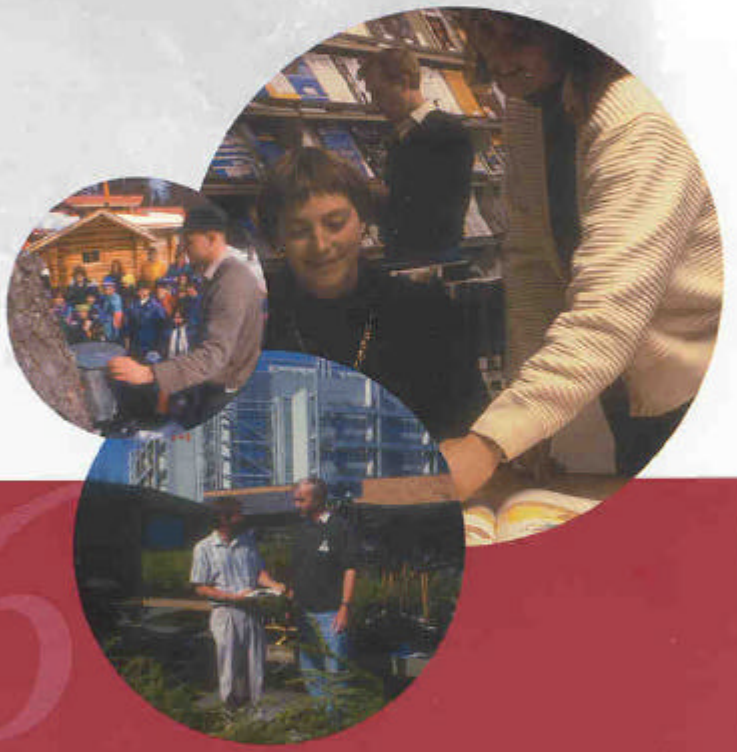
Information for Decision Making in Sustainable Development



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Canada

INFORMATION FOR DECISION MAKING IN SUSTAINABLE DEVELOPMENT

A Canadian contribution to the dialogue at the Ninth Session of the United Nations Commission on Sustainable Development, April 16 to 27, 2001

Ottawa, Canada

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Contents

PREFACE v

INTRODUCTION 1

CANADA'S COMMITMENT TO SUSTAINABLE DEVELOPMENT 1

NEEDED INFORMATION 2

BRINGING INFORMATION TOGETHER 3
- Harmonizing Information Nationally 3
- Integrating Information Geographically 4
- Integrating Traditional Knowledge 5

BUILDING INFORMATION SYSTEMS AND TOOLS 6
- Canadian Information System for the Environment 6
- Core Data Sets 7
- Indicators to Track Sustainable Development 8
- Information Networks and Partnerships 9

IMPROVING PUBLIC ACCESS TO AND USES OF INFORMATION 13
- Public Access 13
- Public Awareness 15
- Community Action 16
- Public Participation in Decision Making 16

RECOGNIZING WEAKNESSES IN INFRASTRUCTURE AND INFORMATION 18

SUPPORTING NEW INFORMATION TECHNOLOGIES 19
- Remote Sensing and Space Technologies 19
- High-Speed Connectivity and Network-Based Information Systems 20

STRIKING PARTNERSHIPS TO FINANCE AND SHARE INFORMATION FOR SUSTAINABLE DEVELOPMENT 21
- Domestic Partnerships 21
- Global Information Networks 22
- Partnerships with Developing Countries 23

LOOKING FORWARD 25

SELECTED READINGS 26

WEB SITES 28

Preface

At its ninth session in the spring of 2001, the United Nations Commission on Sustainable Development (CSD) will review progress made by member countries with respect to sustainable energy development and transportation systems as outlined in Chapters 7 and 9 of Agenda 21 and the Energy, Transport, and Atmosphere section of the Programme for Further Implementation of Agenda 21. The Programme of Work for CSD 9 also includes information for decision making and participation, as well as atmosphere and international cooperation for an enabling environment as key cross-sectoral themes for review and action. As a contribution to the CSD 9 dialogue, Canada has prepared a series of three monographs relating its experiences and challenges on energy, transportation, and information for decision making.

