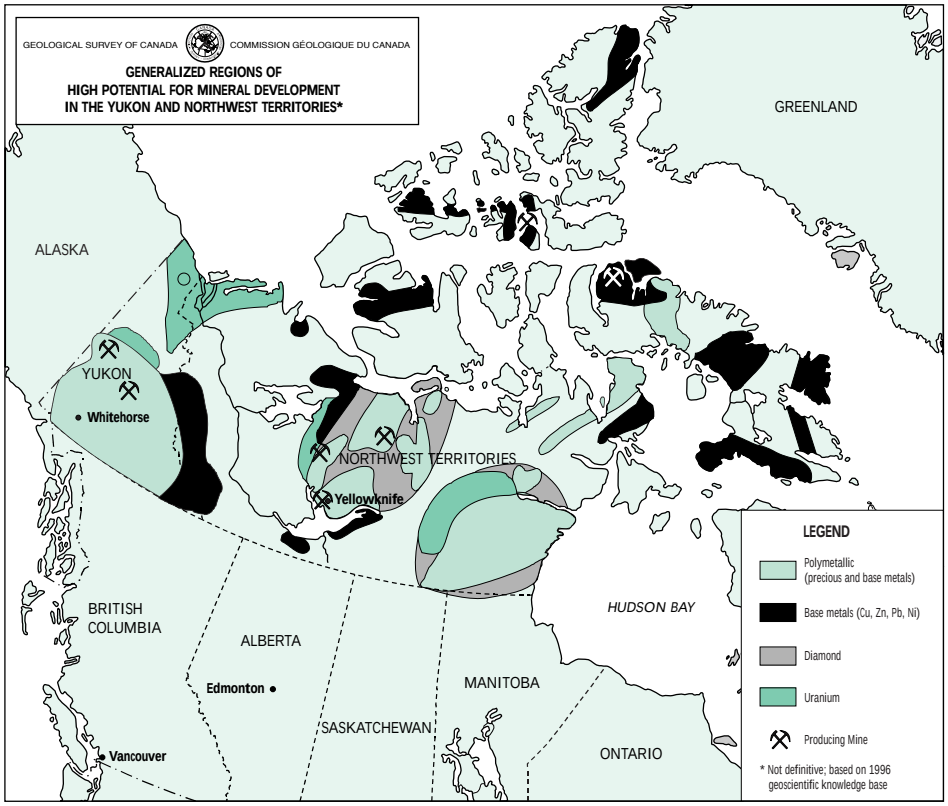
NRCan provides logistical support to numerous federal, territorial and provincial departments as well as university scientists working in the Canadian Arctic. From its bases at Resolute Bay in the eastern Arctic and Tuktoyaktuk in the western Arctic, NRCan's Polar Continental Shelf Project coordinates aircraft and other field support, eliminating the need to duplicate services and reducing costs (Figure 13).

The knowledge gained by government and university scientists has helped to:

- identify safe shipping routes into northern communities;
- establish National Wildlife Areas and Migratory Bird Sanctuaries;
- support the creation of national and territorial parks;
- identify and assess natural resources to support local economies;
- identify pollution sources and their effects on the northern food chain and human health;
- assess the impact of resource development on Arctic and sub-Arctic ecosystems;
- conduct studies into climate change; and,
- preserve and record the traditional knowledge of Aboriginal inhabitants of the North.

Figure 13

High Potential for Mineral Development in the North



Maintaining a Healthy and Safe Environment

Goal 3: Minimizing the impacts of natural resource development and use on the environment and the safety of Canadians.

The environment is constantly undergoing change – some of it as a result of natural processes, and some caused by human activity. We know the environment can adjust to human and natural stresses, provided these stresses remain within the ability of ecosystems to adapt and renew themselves. This puts the onus on us to develop natural resources in a way that respects and protects the integrity of natural ecosystems.

NRCan's Sustainable Development Objectives

3.1 Helping limit and adapt to climate change.

3.2 Promoting technologies and stewardship practices that reduce environmental impacts, conserve biodiversity and increase the efficiency of resource development and use.

3.3 Safeguarding Canadians from natural hazards and the risks associated with natural resource development and use.

3.1 Mitigating and Adapting to Climate Change

Canada, along with more than 150 other nations, signed the United Nations Framework Convention on Climate Change in 1992. The Convention's objective is to return net greenhouse gas emissions to 1990 levels by the year 2000.

Few developed countries, including Canada, will be able to meet this goal. In 1995, Canada's emissions of greenhouse gases were nine percent higher than 1990 levels. Estimates are that Canada's emissions levels will be roughly eight per cent above 1990 levels by the year 2000 – an improvement over previous estimates of 13 per cent, but above the stabilization target. (Figure 6). (See The Climate Change Challenge, in Part I.)

In 1994, Canada tabled its first National Report which outlined its responses to climate change. That was followed, in 1995, by Canada's National Action Program on Climate Change which prescribed strategic directions for governments and the private sector to address climate change science, greenhouse gas emission mitigation, and adaptation to climate change. In April 1997, NRCan and Environment Canada released Canada's second National Report.

NRCan coordinated the preparation of a Federal Action Plan on Climate Change which includes activities in the areas of energy, environment, forestry, agriculture and transportation. The federal government is committed to reducing emissions from federal operations, by at least 20 per cent from 1990 levels, by the year 2005. The Government expects to surpass this objective.

NRCan scientists are studying trees, rocks, glaciers, sediments and other materials to learn how the global climate has changed throughout history, in order to better understand and predict future climate changes. In addition, satellite imagery and remote sensing techniques help to identify and monitor climatically sensitive areas and establish a knowledge base for input to Global Circulation models.



Kiers Roelof

Mini-hydro site in Nefoundland.



Developed by Ballard Power Systems, this zero-emission bus runs on hydrogen fuel cells.

Canada's response to the climate change challenge is coordinated through federal/provincial/territorial Ministers of Energy and Environment, who developed and administer the National Action Program on Climate Change. At the group's December 1996 meeting, the Government of Canada announced 45 new initiatives and improvements to existing programs. The measures include an information program to boost fuel efficiency in transportation, regulatory measures to increase residential and commercial energy efficiency, a strengthened voluntary program and numerous initiatives to involve the public and communities in reducing greenhouse gases.

Climate change concerns extend beyond national boundaries. It is a global problem that will require extraordinary levels of international cooperation. Canada accounts for about 2 per cent of the global emissions of greenhouse gases, although it has less than one per cent of the population. As worrisome as these figures are, they are dwarfed by those of other nations. By comparison, China's emissions are expected to grow annually at a rate equal to 50 per cent of Canada's total annual emissions.

Negotiations are underway to amend the UN Framework Convention on Climate Change to include commitments by developed countries beyond the year 2000 and to increase global efforts to reduce emissions.

In December 1997, Canada will participate in the Third Conference of the Parties in Kyoto, Japan to negotiate legally-binding commitments that extend beyond 2000. In preparation for Kyoto, Canada consulted with world leaders and with provinces, territories, industry and environmental organizations, representatives from which are participating in the Canadian delegation to Kyoto. In Japan, Canada will work toward a comprehensive, legally-binding international agreement which will recognize the importance of strong actions to reduce emissions, while providing necessary flexibility so that targets can be met in the most cost-effective way.

Fulfilling any new, binding commitments agreed to in Kyoto, Japan in December 1997 will not be easy. Almost 90 per cent of our greenhouse gas emissions come from the way we use energy. This reflects the reliance of our economy on energy intensive, natural resource-based industries – approximately 30 per cent of our exports are from energy intensive industries – as well as our small population spread over a vast geographic area, our cold climate and our lifestyle choices, such as urban design.

Taking action on climate change requires cooperation from governments, industry, environmental groups, scientific agencies and the general public. Canada's action plan following Kyoto will need to be strengthened in full consultation with all Canadians, as many of the changes will have a direct impact on our lifestyles and choices as consumers, including the way we use energy to heat our homes, run our transportation and operate our businesses. Canada's response will need to be based on a clear understanding of both the economic and environmental costs and benefits.

Responding to climate change can be beneficial, by reducing the costs of doing business while spawning new business opportunities in the marketing of green technologies, services and products. Economic opportunities may open up for industries based on energy efficiency and alternative energy techniques such as vehicles powered by hydrogen fuel cells, or electricity generated from sources low in greenhouse gas emissions such as hydro, solar, wind or nuclear power.

NRCan's science and technology will play a key role in understanding and mitigating climate change. Increasingly, our scientists are identifying how Canada can adapt to the potential impacts of climate change, which could have an adverse impact on Canadian landmass, forests, water resources, agriculture and fish stocks.

Issues for further research include: permafrost – assessing the potential impact on infrastructure; groundwater – determining the impact of lower water tables; agriculture – studying the impact of soil changes and ecozone migration; and coastal zones – assessing the impact of climate change on the coastal regions of Atlantic Canada and the Beaufort-Mackenzie Region.

3.2 Reduce Environmental Impacts

Pollution prevention

The federal government has recognized that "preventative environmental care" must be the focus for the future. To prevent pollution, as opposed to cleaning it up after the fact, we must focus on the use of processes, practices, materials, products or energy that avoid or minimize the creation of pollutants and waste to reduce the overall risk to human health and the environment (Figure 14). NRCan with its scientific, technical and policy expertise develops technologies and promotes practices that minimize impacts on the environment.

Action Plan 2000

3.1 Helping limit and adapt to climate change.

NRCan will:

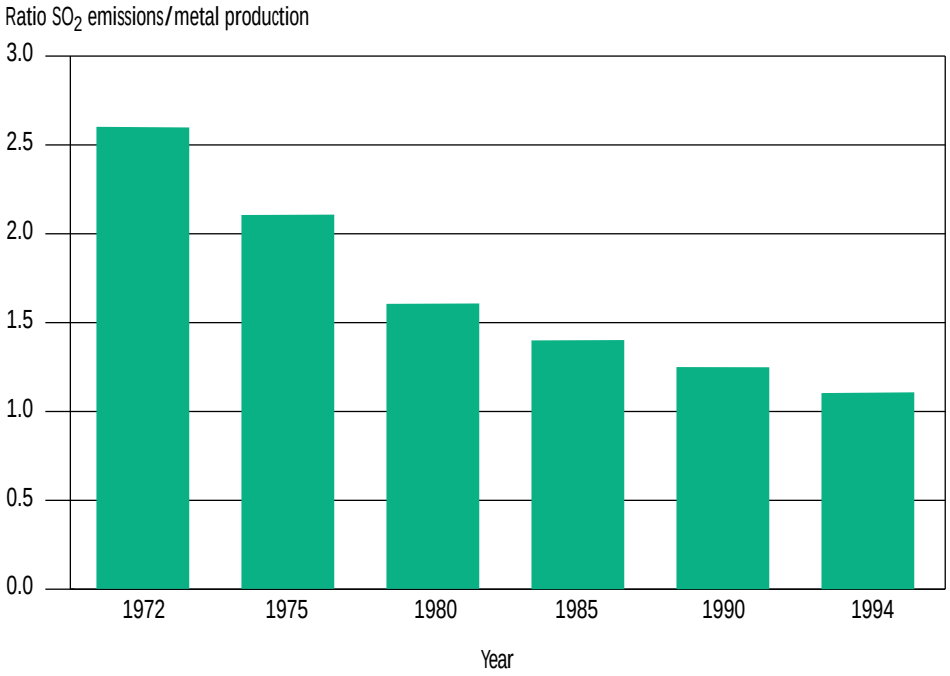
1. Update Canada's National Action Program on Climate Change to fulfill commitments agreed to at the Third Conference of the Parties in Kyoto, Japan – in partnership with provinces, industry, environmental groups and other federal departments – by 1999.
2. Organize a Technology Futures Multi-stakeholder Process to identify promising technology options and assess their potential contributions to reducing emissions, in 1998.
3. Increase the efficiency of Canada's energy use as a means of reducing greenhouse gas emissions by:
   - announcing new energy efficiency initiatives, by 1998, as a follow-up to the 1997 Budget announcement of $60 million in new funding over three years for energy efficiency and renewable energy;
   - expanding the energy efficiency regulations to cover additional equipment and increase the energy efficiency of equipment under existing regulations.
4. Broaden our scientific understanding of climate change and its impacts by:
   - completing the Palliser Triangle study in the southern Prairies; by 1999 produce a CD ROM of results and provide information for the next phase of the Canada Country Study to assess impacts and adaptation; and,
   - analyzing the impact of climate change on forest ecosystems by developing a carbon database for Canadian forest soils and associated analytical models.



Scientists from the Geological Survey of Canada extract core samples from Canada's ice caps to assess the change in climate over the past 50,000 years.