Energy is necessary to most forms of economic and social activity. Canada is an energy-rich nation, with substantial resources of oil, natural gas, coal, and uranium, as well as renewable energy sources such as hydro, wind, solar, and tidal power. While energy will continue to fuel economic activity and social development in Canada and other nations, its production and consumption will also present environmental challenges. The first monograph in this CSD 9 series, *Energy and Sustainable Development: A Canadian Perspective*, examines the issue of energy and sustainable development from both domestic and international standpoints. It describes Canada's efforts to improve the efficiency of energy production and use and to develop and promote alternative fuels and processes that minimize environmental impacts. The monograph confirms Canada's commitment to work with other members of the global community to foster energy options for sustainable development worldwide.

As a vast trade-dependent and modern country with a challenging climate and rugged terrain, Canada must be able to rely on a sustainable transportation system—one that is safe, efficient, and environmentally friendly. The second monograph in this CSD 9 series, *Sustainable Transportation: The Canadian Context*, describes the state of transportation in Canada and highlights Canadian activities that are moving us toward a more sustainable transportation system.

Access to pertinent and reliable information—social, economic, and environmental—is critical to good decision making related to sustainable development. *Information for Decision Making in Sustainable Development*, the third in the CSD 9 series, illustrates the work Canada is doing on many fronts to improve the quality of, and access to, the information needed by citizens, businesses, and governments to make better decisions and take action to support sustainable development. From grassroots community awareness to sophisticated analysis for high-level policy development, Canada is meeting the challenge to bridge the data gap and improve the availability of information.

In 2002, the CSD will undertake a ten-year review of the overall progress achieved by member states in their implementation of Agenda 21. Information offered in the Sustainable Development in Canada Monograph Series describes Canada's contribution to global efforts toward sustainable development and provides a baseline against which future conditions and activities can be assessed. For Canada, sustainable development is best represented as a journey, not a destination. The monographs described above, as well as the other monographs in the series, are milestones on this journey.

INFORMATION FOR DECISION MAKING IN SUSTAINABLE DEVELOPMENT

INTRODUCTION

Realizing sustainable development is everyone's responsibility. In a sustainable society built on good decision making, everyone is a user and sharer of information. At the grassroots level, individuals, businesses, and communities need reliable information to help them make decisions that better mesh social, economic, and environmental considerations. Governments need information to formulate sustainable development policy and practice and to satisfy the demands of the many information users they serve, from citizens and small organizations to multinational trade and regulatory organizations. And international bodies need information to measure the world's progress toward environmental stewardship, fair trade, and acceptable living standards for all.

Canada takes a vital interest in the production and dissemination of information that promotes sustainable development at all levels—in our homes and businesses, in our government operations, and through our international relations. This monograph provides an overview of Canada's work to meet the two main information objectives identified in Chapter 40 of Agenda 21—bridging the data gap and improving the availability of information for decision making related to sustainable development. It begins by describing Canada's commitment to sustainable development and the kind of information we need as we work toward sustainable development. It then goes on to demonstrate Canada's national progress in the areas of bringing information together, building information systems and tools, improving public access to and use of information, recognizing weaknesses in infrastructure and information, supporting new technologies, and striking partnerships to finance and share information for sustainable development at home and abroad.

CANADA'S COMMITMENT TO SUSTAINABLE DEVELOPMENT

Governments—through their policies, legislation, and regulations, as well as through their taxes, subsidies, and spending—establish the context in which Canadians make their decisions. By developing

converging social, economic, and environmental issues, governments can demonstrate the sustainable development approach to decision making to individuals, businesses, and interest groups. Governments are also in a unique position to gather, interpret, and distribute information for decision making and to lead by example, by improving their own environmental performance.

The Government of Canada takes an integrated approach to planning and decision making for sustainable development, involving full-cost accounting, environmental assessment, and ecosystem management. It bases its decisions on the best science and analysis available, seeking to embody the visions and expectations of Canadians and working in partnership with individuals, groups, and other governments. It uses a variety of policy measures, including voluntary approaches, information and awareness tools, and economic instruments, to achieve its sustainable development goals.

In 1997, federal departments were required for the first time to table in Parliament a three-year sustainable development strategy that outlined departmental objectives and an action plan for integrating sustainable development into policies, programs, and operations. These strategies are critical for advancing the Government of Canada's sustainable development agenda and for measuring progress against it. The strategies must be comprehensive, results-oriented, and developed in consultation with clients and other stakeholders. Departments have now assessed their progress against their performance objectives and are currently developing the next generation of sustainable development strategies.

Two other important federal policy initiatives support sustainable development. The National Sustainable Development Policy Research Program, targeted at both government and academia, seeks to build on the foundation of knowledge, increase the capacity for policy research, and generate a network of experts in sustainable development. Strategic environmental assessment is a policy assessment tool that requires federal departments to consider the environmental implications of all policy, plan, and program proposals.

Canada's First National Climate Change Business Plan

A good illustration of Canada's commitment to sustainable development is the recently announced First National Climate Change Business Plan. The measures to reduce greenhouse gas emissions outlined in the plan set the course for action in all sectors of the Canadian economy, encourage action by industry and consumers, and lay the groundwork for long-term behavioural, technological, and economic change. When fully implemented, the plan will take Canada one third of the way to achieving the target established in the Kyoto Protocol and help Canada to become a leader in sustainable development, particularly in the production and use of all forms of energy.

NEEDED INFORMATION

What kind of information is needed to support our decisions for sustainable development? Decision makers at all levels need information on the current performance of any given system, why it is behaving as it is, what performance level is satisfactory, and

whether the actual performance measures up to this standard. They need information on developing trends and pressure points and on how the system is likely to behave in the future in response to changing policies and other driving forces. They need feedback on what adjustments to make to speed up or slow down the effects of interventions. And they need information about milestones achieved or about failures that have frustrated progress. Providing decision makers with the information they need promotes better decisions about whether and how to change the system.

BRINGING INFORMATION TOGETHER

Because sustainable development involves all sectors of society, the information needed for decision making is both vast and varied. Integrating data, information, and knowledge from various social, economic, and environmental subject areas and from various regions into an appropriate information base to address a sustainable development issue requires specialized expertise. Scientific study and analysis in the areas of economics and the natural and social sciences provide the basic data needed to understand the state and performance of a system. These data may be gathered in many ways. For example, environmental data may come from scientific measurement in the field, technologies such as airborne and satellite remote sensing, or the traditional knowledge of Aboriginal peoples.

Scientific data can then be integrated with tools, such as indicators, predictive models, and intelligent systems, that are useful in following the progress of a system under various stresses and in predicting future performance. Knowledgeable people are then needed to interpret the information base in a way that best represents the issue and to place it in the proper sustainable development context. This interpretation must be easily communicated to policy makers, the public, and stakeholders to inform of the decisions that build strategy and produce action at all levels.

Harmonizing Information Nationally

In Canada, sustainable development is the jurisdictional responsibility of all levels of government. Mechanisms are needed to ensure that work toward sustainable development at all government levels is mutually supportive and has a common goal. One such mechanism is the Canadian Council of Ministers of the

New Standards for Particulate Matter and Ground-level Ozone

The Canada-wide Environmental Standards Sub-Agreement under the Canada-wide Accord on Environmental Harmonization sets out principles for governments to jointly agree on priorities, to develop standards, and to prepare complementary work plans to achieve those standards, based on the unique responsibilities and legislation of each government. In June 2000, the Government of Canada, the provinces, and the territories adopted the new Canada-wide Standards for Particulate Matter and Ground-level Ozone that set ambient air quality concentration targets for ground-level ozone and fine particulate matter for 2010. In addition to measures for vehicles, fuels, and solvent-containing products, Environment Canada is working with the provinces and territories to develop comprehensive emission reduction strategies for a number of major industrial sectors in Canada.

Environment (CCME), which brings together environment ministers from the federal, provincial, and territorial governments for discussion and joint action on environmental issues of national and international concern. The recently released Canadian environmental quality guidelines, which provide a nationally consistent scientific basis for protecting and sustaining the major beneficial uses of land and water, are one example of the CCME's coordinated action in addressing environmental issues across Canada. In 1998, the CCME committed to a new approach to environmental management in Canada when all jurisdictions except Quebec signed the Canada-wide Accord on Environmental Harmonization, under which many sub-agreements are being struck on a wide range of important environmental management issues. Recent work under the accord has resulted in the new Canada-wide Standards for Particulate Matter and Ground-level Ozone and an agreement in principle on standards to deal with priority toxic air contaminants in the Canadian environment, including mercury, benzene, dioxins, furans, and petroleum hydrocarbons.