Figure 14

Average (unweighted) Ratio of SO_2 Emissions to Metal Production for Ten Base Smelters



Source: Environment Canada



Quirk Lake reclamation site – before and after.

Within the different natural resource sectors, the priority issues vary considerably. In the minerals and metals sector, the rehabilitation of mining sites is a top priority. Each year, the Canadian mining industry produces about 500 million tonnes of waste rock and tailings. Much of this is broken rock and earth and does not pose risks to the environment. However, seepage from some of these sites is acidic and can contain heavy metals which, if not treated, can threaten the environment. New technologies and practices such as those developed under the Mine Environment Neutral Drainage (MEND) program, are being developed to decommission and rehabilitate mine sites in order to abate the environmental impacts of mining operations.

In the field of energy, advanced combustion technologies are being developed to reduce emissions from fossil fuels, while the development of alternative and renewable energy sources such as wind, solar, small hydro and biomass will help reduce fossil fuel use. Although utilization of renewable forms of energy grew on average 3.4 per cent annually between 1980 and 1995, Canada still derives only about 6 per cent of its energy from renewable sources. A new Renewable Energy Strategy, released in 1996, is aimed at encouraging the increased use of renewable energy sources.

In forestry, efforts focus on developing forest practices that protect the integrity of natural ecosystems and the ecological processes necessary to their renewal. New practices include developing natural alternatives to chemical pesticides, as well as innovative harvesting techniques that replace clear cutting, to maintain aesthetic values while protecting wildlife and ecological functions. Canada's network of eleven Model Forests cover more than 6 million hectares and provide large-scale testing grounds for new, more sustainable forest practices.

Resource efficiency and recycling

Encouraging consumers to cut back consumption, and use resource products responsibly, contributes to more efficient use of Canada's resources. NRCan offers a range of energy efficiency programs from regulating the energy efficiency of home appliances to improving industrial energy efficiency through measures such as the Industrial Energy Innovators Initiative. NRCan also provides consumers with information on reducing energy consumption, such as the Auto$mart program for cars and the Reno$ense program for homes.

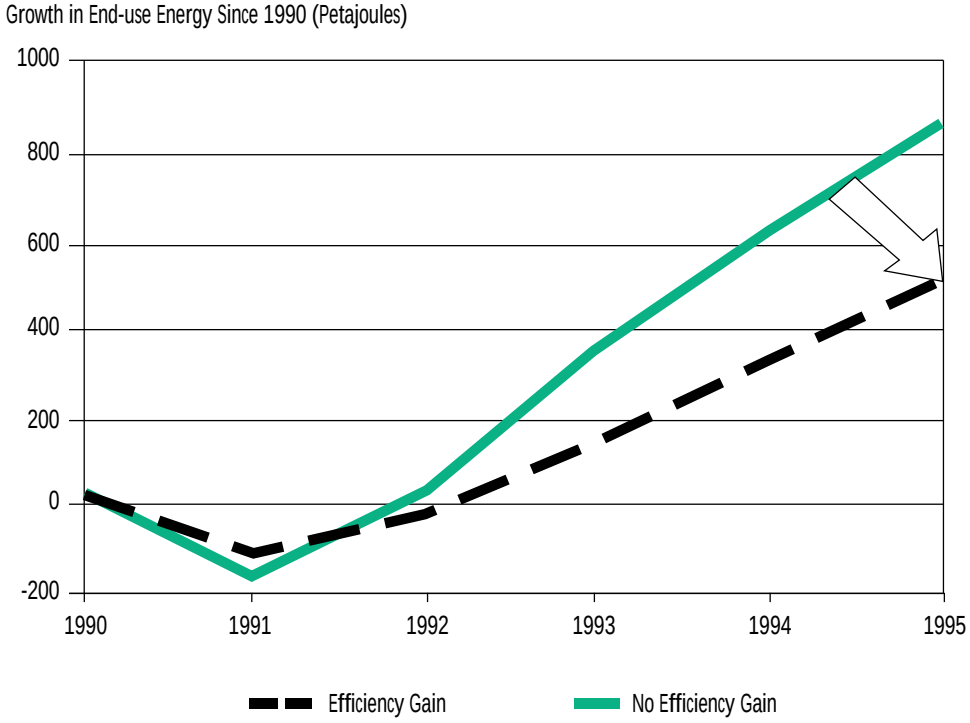
NRCan's Federal Buildings Initiative (FBI) helps federal departments to reduce energy consumption in federal facilities and encourages its replication at the provincial and community levels. The private sector will invest $125 million to upgrade federal buildings which will, in turn, reduce energy costs by $20 million annually.

The potential growth in end-use energy consumption in 1995 from 1990 levels was reduced from 12 per cent to 7.5 per cent due to energy efficiency measures – enough energy savings to heat one-third of all homes in Canada (Figure 15). These improvements in energy efficiency mean that growth in carbon dioxide emissions was 3.5 per cent lower than it otherwise would have been over the period 1990-1995. However, as a result of population growth and an expanding economy, overall energy use still increased.

Using resources more efficiently can also result in less harvesting or extraction, reduced levels of disturbance to natural ecosystems, reduced amounts of pollution and lower costs which make companies more competitive on global markets. New technologies as well as improved extracting and processing methods, recycling and re-using materials contribute to more responsible use of resources (Table 3).

Figure 15

The Effect of Energy Efficiency on Growth in End-Use Energy Since 1990



Source: NRCan

Table 3

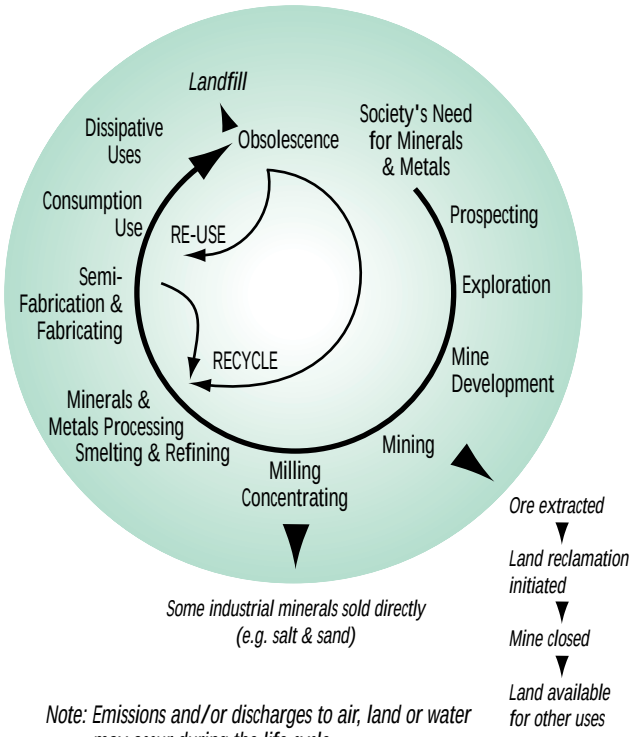
Environmental Benefits of Metal Recycling

	Aluminum	Steel
Energy Conservation	95 per cent	74 per cent
Material Conservation	79 per cent	90 per cent
Reduction in air emissions	95 per cent	86 per cent
Reduction in effluents	97 per cent	40 per cent

Source: NRCan

Figure 16

Life Cycle of Minerals and Metals

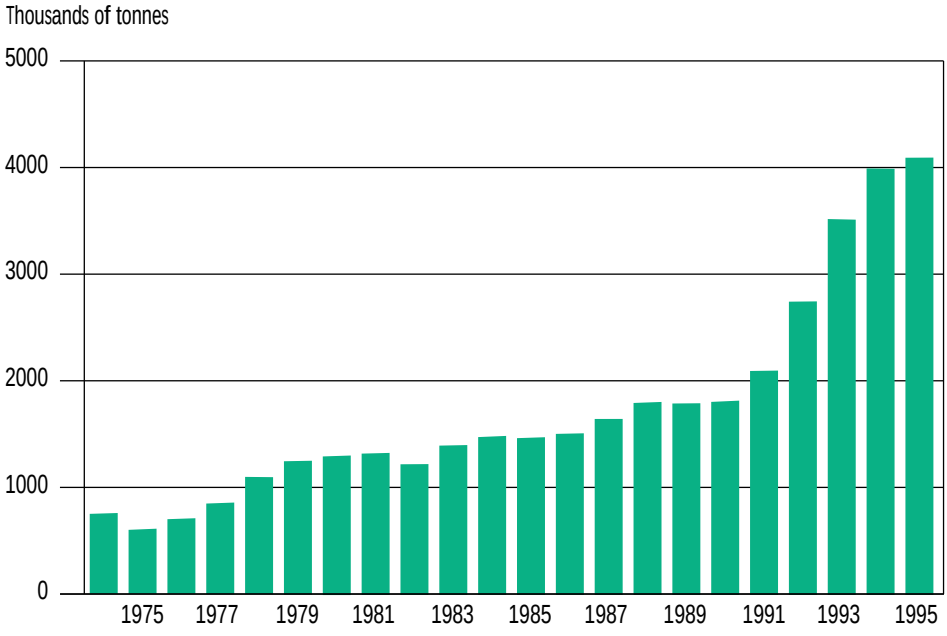


Source: NRCan

Note: Emissions and/or discharges to air, land or water may occur during the life cycle.

Figure 17

Use of Recyclable Paper



Source: Canadian Pulp and Paper Association

NRCan's policies, programs and technologies support recycling and encourage efficient resource use during extraction, processing, manufacturing and final consumption.

The federal government's Science and Technology Strategy highlights the potential of new technologies to help industry make significant gains in their **eco-efficiency** within the next generation. Eco-efficiency is a concept promoted by the World Business Council on Sustainable Development to significantly reduce the ecological impacts and resources required to produce goods and services, and to increase both economic and environmental performance. Eco-efficiency allows firms to produce more from less resources, thereby reducing costs and improving productivity.

The principle of **life cycle management** offers another tool to use resources more efficiently. The life cycle concept is a "cradle to grave" approach to thinking about products, processes and services. It recognizes that the environmental and economic impacts of resource development must be assessed throughout all stages of a product's life including extraction, processing, manufacturing, transportation, use, reuse, recycling and waste management. A life-cycle assessment can quantify the energy and resource inputs and outputs, at each stage, as the basis for improving both environmental and economic performance (Figure 16).

Recycling can extend the efficient use of forest products and metals, reduce the need to harvest or extract new sources of timber or minerals, reduce pressures on landfills and incinerators, and result in energy savings. Resource recycling is now a big business in Canada. One-half of all iron and steel produced domestically is from recycled and scrap metals. More than 11 million tonnes of metals, valued at more than $3 billion annually, are recycled in Canada. The use of recycled paper in newsprint manufacturing more than doubled in Canada between 1991 and 1995 (Figure 17).

Biodiversity

Canada was the first industrialized country to sign and ratify the International Convention on Biological Diversity. Biodiversity refers to the variety of different species, their genetic makeup and their habitat. The Canadian Biodiversity Strategy outlines how Canada will implement its commitments under the Convention. Canada's pledge to set aside 12 per cent of the country's land in protected areas will influence how we develop energy, mineral and forest resources in future. These areas must be representative of Canada's different natural regions.

Forests are particularly important to Canada's biodiversity, given that they cover one half of the country and are home to two-thirds of Canada's estimated 300,000 species of animals, plant and micro-organisms. Forests

Action Plan 2000

3.2 Promoting technologies and stewardship practices that reduce environmental impacts, conserve biodiversity and increase the efficiency of resource development and use.

NRCan will:

1. By 1998, launch a new program to encourage the use of renewable energy and develop, with industry, cost-effective renewable energy technologies such as bioenergy, small hydro, wind, photovoltaic and active solar.
2. Implement a new Post-MEND program to transfer field project technologies to prevent and reduce acidic drainage, in partnership with the Mining Association of Canada, by 1998.
3. Report on options to control the harmful effects of air emissions from copper and zinc smelters, as identified under the Priority Substances List (PSL-2) process, by 2000.
4. Develop technologies to significantly reduce the weight of automobiles by utilizing advanced applications, such as forming technologies for aluminum sheet metal application, to create more energy-efficient automobiles, in partnership with industry, by 2000.
5. Implement a second five-year phase of Canada's Model Forest Program and explore, with stakeholders, its evolution in promoting best forest practices in Canada, from 1998-2000.
6. Develop alternative harvesting practices that will provide forest managers with harvesting options to reduce the use of clear cutting as well as provide a natural means to reduce losses from insects and weeds.
7. Through Forintek Canada Corporation, conduct a study to increase the use of bark waste in wood composite material.
8. Develop an action plan to fulfill federal forestry commitments in the Canadian Biodiversity Strategy. The action plan will be developed in consultation with various stakeholders.
9. Establish a 3-year Diesel Exhaust Emission Program (DEEP) to reduce pollution from diesel exhaust, by 1998.
10. Complete a review of the international use of eco-efficiency within the natural resource sectors to identify opportunities to use eco-efficiency to improve environmental performance and competitiveness, by 1999.