Integrating Information Geographically

Because human–environmental interaction exhibits variability over space and time, many sustainable development issues can be examined in a geographic context. Integration of spatial and temporal data contributes to the understanding of the geographic nature of sustainable development issues. Technological advancements in satellite positioning and information systems are improving the means by which we collect, integrate, analyze, and share data. Together with these technologies, new forms of communications, including high-speed connectivity, are paving the way for real-time integration and access to spatial knowledge.

Advancements to support data integration are also occurring through the development of data standards, policies for data exchange and consistency, and framework data sets such as Canada's National Ecological Framework.

The Canadian Earth Observation Network (CEONet) and The National Atlas of Canada are Canadian initiatives that facilitate access to national-scale geographic information in digital and conventional maps that reflect the social, economic, environmental, and cultural fabric of Canada. The Canadian Geospatial Data Infrastructure, which includes tools and a national set of standards and policies for national and continental consistency and high accuracy, is evolving to meet the demands and opportunities related to geospatial information.

Canada's National Ecological Framework

Canada's National Ecological Framework divides Canada into several levels of detail. From the broadest to the smallest, the hierarchical classification consists of ecozones, ecoprovinces, ecoregions, and ecodistricts, which are based on climate, vegetation, landform, soils, wildlife, and land use factors. Fifteen ecozones were first defined on a subcontinental basis to meet the reporting requirements of the first state of the environment report for Canada in 1986. Ecozone, ecoregion, and ecodistrict boundaries were refined in 1995 by a team of land resource specialists from government agencies across Canada and subsequently used in the 1996 report on the state of Canada's environment.

GeoConnections

GeoConnections is the Government of Canada's initiative to build a Canadian infrastructure for geospatial information, developed collaboratively and available on the Internet. One major thrust of the initiative is to establish a framework of core data layers that can be integrated consistently for decision making in areas as diverse as resource management, marine navigation and charting, traffic and transportation, business planning and operations, public health, public safety and disaster management, emergency response, property mapping, and environmental assessment. Matching international standards is a key goal.

Integrating Traditional Knowledge

A diversity of world views supports human adaptability and resilience. The Government of Canada recognizes and values the knowledge that Aboriginal communities have built over the millennia and is seeking new ways to apply this knowledge to the challenges of sustainable development. Traditional ecological knowledge can provide long-term and detailed data about wildlife resources and ecological processes on lands and waters. Such knowledge is increasingly being twinned with modern science to complement the perspectives of each. One example is the Inuit Knowledge Study in Canada's newest northern territory, Nunavut.

Inuit Bowhead Knowledge Study

Under terms of the Nunavut Land Claims Agreement, the Nunavut Wildlife Management Board undertook a project from 1995 to 1999 to document Inuit knowledge of bowhead whales in the Nunavut Settlement Area. Through an extensive series of interviews and workshops with Inuit elders and hunters, information was gathered on the history of whaling in the area; the seasonal distribution, trends in abundance, ecology, and behaviour of bowhead whales; and the cultural and traditional importance of these whales to the Inuit.

Because the bowhead whale has been so important to the culture and survival of the Inuit until recent years, most Inuit would like to see the bowhead hunt resumed. They believe a renewed hunt would both revitalize Inuit culture, restoring old knowledge and traditions, and become an important component in a successful strategy for conservation of the bowhead in Nunavut. This study concluded that a limited and ongoing bowhead hunt is feasible using a regionally based management system.

Photo credit: Johnny Nowdlak.

Using these same principles, the Canadian International Development Agency has worked with the International Labour Organization, the World Bank, and KIVU Nature Inc. to develop a set of guidelines on the use of traditional knowledge in development planning. These guidelines enhance the depth of information on which decisions are based, promote the cooperation and mutual understanding of all peoples involved in and affected by such decisions, and respect the traditional rights of Indigenous peoples.