NRCan has expertise and equipment to investigate the formability of sheet steel and aluminum for applications such as vehicle bodies.



Forests are particularly important to Canada's biodiversity.

stabilize the climate, recycle nutrients, clean the air and water, protect the soil, and supply food and habitat for wildlife.

The National Forest Strategy and the Whitehorse Mining Initiative (WMI) support working towards completing a national network of protected areas by the year 2000. The WMI also endorses developing scientific criteria for the selection and addition of new parks. NRCan's new Forest Biodiversity Research Network will try to develop a better understanding of how forest ecosystems maintain diversity, determining what roles are played by each species within an ecosystem and advancing strategies for sustainable development.

3.3 Safeguarding the Public

Canadians depend on a healthy environment for clean air, and safe water and food. Available information indicates the risks to health from our environment are relatively low for most Canadians.

Contributing to public health and safety comes down to reducing the risk of human exposure to harmful substances and managing the risks inherent in any such exposure. Measures currently exist to protect us from health hazards that have been recognized and documented. The challenge is to continue to refine our knowledge of existing health hazards and to evaluate and assess new threats as they emerge.

Metals and the environment

Metals occur naturally in the environment. In fact, trace amounts of a number of minerals and metals are essential to all life forms. Yet the extraction and processing, as well as particular uses, of certain minerals and metals can result in adverse effects on human health and the environment. The federal government is committed to mitigating these effects through an improved scientific understanding of the role and behaviour of these substances, and through risk-assessment and risk-management approaches.

Risk assessment includes evaluating the probabilities and magnitude of adverse effects resulting from exposure to a substance from a process or product. Risk management involves deciding what action to take, factoring in the magnitude of adverse effects as well as legal, economic and sociological factors. It also includes developing techniques for containment, mitigation and remediation.

Nuclear Safety

Nuclear-generated electricity provides close to 20 per cent of Canada's total electricity needs and over 60 per cent of the electricity requirements of the province of Ontario.

The Atomic Energy Control Board (AECB) is the federal agency responsible for ensuring that the development and use of nuclear power in Canada does not pose an undue risk to the health and safety of workers, the public or the environment. The AECB requires licensees to meet specific health, safety, environmental and security standards. The federal government has recognized the need to update the legislation governing the regulation of the Canadian nuclear industry, and, in March 1997, passed the *Nuclear Safety and Control Act*. The new law is expected to come into force in late 1998 following finalization of regulations under the Act.

In addition, the federal government finances nuclear research by Atomic

Energy of Canada Limited (AECL) to support the maintenance and safe operation of Canadian CANDU nuclear reactors at home and abroad, extend the useful life of reactors, and reduce capital and operating costs.

Nuclear power generation does not emit greenhouse gases nor produce acid rain. However, nuclear energy, like all forms of energy, has environmental impacts that must be managed. The proper management of radioactive wastes is essential. These wastes include uranium mine and mill tailings, low-level radioactive wastes, and spent nuclear fuel. AECL has developed a proposal for the long-term disposal of nuclear waste, deep underground.

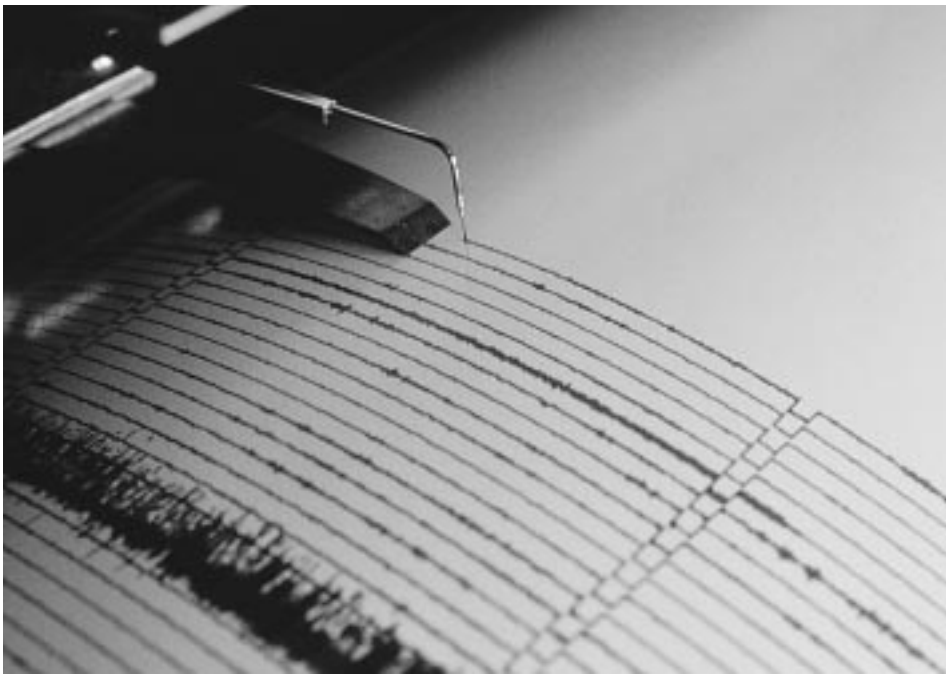
This proposal will require: public and regulatory acceptance of the proposed technologies; decisions about who should undertake and finance the disposal; and, identifying possible sites for radioactive waste disposal facilities. These activities will be carried out under the Radioactive Waste Policy Framework, approved by the Government of Canada in 1996.

Natural Hazards

Just as important as protecting the environment from human activities is the need to protect Canadians from natural hazards. Natural hazards, such as forest fires, often pose threats to human health and safety. In 1994, some 6 million hectares of forest were burned. NRCan provides tools and support systems to predict and control the impact of fires on affected communities.

Geological hazards – earthquakes, landslides, etc. – also have significant implications for both the environment and human health and safety. For example, some 400 deaths in British Columbia were directly attributable to landslides over the past 100 years. A major earthquake in Vancouver could result in damages in the range of $30 billion for infrastructure, as well as $100 billion in property damages, before the human costs of such a catastrophe could even begin to be calculated.

NRCan provides scientific information on hazards which occur naturally, and points to potential problems which could arise if development – such as the construction of pipelines, roads, dams, etc. – were to take place in high-risk zones.



Monitoring of earthquakes by the Geological Survey of Canada.

Action Plan 2000

3.3 Safeguarding Canadians from natural hazards and the risks associated with natural resource development and use.

NRCan will:

1. Modernize regulations governing the nuclear industry with respect to health, safety and environmental protection, by 1999.
2. Implement the Policy Framework for Radioactive Waste and, based on the recommendations of the federal environmental assessment report due in 1998, develop financial and institutional arrangements for the disposal of used nuclear fuel in Canada.
3. Clean-up and rehabilitate historic waste sites in Canada through the continued operations of the Low-Level Radioactive Waste Management Office.
4. Launch a new Metals in the Environment Research program to better understand the sources, sinks and pathways of metals in the environment, and the relative contribution of metals from natural and human sources, by 1998.
5. Support the creation of an International Lead Management Centre to reduce the risks to human health from exposure to lead.
6. Undertake research on risk assessment and emergency survival and evacuation procedures for frontier oil and gas exploration and development.
7. Produce a natural geological hazards atlas summarizing information on natural hazards (e.g. earthquakes, landslides) in Canada.
8. Develop models to monitor and predict the behavior of extreme forest fires that threaten communities.



NRCan conducts research in its Experimental Mine in Val-d'Or, Québec.

Putting Our House in Order

Goal 4: Establishing NRCan as a leader in the federal government in managing its operations in line with the principles of sustainable development.

The federal government is this country's largest single enterprise. The way departments operate their facilities, manage fleets, dispose of wastes, and purchase goods and services can significantly influence Canada's ability to achieve its sustainable development goals. As part of its contribution to the federal Greening of Government Initiative, NRCan is committed to integrating environmental considerations into its day-to-day activities. It will put in place environmental management systems that ensure departmental operations uphold sustainable development principles.

NRCan's Sustainable Development Objectives

4.1 Using leading-edge environmental management tools and practices for NRCan operations.

4.2 Reducing wastes from NRCan operations.

4.3 Increasing the efficiency of energy and other resource use in NRCan operations.

4.4 Promoting the use of goods and services that are eco-efficient.

4.1 Integrating the Environment into NRCan Operations

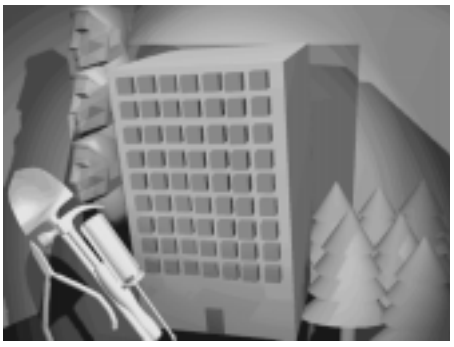
The federal government's Code of Environmental Stewardship provides guidance to departments to help them integrate environmental considerations into their management practices and operations. Each department must develop policies and practices that help guide employees in their daily decisions and activities.

NRCan has developed an Environmental Management System to ensure its operations are carried out in an environmentally-sound manner. The System outlines the organizational structure, policies, practices, procedures and resources necessary to implement sound environmental management within NRCan.

During public consultations, it was suggested that NRCan enhance awareness of environmental considerations among employees so that, over time, sustainable development becomes a conscious part of the every-day activities of both management and staff.

A top priority is to provide employees with the tools and the training required to understand their roles and responsibilities in protecting the environment. Key to achieving this goal will be the release, in 1998, of an NRCan Environmental Protection Guide compatible with the internationally approved ISO 14000 requirements. The Guide will outline the responsibilities for both managers and employees with respect to protecting the environment.

As part of this effort, NRCan will raise awareness among employees of sound environmental practices and report on departmental performance.



Action Plan 2000

4.1 Using leading-edge environmental management tools and practices for NRCan operations.

NRCan will:

1. Review and upgrade NRCan's Environmental Management System (EMS) to comply with international standards (i.e. ISO 14000 series)
2. Update and improve NRCan environmental management policies and practices by:
   - distributing a *Departmental Environmental Protection Guide* on manager and employee best practices; and,
   - reviewing and updating the *Departmental Environmental Policy*, in 1998.
3. Increase awareness among NRCan employees of best practices for environmental stewardship by:
   - creating a web-site to publicize the Department's environmental management system;
   - preparing an environmental progress report, in 1999; and,
   - measuring the changes in employee environmental awareness, by 2000.
4. Improve NRCan's environmental assessment practices by:
   - reviewing and updating the *Departmental Environmental Assessment Manual*;
   - making available a manual for the Departmental Environmental Assessment Public Registry Database; and,
   - conducting four training sessions on environmental responsibility awareness; four environmental assessment evaluations; and four environmental, health and safety audits, each year.
5. Complete an assessment of NRCan's partnerships with stakeholders, particularly the environmental and Aboriginal communities, to identify and promote best practices.



Pierre St-Jacques

Training sessions on environmental responsibility awareness will be a key action for improving NRCan's environmental stewardship practices.