Other initiatives in Canada that promote the value of traditional knowledge include the following:

- the University of the Arctic
- the Aboriginal Health Institute, which focuses on health information and research, traditional health and healing, health policy, capacity building, and public education
- the Community Fisheries Workers Project, sponsored by Fisheries and Oceans Canada, in which Aboriginal organizations demonstrate cooperative fisheries management at the community level
- the First Nations Furbearer Monitoring Project under the Canadian Rural Partnership, which will employ local First Nations trappers and youth to gather data to monitor the population density of furbearing mammals in part of Kluane National Park and Reserve.

University of the Arctic

In October 1998, Ministers of the Arctic Council announced the establishment of the University of the Arctic. A partnership of academic institutions, Indigenous peoples organizations, the Arctic states, and other stakeholders, the university is designed to meet the needs of northern peoples as they face the challenges of greater global influence. Once operational, it will serve the northern community by helping to protect fragile ecosystems, preserving traditional cultures and languages, developing a sustainable basis for northern societies, building new political frameworks, understanding North–South relationships, and enhancing the northern voice in global issues.

BUILDING INFORMATION SYSTEMS AND TOOLS

Canadian Information System for the Environment

As part of its commitment to improve environmental decision making and accountability, the Government of Canada has established a national task force on a Canadian information system for the environment. The report of the task force, expected in October 2001, will provide a vision and a design for an integrated national system for environmental information, which will be linked to existing and planned information systems for economic, health, and social information. The system will span the collection, management, assessment, and communication of environmental

information that responds to the needs of a broad range of users, including citizens, policy makers, and resource managers.

Core Data Sets

Core data sets form the foundation on which sustainable development information is built. These data sets take years to build and must evolve to meet changing demands for information. Following are examples of national databases that are maintained in Canada.

Land and Soil Resources

The National Soil DataBase, maintained by the Canadian Soil Information System of Agriculture and Agri-Food Canada, is the national archive for land resources information on soil, landscape, and climate, collected by federal and provincial field surveys or created by land data analysis projects. The database includes GIS coverages at a variety of scales and the characteristics of each named soil series.

Topography

The National Topographic Data Base is a digital data base developed by Geomatics Canada of Natural Resources Canada. It covers the entire Canadian landmass and contains the features normally found on topographic maps at the scales of 1:50 000 and 1:250 000: hydrography, hypsography (contours), vegetation, the road network, the rail network, the electric power network, designated areas, land forms, wetlands, and anthropogenic features.

Energy

The National Energy Use Database Initiative supports the development of energy end-use data in all sectors of the economy by reviewing existing data and assessing information needs, expanding existing surveys or creating new ones to meet these data needs, and establishing energy end-use data and analysis centres at selected universities in Canada.

The Energy Statistics Handbook, jointly published by Natural Resources Canada and Statistics Canada in both print and electronic format, provides current monthly and historical annual energy data covering the last twelve years. It is a compendium of energy-related general indicators; data on energy commodity reserves; monthly and annual primary energy demand and supply data; energy trade, demand, and supply balances for individual energy commodities; and pricing and capital expenditure data.

Indicators to Track Sustainable Development

Sustainable development indicators are useful integrative tools that measure our progress toward sustainable development and signal whether we are heading in the right direction. They provide a bridge between the detailed data found in core data sets and interpreted information. Three indicators shed light on the economic, social, and environmental aspects of the sustainability of a system:

- the driving forces (e.g., pressures from human activities, process, and patterns) that society places on the system environmentally, economically, and socially

- the resulting state of the environment, economy, and social systems

- the human response to this state, with measures such as government policy, business activity, and citizen action.

The United Nations Commission on Sustainable Development approved a work program on indicators of sustainable development at its third session in 1995. In this program, Canada provided expert advice in the identification of indicators, the evaluation of the indicator methodology sheets, and the capacity-building phase. Countries from all regions of the world tested the indicators over a three-year period, and subsequently Canada participated in a small group of experts to prepare a final framework, themes, and a core set of indicators for sustainable development. Canada's support for international sustainable development indicators also includes work on the Organisation for Economic Co-operation and Development's environmental, agri-environmental, and sustainable development indicators and on the Montréal Process's criteria and indicators for sustainable forest management. In September 2000, Canada and the United Nations Department of Economic and Social Affairs and the United Nations Environment Programme hosted an International Expert Meeting on Information for Decision Making and Participation at which there was a special session on indicators for sustainable development.