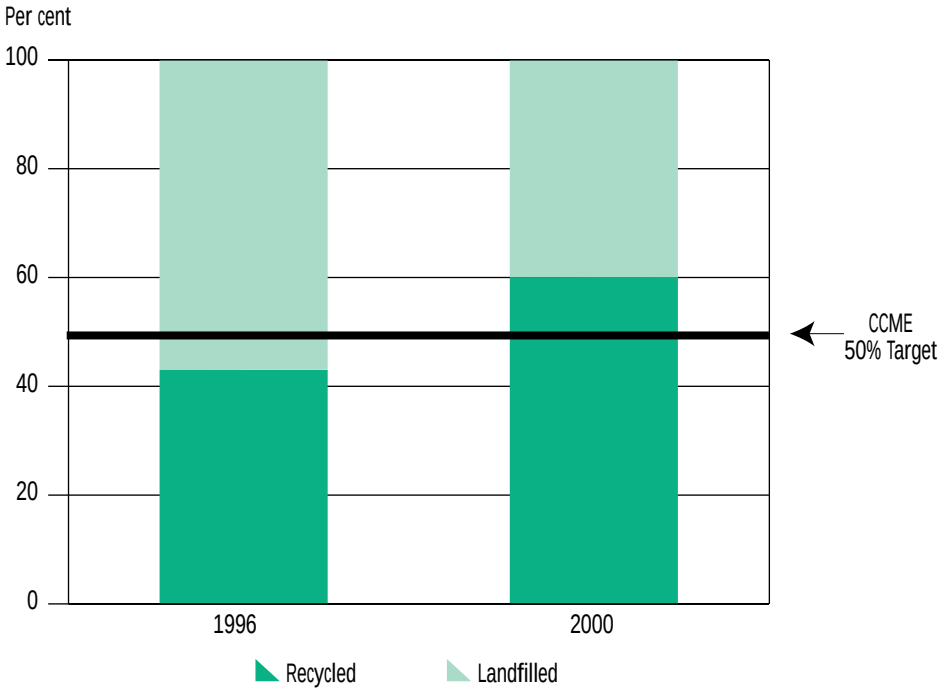
4.2 Waste Management and Reduction

Canadians spend more than $1.5 billion annually for collection and disposal of solid wastes. The federal government is committed to reducing its solid waste by 50 per cent from 1988 levels by the year 2000 (Figure 18).

NRCan's pollution prevention approach focuses on key areas including reducing, re-using, and recycling of hazardous and non-hazardous materials, composting, treatment and safe destruction of PCB wastes, and secure land filling of remaining waste.

Figure 18

Recycled Waste at NRCan



NRCan intends to exceed the goal of 50% reduction in waste by year 2000.

Action Plan 2000

4.2 Reducing wastes from NRCan operations

NRCan will:

1. Evaluate NRCan's participation in the Accelerated Reduction/Elimination of Toxics program, in 1998.
2. Safely destroy all remaining Departmental PCB wastes, by 2000.
3. Survey one laboratory facility per year for wastewater compliance.
4. Manage NRCan's Ozone Depleting Substances to meet international obligations.
5. Improve NRCan's in-house recycling program, including expanding organic waste composting.



Minister Goodale inspecting NRCan's new vertical combustor and emissions control facility – designed to separate and capture CO_2 and other pollutants.

Action Plan 2000

4.3 Increasing the efficiency of energy and other resource use in NRCan operations.

NRCan will:

1. Reduce the Departmental vehicle fleet size by 40 per cent from 1995 figures and ensure, where technically and operationally possible, that all new vehicles run on alternative transportation fuels, by 1998.
2. Reduce Departmental energy consumption by 18 per cent over 1993-94 levels, by 1999.
3. Reduce water consumption by 30 per cent over 1994-95 levels, by 2000.

4.3 Efficient Use of Energy and Water

NRCan has adopted the goal of becoming the most energy efficient department in the Government of Canada. Through its Federal Buildings Initiative (FBI) and Greening NRCan Operations Plan, the Department has discovered opportunities to minimize air emissions, save resources and reduce operating costs through better water management and energy efficiency improvements. NRCan will apply the FBI to all its facilities, using the energy savings to pay capital costs for energy efficiency improvements.

The federal government is one of the largest users of motor vehicles in Canada, consuming about 2 per cent of all energy used for transportation. NRCan is actively taking steps through its Fleet Management Program to reduce the number of its vehicles, convert the remainder to alternative fuels where economically feasible, and promote more efficient use of vehicles through such actions as car pooling.

4.4 Green Goods and Services

Procurement policies and practices can have a significant influence on waste generation. NRCan will be piloting "green" procurement training which will focus on environmental considerations when purchasing goods and services, and the role of NRCan staff involved in purchasing.

Action Plan 2000

4.4 Promoting the use of goods and services that are eco-efficient.

NRCan will:

1. Provide staff with new tools and training to promote green procurement of goods and services, during 1998.
2. Purchase green power generated from renewable and alternative sources of energy, by 1998.

Moving from Concept to Action: Making the Strategy Work

A strategy is little more than words on paper until it is put into effect. Policies must translate into actions that produce concrete results. NRCan is not only committed to implementing its sustainable development strategy, but to holding itself accountable to Canadians for its actions.

We will be putting in place the following steps to ensure implementation of the actions outlined in our sustainable development strategy:

- The Assistant Deputy Minister of the Canadian Forest Service will act as a Champion of the strategy at the senior management level and will assume responsibility for its overall implementation;
- The Department will realign the goals of its business plan to match those in this strategy, ensuring sustainable development is incorporated into the on-going planning of NRCan's business;
- Senior departmental managers will be accountable to implement specific actions outlined in this strategy. Action plans will be updated annually and included in the Department's Business Plan;
- An annual report will be prepared detailing the implementation of this strategy. This report will be reviewed by the Department's Management Committee and published on NRCan's Internet site. A summary will be part of the Department's annual report on performance submitted to Parliament;
- NRCan's performance will be reviewed by the Commissioner of the Environment and Sustainable Development in the Office of the Auditor General of Canada;
- The strategy will be updated in three years (by December 2000). Prior to that time, an independent advisory panel, made up of a cross-section of interested stakeholders, will be asked to review NRCan's progress in sustainable development against this strategy and to advise the Minister of Natural Resources on priorities for the year 2000 and beyond; and, finally,
- To gauge our Department's success, we will develop the means to measure and report on results (See Appendix B).

In the final analysis, government alone cannot effect the changes which will result in meaningful progress.

The successful implementation of sustainable development rests with every Canadian. Each of us must play our part – as better-informed consumers, as conscientious corporate and public policy decision makers, and as positive role models for our children and grandchildren.



Sustainable Development Issues: the Public View

In establishing our sustainable development priorities, Canadians must decide – as a society – just what it is we want from our natural resources and what we are willing to do to ensure their sustainability. The following section highlights what we believe to be the key issues and concerns of Canadians regarding the sustainable development of natural resources.

These issues were developed based on various consultations and analyses conducted in the past few years for undertakings including the Whitehorse Mining Initiative, the National Forest Strategy, Criteria and Indicators for Sustainable Forest Management, climate change and energy efficiency programs, as well as public opinion polls. These issues were reviewed and refined during consultations on the sustainable development strategy itself. The issues presented reflect what we believe the Canadian public perceives to be the top priorities.

Maintaining a Healthy Environment

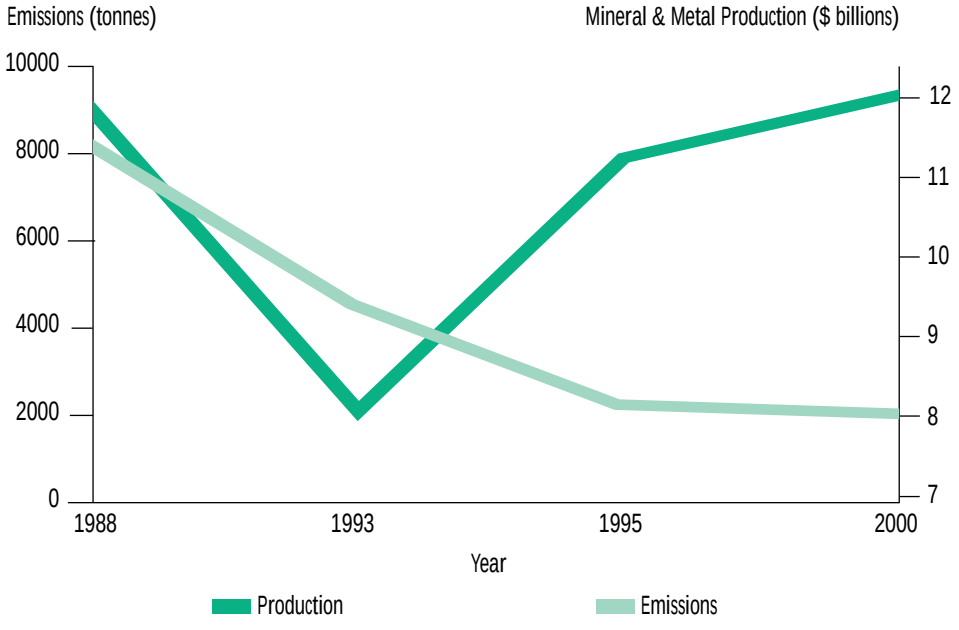
In the same way that our actions have direct impacts on the environment, the environment also has a direct bearing on human health and our quality of life. The environment is our life-support system – providing the water we drink, the air we breathe and the soils for crops and forests that we need to survive. Canadians increasingly understand our symbiotic relationship with nature, and the relationship between the environment and human health. A recent survey indicated that 64 per cent of Canadians believe their health has been affected by pollution over the past few years.

All human activity causes some degree of environmental degradation. The challenge is to minimize this degradation to a level consistent with society's values and objectives and that safe guards the ecological functions of ecosystems that support life.

More and more, Canadians recognize it is often easier and more cost-effective to prevent pollution and degradation than to rehabilitate and correct damage after it has occurred. Pollution prevention has the additional benefit of encouraging the kinds of changes that are likely to lead to lower production costs, increased efficiencies, reduced consumption of resources and more effective protection of the environment. Stricter regulations – such as those to reduce dioxin and furan formation in pulp and paper production or to ensure the safe disposal of nuclear wastes – and non-regulatory measures such as the Accelerated Reduction and Elimination of Toxics (ARET) program, can reduce risks to both the environment and human health (Figure 19 and 20).

Figure 19

ARET Emissions vs. Mining Sector Potential

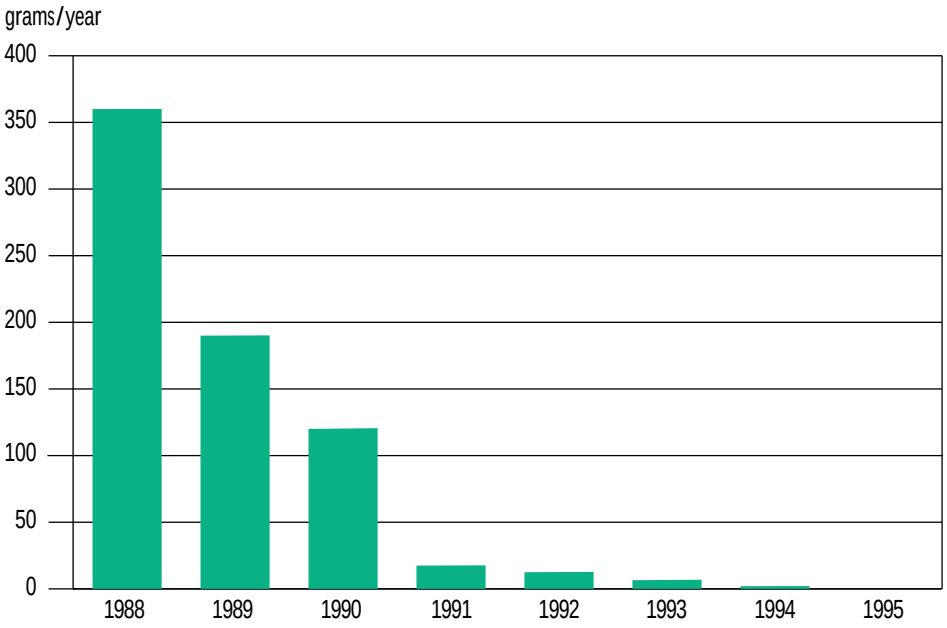


* Production figures are subject to price variations over time.

Source: NRCan and Environment Canada (Env. Can. 1996)

Figure 20

Dioxin Production from Pulp and Paper Mills



Source: *State of Canada's Forests*, NRCan.

A Non-regulatory Approach to Reducing Emissions

The ARET Challenge was launched in March 1994 by a group representing different industries, health and academic associations, as well as federal and provincial governments. Companies representing 91 per cent of Canada's base metal production and all non ferrous smelters have now joined ARET. Action plans have been submitted to reduce emissions of 12 substances by 71 per cent from 1988 levels by the year 2000. Industry estimates it may surpass this goal and achieve a 74 per cent reduction.

Creating Jobs and Building Stable Communities

Canada's wealth of natural resources is a significant contributor to our high standard of living. The energy, mineral and forest industries provide 750,000 high-paying jobs for Canadians. Another million people work for companies providing products and services to these industries such as banks, equipment manufacturers, consulting firms, investment dealers, the transportation industry and research groups. A survey in Toronto discovered 33 mining companies with head offices in that city had payrolls worth $63 million and total company revenues of close to $9 billion.

The resource sector is at the leading edge in introducing and utilizing new technologies. For instance, roughly 85 per cent of the mining workforce today uses advanced technology. The use of technology has contributed to a 69 per cent increase in labour productivity in the decade ending in 1995. While these trends create jobs in knowledge and service industries, they can also lead to job losses when traditional skills are no longer needed.

Five hundred communities depend on natural resources as their primary source of jobs and economic livelihood. A challenge of sustainable development is to promote the longer-term viability of Canada's resource communities, many of which are located in rural and remote regions. Many communities are seeking to diversify their economies, either to augment their resource industry or to replace an industry no longer viable. For example, Sudbury has developed its service economy to supplement its existing mining industry and Elliot Lake has developed its potential as a retirement community following the closure of its mining industry. Ensuring access to education, training, infrastructure, communications, capital, research and

development, and other economic development tools is vital for rural Canadians to meet their socio-economic needs.

Balancing Demands for Land Use

Communities facing development decisions frequently find themselves trying to reconcile often competing values and alternative uses that make demands on the land base. Proponents of resource development (agriculture, forestry, fisheries, energy or mining) may be competing with those promoting urban development, parks, wilderness spaces or recreation and tourism. In some areas, Aboriginal interest and title to land is still being determined through various land claims processes.

Not all land uses are mutually exclusive. Some, such as mining within an area producing timber, may be compatible. Others, such as urban development and a wilderness area, are not. An objective of sustainable development is to encourage, where practical, the co-existence of various activities – often an achievable goal with proper planning, effective property rights and good land management. Problems must be resolved through open and structured planning processes that involve local communities and Aboriginal people.

In determining whether land should be left in its natural state or developed, Canadians are confronted with the sustainable development challenge: finding ways to integrate the social, economic and environmental needs of themselves and their neighbours.

Changing Consumption

North Americans account for eight per cent of the world's population yet produce half the world's solid waste. Canadians, alone, generate 16 million tonnes of residential waste each year. This trend underscores the need to make more efficient use of natural resource products on which we depend.

Minerals, petroleum and forests form the basis for most of the durable goods we use in our everyday lives, from the most common consumer products to the latest technologies for the information highway. The lumber to build our houses, metals to manufacture high-tech medical devices, and the oil or natural gas to heat our schools and offices, are all derived from our natural resources. The sustainable way to develop these products is to gain greater knowledge of environmental impacts throughout their life cycle, make better use of natural resources at every stage of production and develop new products that reduce impacts on the environment.

As consumers, we have a direct impact on the environment in deciding what products, and what quantities of different products, we purchase. We need to adopt more sustainable patterns of consumption (i.e. reducing, recycling and reusing resource products) if we are to reduce environmental pressures while assuring continued access to necessary goods and services. The buying public must become more aware of alternative products, make better use of labeling that identifies "green" goods and perhaps pay higher prices for products that have less environmental impact.

Ultimately, it is consumers that determine demand for resource products. Consequently, our individual choices about the products we purchase determine their rate of consumption. Reducing consumption necessarily requires lifestyle changes. For example, if we want to lower greenhouse gas emissions, we must cut back on our use of fossil fuels for heating or transportation, which means not only turning down the thermostat but perhaps giving up our cars and opting for public transportation.









To assure a secure supply of high-quality products at reasonable prices, we have to find and develop resources in ecologically-sound ways, extend their lifespan through recycling, improve product design to encourage recycling, increase the efficiency of resource utilization, reduce consumption of products that consume large amounts of resources, and improve the performance and reduce the cost of renewable energy.

Meeting Our Global Responsibilities

Rapid population growth, coupled with increasing industrialization in the developing world, means that emerging economies need access to ever larger quantities of natural resources. More than 1.5 billion people will be added to the world population in the next decade. Consumption of resource products such as energy, timber and steel, which has more than doubled since 1950, is expected to continue to increase. Developing economies are growing rapidly; for example, in Asia, the number of cars is expected to increase five-fold in the next 25–30 years. The World Energy Council estimates that global energy consumption will grow by 50 to 70 per cent by the year 2020. This growth will place increased demands on the global environment.

As a producer of much of the world's natural resources and a steward of a large part of the planet's natural environment, Canada has a responsibility to develop its natural resources in a sustainable fashion. Canada, with its combination of technology, resource management expertise and environmental awareness, can benefit from growing economic opportunities in a way that meets our obligations as responsible stewards of significant portions of the earth's natural resources.

Canada's international obligations also extend to formal agreements dealing with trade, scientific cooperation and the environment. For example, Canada participated at the Earth Summit in 1992 and was a signatory to a number of international agreements, including *Agenda 21* – a blueprint for sustainable development – as well as legal conventions on climate change and biodiversity (discussed in more detail below) and a voluntary statement of principles for sustainable forestry.

Understanding and Mitigating Climate Change

Canada is part of an international effort to understand climate and climate change, and to find solutions to global warming. In 1992, Canada and 150 other countries ratified the Framework Convention on Climate Change, with the aim of stabilizing emissions of greenhouse gases (such as carbon dioxide) at 1990 levels by the year 2000. (See The Climate Change Challenge in Part I.)

Conserving Biodiversity

Biodiversity refers to the variability of plant and animal life; this includes diversity within species (genetic diversity), between species and of ecosystems. Maintaining diversity in our natural systems helps ensure that the planet's ecological systems are strong and healthy enough to withstand the stresses and changes from both human intervention and nature. In 1992, Canada was the first industrialized nation to sign the International Convention to protect biodiversity and has since developed a national strategy to promote the conservation of Canada's biological diversity.

Canada is home to an estimated 300,000 species of wildlife. The Committee on the Status of Endangered Wildlife in Canada has identified 291 species of birds, animals and plants at risk in this country. One of the leading causes is the loss of habitat due to resource development, urbanization, and

agriculture both in Canada and abroad, in wintering areas for migratory species.

Canadians want to maintain Canada's wildlife and biodiversity. In the most recent survey of Canadians' attitudes toward wildlife, 86 per cent indicated that maintaining abundant wildlife was important to them and 83 per cent agreed it was necessary to protect endangered or declining species. In 1991, Canadians spent more than $5 billion participating in wildlife related activities.

Assuring a Role for Aboriginal Peoples

Since time immemorial, Canada's land, forests and resources have met the cultural, spiritual and material needs of the Aboriginal people of Canada. The Aboriginal land ethic is deeply rooted in traditional cultural beliefs and embodies a view that land and its resources must be protected out of respect for past, present and future generations.

The sustainable development of Canada's resources is very much linked to issues such as Aboriginal self-government, land claims, Aboriginal and treaty rights in traditional territories and the responsibility of the Crown for Indian lands. As these issues are resolved through agreements with governments, greater certainty will contribute to increased cooperation among governments, industry and the Aboriginal people of Canada with respect to Canada's resources. Increased efforts must also be made to ensure that Aboriginal communities benefit from resource development in terms of jobs and economic growth.

The traditional knowledge of Aboriginal communities can bring a special perspective to the sustainable development of resources. Governments, the business sector and community organizations are increasingly working to make development decisions inclusive of Aboriginal interests and concerns.

Leaving a Legacy for the Future

Canadians' relationship with trees and lakes, mountains and seas, even the weather, is a part of the national psyche. Canadians want the peace of mind in knowing that the country's physical beauty is being safe-guarded, their continued access to natural areas is assured, and that they are leaving a legacy to their children and grandchildren which will provide them with the same good quality of life. In order to leave a healthy environment, diverse natural areas for the next generations' enjoyment, a healthy economy, as well as opportunities for development from minerals, energy and forests to meet future needs, we must make responsible decisions about development today.

Over the past three decades the amount of protected area across Canada has almost quadrupled, accounting for more than 7.9 per cent of Canada's total land and freshwater (Figure 21). The Government of Canada, in partnership with the provinces, has a goal of setting aside 12 per cent of Canada in areas that are representative of the country's land-based natural regions and of completing the national parks system by the year 2000. Deciding what areas to protect has crucial economic, social and environmental implications. Equally important is the need to ensure that the resources on the land and offshore areas outside of these protected areas are managed in a sustainable fashion.



Increased efforts must be made to ensure that Aboriginal communities benefit from resource development in terms of jobs and economic growth.

Canadians Playing a Part in Sustainable Development

Canadians increasingly want to have a voice in deciding what sustainable development means and how it should be implemented. Communities are becoming directly involved in decision-making about development, by participating in environmental assessments of resource projects or through joint initiatives with industry and governments. Sustainable development requires an integrated approach to issues including organizations with mandates in different disciplines, such as resource management, fish and wildlife, environment, as well as the economic and social domains. This new reality is driving the need to break down barriers between departments within government, and between levels of government.

It also demands much more open approaches to decision-making that encourage cooperation among governments, industry, non-governmental organizations and local communities to try to resolve the disputes and tensions that sometimes arrive in balancing different views and priorities. Decision-making processes must be fair, open and well-defined so that differing views are heard and decisions made in a reasonable time-frame.

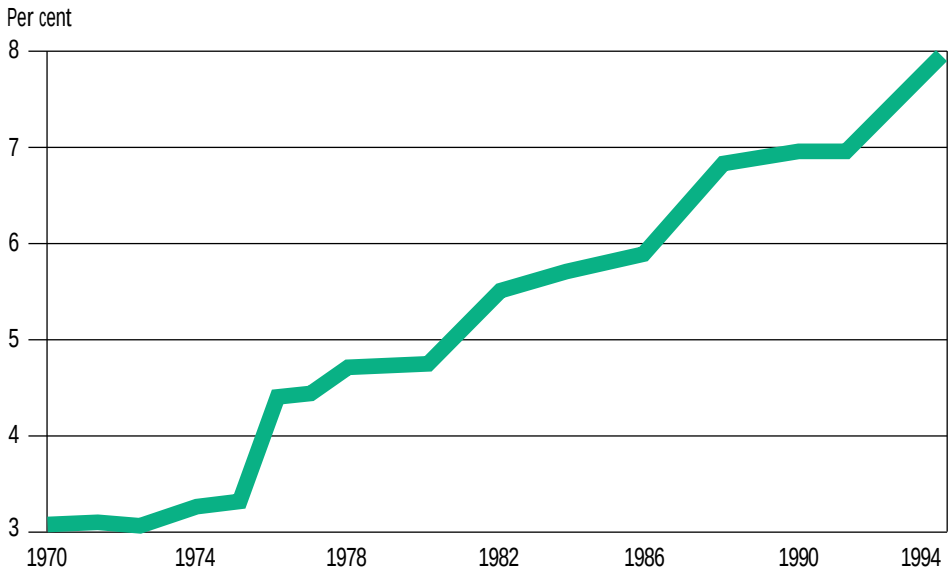
If Canadians are to play a meaningful role in sustainable development decisions, they have a responsibility to be well-informed. This, in turn, implies that they must have easy access to all the facts to make informed judgments.

There is a growing need for clear, concise and user-friendly information to gain a better understanding of the economic, social and environmental aspects of resource use and potential development.

The evolution of information technologies, such as the Internet, is making information more readily available. Community and voluntary organizations are also making information accessible to Canadians concerned about environmental issues and related social and economic considerations, providing them with an opportunity to participate in decision-making.

Figure 21

Percentage of Land Protected



Source: *State of Canada's Forests 1995*, NRCan.

Measuring our Progress

Sustainable development is a process of continuous improvement. Objectives and actions must continually be refined as new knowledge comes to light, and as new technologies and practices are developed. This knowledge compels us to act.

Sustainable development is a broad concept. As such, it is important to define more precisely what we are trying to achieve, and then put in place the means to measure and report on our progress. NRCan's work in promoting sustainable development can be assessed at three different levels:

Commitments and actions

At the most basic level, we must monitor and report on the actions and commitments made in our strategy – did we do what we said we would do? Managers within the Department will be responsible for implementing specific components of the sustainable development strategy and will be accountable for progress in their areas of responsibility. In assessing our performance, we will report on each commitment and action in the strategy.

Achievement of objectives

More difficult is the need to assess our performance against the strategy's objectives. This goes beyond merely reporting on whether a specific action was completed, to assessing whether those actions are actually helping us reach the objectives identified in this strategy.

For each of the strategy's objectives we will report on a few indicators to help assess our achievements. Table 4 contains a draft of the performance indicators we have developed to measure progress against our objectives. These indicators will continue to be further refined, over the first few months of the strategy, in consultation with stakeholders.

National progress on sustainable development

At a much broader level is the need to gauge Canada's overall progress in the sustainable development of its natural resources. This goes beyond the contributions of NRCan. It must reflect the work and efforts of all Canadians who have an interest in the sustainable development of our resources, including other federal departments, provinces, industry, scientists, environmental groups, and Aboriginal and rural communities.