At the national level, Canada has a number of indicator initiatives to track different aspects of sustainable development. The following are three examples.

- The National Environmental Indicator Series reports on indicators for environmental issues of national significance in the areas of ecological life-support systems, human health and

well-being, sustainability of natural resources, and pervasive influencing factors.

- The national agri-environmental indicators relate to issues of environmental farm management, soil quality, water quality, greenhouse gas emissions, agroecosystem biodiversity, and production intensity.

- The Canadian Council of Forest Ministers recently published *Criteria and Indicators of Sustainable Forest Management in Canada: National Status 2000*, which reports on indicators in the areas of conserving biological diversity, ecosystem condition and productivity, conserving soil and water resources, global ecological cycles, multiple benefits of forests to society, and society's responsibility.

Recognizing the importance of integrating economic and environmental information, Statistics Canada publishes a set of environment and natural resource accounts that are used to derive a set of ten environment–economy indicators. These accounts and indicators are based on an approach that focuses on trends in stocks of natural resources and ecosystems and trends in their consumption and quality. Canada's federal budget in 2000 provided three-year funding to the National Round Table on the Environment and the Economy to develop sustainable development indicators, with the cooperation of Environment Canada and Statistics Canada. These indicators are intended to integrate environmental and social considerations into economic decision making by governments, business, and civil society and to track progress toward sustainability. Work to create the indicators will build on existing sustainable development indicator research, support further research, and engage a broad range of experts, stakeholders, and the general public in the process.

Information Networks and Partnerships

The Government has also created a variety of networks, such as the Network for Health Surveillance in Canada, that provide a means for professionals to share information in their field. Well-functioning networks go beyond having the right hardware, software, and databases. They are underpinned by a set of dynamic relationships and understandings among users who are dedicated to sharing information and to rendering mutual assistance. Following are

Canada's Agri-Environmental Indicators

Agri-environmental indicators are measures of key environmental conditions, risks, and changes resulting from agriculture, and of management practices used by producers. With the collaboration of farm leaders, the academic community, and government scientists, fourteen indicators were developed in different ways using data from the Census of Agriculture, surveys, provincial data sets, Soil Landscapes of Canada, and custom data sets. Results of the indicator study suggest that Canadian farmers have made important strides in conserving the health of agricultural soils. Progress is less evident with regard to off-farm impacts.

National Round Table on the Environment and the Economy

The National Round Table on the Environment and the Economy (NRTEE) is an independent advisory body that provides decision makers, opinion leaders, and the Canadian public with advice and recommendations for promoting sustainable development. Working with stakeholders across Canada, the NRTEE identifies key issues with both environmental and economic implications, examines these implications, and suggests how to balance economic prosperity with environmental preservation. Activities are organized into programs, each overseen by a task force that commissions research, conducts national consultations, reports on agreements and disagreements, and recommends how to promote sustainability. The NRTEE reviews these reports and recommendations before approving them for public release.

some examples of national information networks and partnerships supporting sustainable development.

Health
The Canadian Health Network is a national, bilingual Internet-based health information service. The network, which includes more than six hundred nonprofit organizations across Canada and links to more than six thousand Internet-based resources, connects Canadians to high quality local, regional, and national health information and resources. Information currently relates to health promotion and disease prevention. Information on self-care and how the Canadian health system is performing is expected to be added.

The Network for Health Surveillance in Canada is designed to build the relationships, tools, and connections needed so that public health decision makers anywhere in Canada can access, via the Internet, the information they need to better meet national, provincial/territorial, and regional/local public health needs. The network allows for the collection, integration, and analysis of data from diverse sources to provide information for risk management.

The Rural Health Pilot Project enables people from selected rural communities across Canada to look up or download map-based information from federal departments and provincial and municipal bodies and use it to manage health and environmental issues in their own communities.

Northern Information
The Northern Information Network (NIN) encourages information sharing about Canada's northern territories for more effective decision making in areas such as resource management and economic development. NIN supports a variety of research initiatives in and about the North, including project impact assessments, wildlife management planning, land use planning, emergency preparedness, and sustainable development strategies. Components of the site include a directory of geographically referenced databases, a discussion forum, documents, and links to related sites.