At present, a framework of sustainable development indicators has been developed to measure success in the sustainable management of Canada's forests. These indicators were developed by a multi-stakeholder group, under the leadership of the Canadian Council of Forest Ministers. The framework includes six broad criteria and 86 indicators. Canada's first report on these indicators was published in 1997.

A key commitment in this strategy is NRCan's commitment to work with stakeholders to create sustainable development indicators for both the minerals and metals, and energy sectors.

These activities will complement existing efforts by other organizations to report on Canada's economic, social and environmental performance. Our goal is to develop and strengthen Canada's ability to provide Canadians with progress reports on the sustainable development of this country's natural resources.



Pierre Sxacques

Development of computer model for conducting impact analysis.

Table 4.

Performance Measures – NRCan's Sustainable Development Objectives

Goal	*Objective*	*Performance Measures*
1 Making Better Decisions *Enabling Canadians to make balanced decisions regarding natural resources.*	1.1 Creating easily accessible and integrated knowledge on the state of Canada's landmass and natural resources, and the economic, environmental, and social dimensions of their use.	1.1.1 Number of integrated databases developed by NRCan in collaboration with partners. 1.1.2 Requests for NRCan information products (number, dollar value, website visits, databases). 1.1.3 User satisfaction with value, accessibility and quality of information (user surveys).
	1.2 Promoting greater national and international cooperation and consensus on sustainable development issues and actions.	1.2.1 Participation in, and results of, national and international multi-stakeholder approaches to SD issues (e.g. NFS, WMI, Model Forests)
	1.3 Developing and promoting fiscal, regulatory and voluntary approaches that encourage the sustainable development of natural resources.	1.3.1 Participation in, and results of, voluntary SD initiatives (e.g. FBI, VCR, ARET, etc.) 1.3.2 Processes underway and number of agreements reached to harmonize regulations and standards affecting natural resources.

Table 4.

Performance Measures – NRCan's Sustainable Development Objectives

Goal	*Objective*	*Performance Measures*
2 Enhancing Long-term Social and Economic Benefits *Sustaining the economic and social benefits from natural resources for present and future generations.*	2.1 Creating economic opportunities and encouraging investment in innovative and higher-value uses of natural resources.	2.1.1 Number of NRCan-supported technologies and practices adopted by stakeholders. 2.1.2 Regular assessment of present and future supplies and use of natural resources. 2.1.3 Total funds leveraged by NRCan from shared S&T projects. 2.1.4 Economic impacts of NRCan S&T. 2.1.5 Employment levels and productivity in resource and resource-related industries. 2.1.6 Value-added in the natural resource sectors. 2.1.7 Capital investment in resource and related industries.
	2.2 Maintaining and expanding access to international markets for Canadian resource-based products, knowledge, technologies and services.	2.2.1 NRCan participation in resolving trade issues and challenges related to resources. 2.2.2 NRCan-supported technologies and practices adopted internationally (e.g. CIDA projects, RADARSAT sales, etc.). 2.2.3 Value ($) and per cent of exports of resource-based products, technologies and services.
	2.3 Building the capacity of Aboriginal, rural and northern communities to generate sustainable economic activity based on natural resources.	2.3.1 Legal surveys of land claim boundaries completed to client's satisfaction. 2.3.2 Number of partnerships and investment leveraged with rural, Aboriginal and Northern communities. 2.3.3 Number of Aboriginal peoples trained in resource management by NRCan.

Table 4.

Performance Measures – NRCan's Sustainable Development Objectives

Goal	*Objective*	*Performance Measures*
3 Maintaining A Healthy and Safe Environment *Minimizing the impacts of natural resource development and use on the environment and the safety of Canadians.*	3.1 Helping limit and adapt to climate change.	3.1.1 Number of NRCan-supported technologies in development to reduce GHG emissions. 3.1.2 Development of scientific data on climate change. 3.1.3 Trends in use of alternative and renewable energy. 3.1.4 GHG emissions from federal operations. 3.1.5 GHG emissions to GDP ratio and compared to international commitments and other countries.
	3.2 Promoting technologies and stewardship practices that reduce environmental impacts, conserve biodiversity and increase the efficiency of resource development and use.	3.2.1 Number of NRCan-supported environmental technologies and practices being developed and adopted. 3.2.2 Trends in energy efficiency by end use. 3.2.3 Forest products produced per cubic meter of wood harvested. 3.2.4 Emissions of GHG's per unit of production of conventional oil, oil sands and coal. 3.2.5 Level of liability from acid rock drainage. 3.2.6 Amount of forest and mineral products recycled.
	3.3 Safeguarding Canadians from natural hazards and the risks associated with natural resource development and use.	3.3.1 Volume and quality of information disseminated in response to natural hazards. 3.3.2 Clean up of contaminated low level radioactive waste sites.

Table 4.

Performance Measures – NRCan's Sustainable Development Objectives

Goal	*Objective*	*Performance Measures*
4 Putting Our House in Order *Establishing NRCan as a leader in the federal government in managing its operations in line with the principles of sustainable development.*	4.1 Using leading-edge environmental management tools and practices for NRCan operations.	4.1.1 Level of response to international standards in improving EMS. 4.1.2 Application of environmental audits and evaluations to NRCan operations.
	4.2 Reducing wastes from NRCan operations.	4.2.1 Amount of total waste from NRCan operations/ per capita, per year. 4.2.2 Amount of greenhouse gases from NRCan operations.
	4.3 Increasing the efficiency of energy and other resource use in NRCan operations.	4.3.1 Number of vehicles and proportion of fleet converted to alternative fuels. 4.3.2 Energy consumption in NRCan buildings per square meter, per year. 4.3.3 Water consumption at NRCan per capita, per year.
	4.4 Promoting the use of goods and services that are eco-efficient.	4.4.1 Rate of purchasing by NRCan of environmentally friendly goods and services. 4.4.2 Number of employees trained in and/or aware of NRCan's green procurement requirements. 4.4.3 Procurement of green power by NRCan.

Consultations

In August 1997, NRCan released a draft of its Sustainable Development discussion paper, *Safeguarding our Assets: Securing our future*. The discussion paper was designed to stimulate debate about ways NRCan can help Canadians make the sustainable development of natural resources a part of daily practice. It sought feedback about whether NRCan has correctly identified the issues, realistically set its goals and found workable ways to put sustainable development into practice.

Copies of the discussion paper, including the survey questionnaire, *Your Turn*, were mailed to 1200 stakeholders.

In addition, an electronic version of the paper, including questionnaire, was made available on the new sustainable development page of NRCan's web site (http://www.nrcan.gc.ca/dmo/susdev/stratdoc/tofc_e.html).

Written Responses to the Discussion Paper

NRCan received 52 written responses to the discussion paper, either in the form of letters, completed questionnaires or both. Comments were received from:

- federal government departments (7);
- provincial government departments (8);
- utilities (3);
- industry (11); and,
- non-governmental organizations (23).

Consultation Meetings

Following the distribution of the discussion paper, the Department engaged in a series of public meetings to solicit the views of partners and stakeholders. In total, five meetings were held with 70 stakeholders. Meetings were held with:

- other federal departments (11 departments);
- environmental and Aboriginal groups (12 organizations);
- industry – central and eastern Canada (14 organizations);
- industry – western Canada (9 organizations); and,
- NRCan's Earth Sciences Advisory Committee (24 participants).

North of 60

In addition to these meetings, NRCan consulted with other government departments to solicit input from the public 'North of 60.' Consultations at the community level sought input from northern residents about the impacts, issues and challenges of the sustainable development strategies being developed by the participating departments.

The 'North of 60' process, led by the Department of Indian Affairs and Northern Development, also involved the Departments of Fisheries and Oceans, Environment, Canadian Heritage, Parks, and National Defence. Public meetings were held in Inuvik, Yellowknife, Hay River, Iqaluit, Rankin Inlet, Whitehorse and Cambridge Bay. A meeting was also held in Ottawa to include groups that serve northern interests from a base in the nation's capital.

Feedback to Stakeholders

NRCan received a diverse range of views on the discussion paper. The comments of stakeholders were captured in a report, *What You Said*. NRCan mailed each respondent or meeting participant a copy of the report.

NRCan Departmental Profile

Natural Resources Canada | Ressources naturelles Canada

Organization

As a result of restructuring, NRCan has become smaller and more focused, with five (down from seven) sectors. These include:

- The **Earth Sciences Sector**, which is the government's principal agency for earth science knowledge and information. Geomatics Canada provides a reliable system of surveys, remotely-sensed data as well as geographically referenced information describing the Canadian landmass; the Geological Survey of Canada is a principal contributor to a comprehensive geoscience knowledge base of Canada; and, the Polar Continental Shelf project contributes to scientific research in our Arctic regions by providing a comprehensive logistics support organization.
- The **Canadian Forest Service**, which promotes the sustainable development of Canada's forests and the competitiveness of the Canadian forest sector for the well-being of present and future generations of Canadians. It delivers its science and technology program through ten national science research networks operating out of five regional research centers and headquarters.
- The **Minerals and Metals Sector**, which promotes the sustainable development of Canada's minerals and metals resources industry by integrating economic, social and environmental objectives. It provides policy advice, S&T, as well as commodity and statistical information in support of decisionmaking. It is also the federal government's primary source of expertise on explosives regulations and technology.
- The **Energy Sector**, which promotes the sustainable development and safe and efficient use of Canada's energy resources through its policies, programs, and science and technology. It assesses the potential economic, regional, international and environmental implications of Canada's energy production and use. It also provides technical knowledge and advice to the energy industry and to government. Its knowledge base helps the Government of Canada to formulate policies, implement regulations, enhance job and wealth creation, and meet its international commitments.
- The **Corporate Services Sector**, which provides functional direction to the Department in the effective and efficient management of resources in the areas of finance, administration, human resources, information management/information technology and environmental affairs.

In addition, there are **Strategic Planning and Coordination, Communications**, and **Audit and Evaluation Branches**, which contribute to improved performance measurement and accountability as well as an increased understanding of NRCan's mandate and programs among Canadians, clients and employees.

Departmental Mandate

By legislation, the Minister of Natural Resources Canada is responsible for:

- Coordinating, promoting, recommending and implementing policies, programs and practices pertaining to the mandate of NRCan;
- Fostering the integrated management and sustainable development of Canada's natural resources;

Earth Sciences Sector

Canadian Forest Service

Minerals and Metals Sector

Energy Sector

Corporate Services Sector



NRCan conducts leading-edge science to generate and transfer the ideas, knowledge and technologies Canada needs to use its resources wisely and efficiently, reduce costs, protect the environment and help Canadians create new products and services.

- Helping in the development and promotion of Canadian scientific and technological capabilities;
- Gathering, compiling, analyzing, coordinating and disseminating information respecting scientific, technological, economic, industrial, managerial, marketing, and related activities and developments affecting Canada's natural resources;
- Participating in the development and application of codes and standards for technical surveys and natural resource products, and for the management and use of natural resources;
- Improving remote-sensing technology and promoting the development of the Canadian remote-sensing industry;
- Encouraging the responsible development and use of Canada's natural resources, and the competitiveness of Canada's natural resource products;
- Working to widen and promote markets for Canada's natural resource products and technical surveys industries, both at home and abroad; and,
- Working in partnership with provincial/territorial governments and non-governmental organizations in Canada, and promoting cooperation among nations and international organizations.

Other Agencies

NRCan maintains a special relationship with agencies for which the Minister reports to Parliament. These agencies include the National Energy Board, the Atomic Energy Control Board, Atomic Energy of Canada Limited, the Energy Supplies Allocation Board and the Cape Breton Development Corporation. These Agencies are not included in the Sustainable Development Strategy of the Department.

NRCan Business Lines

NRCan provide services to Canadians in four principal areas:

 science and technology;

 policy and regulation;

 knowledge infrastructure; and,

 doing business in a global market.

Science and Technology

NRCan undertakes science that provides knowledge about our resources and their potential, and increases our understanding of the natural environment and how it is affected by resource development and other human activities. Research can also lead to new technologies that allow us to use our resources more wisely, for example extending the lives of resources through their efficient use and recycling, or by replacing them with alternatives.

New technologies can reduce impacts on the environment while lowering costs. This makes Canadian companies more competitive and helps create jobs for Canadians involved in providing new products and services.

Research and development is key to marketing and commercializing products and services with environmental advantages.

NRCan works in partnership with industry to improve industrial metal processing, produce new, higher-performance mineral and metal-based products, and enhance growth in the mine equipment manufacturing sector. Using the Mobile Foundry Laboratory, NRCan monitors energy consumption and foundry operations and provides recommendations to increase foundry productivity, efficiency, and competitiveness. NRCan conducts research in its experimental mine in Val d'Or

to develop equipment for greater mechanization and automation, in order to minimize mining costs and reduce the need for operators to work in potentially hazardous mining environments.

NRCan collaborates with the provinces, universities and the private sector to develop leading-edge technologies that reduce pressures on the environment, create knowledge-intensive jobs and contribute to sustainable development.

What We're Doing - Science and Technology

Securing a long-term supply of natural resources

- Through biotechnology, NRCan scientists are producing "Transgenic" spruce. This technique bombards spruce tree cells with DNA-coated micro particles that can result in trees that grow faster and are more resistant to insects and disease.
- NRCan runs NATMAP (National Mapping) to assist industry in discovering new mineral reserves and EXTECH (Exploration Technology) to extend the life of existing mines, sustaining economic growth in areas such as Manitoba and New Brunswick.

Creating new opportunities through innovation

- NRCan recently released its new Renewable Energy Strategy – a blueprint for government and industry partnerships to accelerate the development and commercialization of promising technologies.
- Canadian forest-product Parallam – a high strength wood beam made from small particles – is a world-recognized wood product. Canada is rapidly becoming a world leader in eco-housing, designing and developing energy-efficient prefabricated houses for export to markets such as Japan.
- NRCan is creating specialty materials to produce lightweight components for use in conventional automobiles as well new materials for electric vehicle batteries.

Pollution prevention and ecosystem integrity

- Through the Mine Environment Neutral Drainage (MEND) program, NRCan, in partnership with the provinces and the mining industry, is developing techniques to reduce acidic drainage from mine sites.
- The development of alternative and renewable energy can reduce emissions from the burning of fossil fuels. For example, NRCan is evaluating a 600 kilowatt horizontal axis wind turbine. One turbine can generate enough energy to supply electricity to 175–200 homes.
- Scientists are developing biological and natural alternatives to control forest pests. For example, B.t. is a natural bacterium that occurs in soils everywhere and is being used in place of the synthetic chemical fenitrothion to control outbreaks of spruce budworm.
- The Department is developing new forest harvesting and regeneration practices that are more cost-efficient and environmentally sound. The Montain Alternative Silviculture Site (MASS) is assessing the impact of alternative harvesting approaches on the productivity of industrial operations and their implications for regeneration. The project demonstrates full-scale clear cutting, patch cutting, green-tree retention and control sites.
- NRCan is developing computer models of coal fields in order to mine them in a more environmentally responsible manner.

Efficient production and use of natural resources

- NRCan's Industrial Energy Research and Development Program has produced an innovative process to manufacture high-quality, low-cost automotive parts which use 50 per cent less energy and result in 40 per cent less waste than traditional manufacturing.

International cooperation on sustainable development

- NRCan participates in the International Ocean Drilling Program, benefitting from a $60 million per year exploration program, which provides data on mineral deposits as well as core samples from the ocean that can be used to gain a better understanding of processes affecting climate change.

Climate change

- By examining ice cores, lake sediments and glacier-related features, NRCan is establishing a chronology of past climate change which is being used to calibrate global climate models, used to predict future climate changes.
- Under the BOREAS program, NRCan collaborated with NASA to examine forests in northern Manitoba and Saskatchewan, and assess their capacity to absorb carbon dioxide. Using satellites, air planes and on-the-ground towers, scientists measured how much carbon dioxide is absorbed, how much oxygen is produced and what impact the natural lifecycle of forests has on climate change.

NRCan ensures that federal policies and regulations – in areas such as the environment, trade, the economy, science and technology, Aboriginal matters and Canada lands – enhance the contribution of natural resources to Canada's economy, while protecting the environment and the health and safety of Canadians.

Policy and Regulation

Government policies, legislation, regulations, taxes and spending establish the context in which Canadians make sustainable development decisions. Governments must create a climate for society and the marketplace to make the right choices and adopt the best practices to ensure economic opportunities, while protecting the environment. Policies must also support the resource sector, as major exporters, to compete in global markets. This in turn enhances their ability to provide jobs and improve environmental performance.

Traditionally, governments have relied on direct spending, legislation and regulation to achieve their goals.

Today, there is a growing emphasis on finding alternatives such as non-regulatory approaches and economic instruments that

WHAT WE'RE DOING - POLICY AND REGULATION

A CLIMATE FOR SUSTAINABLE DEVELOPMENT

- The 1996 Budget announced improvements to the tax treatment of renewable energy and energy efficiency investments. Measures related to renewable energy serve to increase the access of such investments to financing. Consultations conducted by NRCan and Finance Canada in 1996 provided a better understanding of the impediments to energy efficiency investment. These were followed by consultations in 1997 on a new incentive mechanism.
- In response to a report of the House of Commons Standing Committee on Natural Resources, NRCan is working with other federal and provincial departments to provide a more efficient and effective environmental regulatory regime for mining in Canada.
- NRCan scientists and experts contribute to environmental assessment panels such as the one reviewing a proposal to manage nuclear waste through long-term storage in bedrock, deep underground.
- NRCan is working with the Canadian Standards Association, the Canadian Environmental Agency and others to develop national standards for environmental assessment.

SECURING A LONG-TERM SUPPLY OF NATURAL RESOURCES

- The federal government's response to the National Oil Sands Task Force has resulted in important regulatory and tax changes and a commitment to research that could lead to $25 billion in new investment over the next 25 years. NRCan is a partner in the Canadian Oil Sands Network for Research and Development (CONRAD) to address environmental issues, improve energy efficiency and reduce costs.

INCREASING THE PARTICIPATION OF ABORIGINAL PEOPLES

- NRCan and DIAND collaborated to create the First Nations Forestry Program. The program promotes the sustainable management of forests on reserve lands, provides jobs in Aboriginal communities and develops skills to access jobs off-reserve.
- NRCan works with Aboriginal communities in Ouje Bougoumou and Grassy Narrows to help them become more energy efficient through technologies such as district heating and cooling, combined production of heat and power, and waste heat recovery.
- NRCan, the Assembly of First Nations and other federal departments are cooperating on a study of sustainable energy opportunities in remote First Nations communities.
- NRCan manages and regulates the land surveys for native land claims in Canada, providing training and economic opportunities for Aboriginal people.
- The Whitehorse Mining Accord and the Canada Forest Accord encourage Aboriginal peoples' increased participation in decision-making and seek to increase their involvement in economic opportunities in forestry and mining.

EFFICIENT PRODUCTION AND USE OF NATURAL RESOURCES

- Half of all iron and steel produced in Canada is from recycled scrap metals. The number of newsprint mills using recycled content has also grown dramatically, from just one in 1990 to 20 in 1996. NRCan is working to remove inappropriate impediments to trade in recyclable materials.
- NRCan manages the R2000 program to promote the construction of more energy efficient housing. The total number of R-2000 certified houses increased from 2,621 in 1990 to 7,154 in 1995. More than 9,000 builders have been trained since the program began.
- The Department regulates the energy efficiency of many appliances. Between 1990 and 1995, the energy efficiency of new refrigerators increased by 35 per cent and by 25 per cent for new freezers.
- The recycling technology newsletter R-net is issued 4 times per year, providing information on technologies available, success stories, meetings and conferences.

Climate change

- Canada reports internationally through its "National Report" prepared jointly by NRCan and Environment Canada. Canada's second National Report was filed in May, 1997.
- In December 1996, the federal government announced 45 initiatives to strengthen the National Action Program on Climate Change, including education, technology commercialization, an enhanced VCR and regulatory measures to promote energy efficiency.
- NRCan coordinated the preparation of a Federal Action Plan on Climate Change which includes activities in the areas of energy, environment, forestry, agriculture and transportation. It also includes a commitment, with respect to federal operations, to reduce emissions by at least 20 per cent from 1990 levels by the year 2005. The Government expects to surpass this objective. NRCan assists other federal departments to use energy more efficiently and publishes an annual report on greenhouse gas emissions from federal operations.
- Under the Voluntary Challenge and Registry Program, over 700 companies and other organizations have committed to reduce greenhouse gas emissions through improved energy efficiency measures, increasing the use of alternative and renewable energy, as well as energy research and development. In December 1996, a series of measures was announced to strengthen the VCR.
- NRCan's Federal Buildings Initiative (FBI) is assisting departments to reduce energy consumption in federal facilities and encourage its replication at the provincial and community levels. The private sector will be investing $125 million to upgrade federal buildings, reducing energy costs by $20 million annually. NRCan also contributes to the development of model building code provisions to improve the energy efficiency of buildings.

Today, there is a growing emphasis on finding alternatives such as non-regulatory approaches and economic instruments that encourage developers and consumers to consider the economic and environmental impacts during each phase of resource development and use.

NRCan works with the provinces/territories and other partners to develop national strategies to guide sustainable development, such as the National Forest Strategy and the Whitehorse Mining Initiative.

The Department develops regulations in areas such as nuclear energy, energy efficiency and explosives. It also works with other federal departments including: Environment, Health, and Fisheries and Oceans to develop environmental regulations; the Department of Finance on fiscal and tax policies affecting resources; and, Indian Affairs and Northern Development (DIAND) on resource policies in northern Canada and to resolve Aboriginal issues related to land.

Biodiversity

- The National Forest Strategy and the Whitehorse Mining Initiative (WMI) support the creation of a national network of protected areas by the year 2000. The WMI also supports developing scientific criteria for the selection and addition of new parks.
- A new Forest Biodiversity Research Network is developing a better understanding of how forest ecosystems maintain diversity, determining what roles are played by each species within an ecosystem and advancing strategies for sustainable development.

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Knowledge Infrastructure

Sustainable development demands greater knowledge of the many interrelated factors that go into integrated decision-making – such as information on soils, bedrock, wildlife, water, climate and the socio-economic dimensions of resource development. Resource managers need to be able to consolidate



NRCan builds a national knowledge infrastructure on Canada's land and resources, providing Canadians with easy access to the latest environmental, economic and scientific information from a variety of sources.

What We're Doing - Knowledge Infrastructure

KNOWLEDGE FOR SUSTAINABLE DEVELOPMENT

- NRCan provides national mapping topography and remote sensing data on natural resources and the environment. This information assists in the discovery and management of resources and in identifying environmentally sensitive areas, information that is critical to the safe development of mines, roads, pipelines and other infrastructure.
- Following comprehensive consultations under the Canadian Council of Forest Ministers, Canada has developed a framework of criteria and indicators for sustainable forest management. The 6 criteria and 83 indicators provide an agreed-upon, scientific definition of sustainable forest management and identify the factors to be measured in assessing progress.
- The National Energy Use Database, working through centres established in universities across Canada, provides data on where and how energy is used, and can help identify opportunities to improve energy efficiency.

ACCESS TO INTEGRATED INFORMATION

- NRCan's National Atlas Information Service (NAIS) on the Internet is pioneering new techniques to facilitate public access to integrated data from a variety of sources. Through SchoolNet, schools have access to geographic information along with the ability to custom design maps.
- NRCan's "Factsline", an automated fax delivery system, offers over 190 documents on the minerals and metals industry.

MONITORING ENVIRONMENTAL HEALTH

- NRCan uses satellite images to provide remote sensing data on natural resources and to monitor changes to the environment. Scientists are working with provincial and local agencies to assess environmental impacts such as the mining development in Voisey's Bay, Newfoundland and the July 1996 floods in the Saguenay region of Quebec.
- NRCan has assembled computer databases that plot environmental conditions for 1,000-year intervals over the last 20,000 years, to separate natural processes and man-made factors affecting climate change. By identifying natural and man-made conditions, and demonstrating their impacts on Canada's landmass and offshore, we can predict how the environment will behave in future.
- NRCan measures and analyzes foliage samples from forest plots across the country to detect signs of damage to trees and soils that may have been caused by acid rain and ascertains long-term changes in soil and vegetation due to pollutants.
- The Aquatic Effects Technology Evaluation (AETE) program assesses technologies for monitoring effects of mine effluents on the aquatic environment.

PROTECTING PUBLIC HEALTH AND SAFETY

- In 1996, the federal government released a new Radioactive Waste Policy Framework. Through this policy, the government will work with waste producers and owners to ensure that radioactive waste disposal is carried out in a safe, environmentally sound and cost-effective manner.
- NRCan conducts major ground water surveys to identify inexpensive, plentiful and safe water sources near urban centres such as Vancouver and the Greater Toronto area.
- NRCan conducts research to improve roof control, underground environment, mine ventilation and rock bursts from mines located in Canada.
- NRCan developed the Forest Fire Behaviour Prediction System following 20 years of research and development. It allows fire managers to predict the direction and rate of spread of forest fires, thereby allowing them to dispatch crews and equipment more quickly.
- NRCan conducts research on stress corrosion cracking of high pressure oil and gas pipelines to ensure the continued safe operation of pipelines buried in soil.

that knowledge to make the right sustainable development decisions. All Canadians need access to this information to make appropriate judgments about their health and safety, the environment and economic opportunities.

NRCan provides basic knowledge, information and technologies to address both the economic and environmental aspects of sustainable development. It assists decision-makers and concerned citizens by providing conventional information products, such as mapping and reports, and increasingly makes use of the information highway to transfer high-quality scientific data to and from users. Partners and clients regularly access geo-scientific databases through the Internet and from dedicated information centres in provincial facilities.

Doing Business in a Global Market

Many environmental issues transcend political boundaries. This reality, coupled with expanding global trade, is resulting in a greater emphasis on international cooperation. Canada works with international agencies and other countries to resolve global sustainable development issues and to ensure access to markets for its natural resource products, technologies and services.

A nation's environmental performance can increasingly affect its access to markets. There is a concern that some countries may use environmental issues to act as barriers to trade. In addition, consumers are increasingly seeking assurances that the products they buy are not harmful to the environment. This has consequences for Canada, which exports more than $90 billion annually of natural resource-based products and services.

NRCan's S&T activities support the development of universally-accepted standards which help ensure Canadian natural resource products are not unduly penalized. NRCan works with the Department of Foreign Affairs and International Trade (DFAIT), international agencies, provinces/ territories, the private sector and other countries to address issues that affect the way Canada develops its natural resources.

NRCan promotes Canada's interests in cooperation with international agencies and other nations to meet our global commitments related to natural resources and to maintain access to world markets for Canadian products, technologies and services

WHAT WE'RE DOING - DOING BUSINESS IN A GLOBAL MARKET

INCREASING TRADE AND ASSURING MARKET ACCESS

- NRCan works with DFAIT and the provinces on the International Forest Partnerships Program to provide accurate and balanced information on Canadian forest practices to key markets such as Europe, the USA and Japan.
- Some countries seek assurances that the wood and paper they buy are not harmful to the environment. NRCan supports the Canadian Standards Association and the Forest Stewardship Council in developing systems to certify forest products that are produced from sustainably managed forests.

INTERNATIONAL COOPERATION ON SUSTAINABLE DEVELOPMENT

- NRCan is a member of the International Working Group on Criteria and Indicators for the Conservation and Sustainable Management of Temperate and Boreal Forests. These criteria and indicators will allow for common reporting by 12 countries on their progress in the sustainable management of 90 per cent of the world's temperate and boreal forests.
- Under the GlobeSAR Program, NRCan works closely with ten host countries demonstrating the use of RADARSAT data for tropical forest management and land cover mapping.
- NRCan, in partnership with DFAIT and the International Development Research Centre, promotes global cooperation through the International Model Forests Network. Canada is collaborating with Mexico, Russia, Malaysia and the United States to establish model forest sites in those countries.
- NRCan works with DFAIT in various international fora to honour Nuclear Cooperation Agreements on nuclear safety, technology safeguards and sustainable energy.
- NRCan participates in multilateral fora to discuss and share information on energy policy approaches and technologies, and to undertake collaborative R&D. NRCan is working through APEC and the Hemispheric Energy Initiative (HEI) to assist developing and reforming economies to put in place regulatory frameworks that encourage sustainable development and increased efficiency. NRCan also works with specific countries (e.g. China and India) to promote the development and use of efficient, environmentally responsible technologies.
- NRCan, in cooperation with the Canadian International Development Agency, provides technical assistance for numerous international aid projects, such as improving the level of environmental management expertise and services offered by foreign R&D institutions to Canadian-owned and operated mining companies in other countries. NRCan is providing technical advice to develop an Energy Efficient Buildings Strategy for China, helping to organize technical workshops on mine effluents and acidic drainage for Brazil, and developing a modern tree seed centre for ASEAN countries.
- NRCan participates in the Sound Management of Chemicals initiative of the NAFTA Commission on Environmental Cooperation.

What We're Doing - Corporate Management and Administration

Integrating the environment into NRCan operations

- NRCan is committed to the federal government's Code of Environmental Stewardship. The Department has its own strategy for greening its operations, has adopted an Environmental Protection Policy and publishes annual stewardship progress reports.
- NRCan has a verification program for environmental assessment unique in the federal government. The Environmental Assessment (EA) Evaluation program is designed to demonstrate due diligence, heighten awareness of responsibilities, and assess the Department's level of compliance and quality of assessments undertaken. Results are reported annually and are available to the public.
- EA practitioners throughout NRCan complete and file their environmental screenings by computer. A central database is maintained and data is regularly transmitted to the Federal Environmental Assessment Index as part of the Public Registry.
- NRCan recently updated its policy on environmental assessment and conducts department-wide training sessions on CEAA and the Canadian Environmental Protection Act (CEPA).

Waste management and reduction

- NRCan has conducted solid waste audits of six headquarters' facilities in the National Capital Region and eight regional facilities. The recycling program at headquarters has expanded from paper, cardboard, newsprint, glass and cans to include organic waste composting, polystyrene, batteries, fluorescent lights, wooden pallets, plastic film and containers. A 1995–96 measurement revealed that 62 per cent of the waste from its headquarters buildings is being diverted from landfill and sent for recycling.
- In 1994, NRCan was the first department to test a mechanical in-vessel composter system. From 1994–96, food waste from NRCan's Ottawa cafeteria, Agriculture and Agri-Food Canada and an Ottawa hospital was diverted from landfills and converted into a soil-like material in 28 days. A central composting facility has replaced the pilot system.
- NRCan, in conjunction with the Departments of National Defense, Transport and Environment, is cleaning up waste left behind at old scientific research sites in the Arctic dating back to the 1960s and '70s. Thousands of old oil drums have been gathered, cleaned and crushed, and other discarded waste removed from abandoned sites. The Polar Continental Shelf Project ensures that more recent sites are cleaned as research work is completed and that drums are back hauled from the field as they are emptied.
- Construction and demolition waste produced at NRCan goes through the 3-Rs process where the material is re-used internally or re-used through used-building-material suppliers. The material that is not re-used is separated and then sent for recycling. Recent NRCan projects demonstrated that waste diversion from landfill of over 90 per cent is achievable and results in a cost saving compared to traditional demolition procedures.

Efficient use of energy and water

- NRCan has set a goal of reducing its water consumption by an average of 30 per cent by the year 2000 over 1994-95 levels. A wastewater control system has been installed to ensure only neutral-pH effluent is released. NRCan has verified the condition of sewer lines and repaired defective sections.
- NRCan has a goal of reducing its energy consumption by 18 per cent from 1993–94 levels by the year 1998–99 and is undertaking work to improve the efficiency of lighting, heating, ventilation and air conditioning.
- In all facilities it occupies NRCan is specifying the adherence to the Model National Energy Code for Buildings for new construction and is also specifying that leased buildings, if constructed after 1998, comply with the Energy Code.
- NRCan is reducing the size of its fleet of vehicles by 40 per cent by 1998–99 based on 1995 figures.
- Fifteen per cent of NRCan's vehicle fleet already uses alternative fuels and 66 per cent of its recent vehicle purchases now operate on alternative fuels.
- Through the Federal Industrial Boiler Program, NRCan is helping other government departments to upgrade their facilities, thereby reducing acid gas and greenhouse gas emissions.

Green goods and services

- NRCan is developing an environmental database for an electronic catalogue to use when purchasing green materials and supplies, in order to reduce the paperwork associated with purchasing these services.
- NRCan houses the federal government's first ever "green floor" which showcases leading-edge technologies which reduce the amount of waste being sent to landfills, decrease lighting energy costs by 60–70 per cent, improve indoor air quality and lower the level of volatile organic compounds in carpeting and construction materials.
- NRCan has committed to purchasing renewable energy "green power" (power from sources) from utilities in Ontario and Alberta.

Corporate Management and Administration

Although not a business line per se, real property management is an integral part of the department's program delivery. NRCan conducts its business in an efficient and effective manner which, in the process, improves the quality of working life for its employees.

Through the federal Greening of Government Initiative, all departments are required to integrate environmental considerations into their operations and put in place environmental management systems in order to manage their operations in line with sustainable development principles. In this regard, NRCan is taking action in the following four areas:

- integrating the environment into NRCan operations;
- managing and reducing waste;
- using energy and water efficiently; and,
- procuring green goods and services.

Resource Allocations

Table 5 shows how NRCan plans to use its financial and human resources to the year 2000. The 1995–96 and 1996–97 information is for purposes of comparison. Table 6 shows this resource use, sector by sector, for each of the four principal business lines (science and technology, policy and regulations, knowledge infrastructure, and doing business in a global market).

Table 5

1995-1996 to 1999-2000 Departmental Resource Changes

($ thousands)

Resources	1995-96 Estimates	1996-97 Estimates	1997-98 Estimates	1998-99 Planned	1999-2000 Planned
Full-Time Equivalents	4,830	4,143	3,712	3,640	3,637
Total NRCan Resources	**841,473**	**522,970**	**472,172**	**444,823**	**442,106**

*** Full-time equivalents (FTE) is a human resources utilization measure based on the amount of time normally worked by a person in a 12-month period. The FTE takes into account the participation of full- and part-time workers.**



NRCan Headquarters, Ottawa.

Table 6

Provisional Allocation of Departmental Resources by Business Lines

($ thousands)

Organization/Activities

Business Lines	*Energy*	*Minerals and Metals*	*Canadian Forest Service*	*Earth Sciences*	*Administration*	*Total*
Science and Technology	76,879	23,115	84,418	35,881	8,452	228,745
1997-98	75,378	22,426	79,804	34,149	8,756	220,513
1998-99	75,511	22,572	80,141	34,107	8,757	221,088
1999-2000						
Knowledge Infrastructure	2,944	3,286	1,365	97,165	6,119	110,879
1997-98	2,816	3,149	1,365	93,221	6,016	106,567
1998-99	2,816	3,149	1,365	94,036	6,016	107,382
1999-2000						
Federal Policies and Regulations	32,366	7,353	6,515	7,832	1,223	55,289
1997-98	31,154	6,587	6,515	7,530	1,268	53,054
1998-99	31,229	6,587	6,515	7,525	1,268	53,124
1999-2000						
Promotion of International Interests	1,901	1,834	3,134	1,414	354	8,637
1997-98	1,802	1,802	3,134	1,343	392	8,473
1998-99	1,802	1,802	3,134	1,340	392	8,470
1999-2000						
Sunset/Special Programs	13,614	7,649	2,023	–	799	24,085
1997-98	9,675	1,934	1,900	–	235	13,744
1998-99	8,582	–	1,900	–	235	10,717
1999-2000						
Corporate Management & Administration	–	–	–	–	43,444	43,444
1997-98	–	–	–	–	42,011	42,011
1998-99	–	–	–	–	42,185	42,185
1999-2000						
Geomatics Canada Revolving Fund	–	–	–	1,093	–	1,093
1997-98	–	–	–	461	–	461
1998-99	–	–	–	-860	–	-860
1999-2000						
Total						
1997-98	**127,704**	**43,237**	**97,455**	**143,385**	**60,391**	**472,172**
1998-99	**120,825**	**35,898**	**92,718**	**136,704**	**58,678**	**444,823**
1999-2000	**119,940**	**34,110**	**93,055**	**136,148**	**58,853**	**442,106**

Source: Natural Resources Canada Business Plan 1997-2000.

Glossary

Anthropogenic:

Due to human activity, rather than to natural sources or processes.

Biodiversity:

The variability among living organisms; this includes diversity within species (genetic diversity), between species and of ecosystems.

Eco-efficiency:

A term developed by the World Business Council on Sustainable Development. Eco-efficiency is reached by the delivery of competitively-priced goods and services that satisfy human needs and bring quality of life, while progressively reducing ecological impacts and resource intensity throughout the life cycle, to a level in line with the earth's estimated carrying capacity.

Ecosystem:

A dynamic system of plants, animals and other organisms, together with the non-living components of the environment, functioning as an inter-dependent unit.

Ecosystem integrity:

The quality of a natural un-managed or managed eco-system in which natural processes sustain the function, composition and structure of the system.

Pollution prevention:

The use of processes, practices, materials, products or energy that avoid or minimize the creation of pollutants and waste, and reduce the overall risk to human health or the environment.

Precautionary principle:

A principle in the Rio Declaration from the 1992 UN Conference on Environment and Development that states: "where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation".

Wildlife:

All wild life, including wild mammals, birds, reptiles, amphibians, fish, invertebrates, plants, fungi, algae, bacteria and other natural organisms.

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