Weather Forecasting
The Meteorological Service of Canada (MSC) is Canada's source for meteorological information, including weather forecasts and warnings. The MSC monitors atmospheric conditions and water quantities and provides information and conducts research on climate, atmospheric science, air quality, ice, and other environmental issues.

Pollution Prevention
The National Office of Pollution Prevention (NOPP) provides Canadians with comprehensive information and tools to contribute to sustainable development through pollution prevention. Its Internet-based Canadian Pollution Prevention Information Clearinghouse provides a wide array of easily accessed information with links to information from around the globe. The NOPP supports and works with the Canadian Centre for Pollution Prevention, which is Canada's proponent of the new Global Cleaner Production Information Network launched at the International Pollution Prevention Summit.

Biodiversity
The Canadian Biodiversity Information Network (CBIN) is Canada's national node in the International Clearing-house Mechanism of the United Nations Convention on Biological Diversity. CBIN is a window on biodiversity information in Canada and also helps to increase awareness of biodiversity issues and facilitate cooperation between people across Canada.

The Biodiversity Stewardship in Resource Industries Initiative is a voluntary initiative that catalyzes partnerships between natural resource industries, conservation organizations, Aboriginal and rural communities, and governments to protect wildlife and habitats across Canada through the exchange of biodiversity stewardship information and development of on-the-ground stewardship projects.

Freshwater
The Freshwater Website educates Canadians about freshwater in Canada related to water use, water efficiency, water quality, policy and legislation, groundwater, interjurisdictional water issues, art, and culture. Each subject makes links to water-related Web sites in Canada and around the world.

State of the Environment
The State of Canada's Environment Infobase provides Canadian environmental information through four modules: national, regional, ecological framework, and tools. Components of the infobase include the National Environmental Indicator Series, regional and issue-specific state of the environment (SOE) reports, and the state of Canada's environment reports. The ecological–spatial framework used to house information at subnational and regional scales is also linked to Eco-vignettes, which portray ecological relationships in the various terrestrial and marine ecological units. The tools module includes the Sustainable Community Indicators Program and its software, as well as

Cleaner Production Information Network

The first International Pollution Prevention Summit took place in Montreal, Quebec, in October 2000. A major outcome of the summit is the Internet-based Global Cleaner Production Information Network, a vital new resource for businesses and government that will be a virtual meeting place for the hundreds of pollution prevention roundtables and the sustainability and cleaner production networks worldwide that promote the science of reducing the generation of pollution.

electronic links to SOE-related products on other federal, provincial/territorial, and international Web sites.

Oceans
Under the recently announced National Programme of Action for the Protection of the Marine Environment from Land-based Activities (NPA), an Internet information clearing-house will be established to engage Canadians and raise awareness of NPA projects and events. The NPA is a strong domestic vehicle to protect habitat in the nearshore or coastal zone and to prevent land-based sources of marine pollution such as sewage, heavy metals, persistent organic pollutants, radioactive substances, oils and carbons, litter, nutrients, and sediment.

Geomatics
The Canadian Earth Observation Network (CEONet) provides geospatial information products and services and is the prime discovery and access component of the Canadian Geospatial Data Infrastructure, which will coordinate Canada's numerous databases of geographic information and make them accessible through a common window on the Internet.

Geoscience
The Canadian Geoscience Knowledge Network is currently being developed by the Government of Canada's national geoscience agency, along with its provincial/territorial counterparts. The resulting single-window Internet access will facilitate national and international access to Canadian geoscience knowledge, vital to the sustainable development of the mineral industry, and will incorporate such knowledge into the Canadian Geospatial Data Infrastructure.

Transportation
Industry associations, nongovernmental organizations, academics, and governments are working together in many different foras to address environmental issues such as climate change. This spirit of partnership is reflected in the transportation initiatives included in the Government of Canada's $500M Action Plan 2000. These initiatives will demonstrate innovative approaches to emission reduction in the areas of vehicle and fuel efficiency, urban transportation, and freight. Results of these projects, and any associated educational materials, will be disseminated to decision makers and other stakeholders through Web sites, conferences, and the strengthening of existing networks.

IMPROVING PUBLIC ACCESS TO AND USES OF INFORMATION

Public Access

Reliable access to information, which is essential for knowledge-based decision making, involves both physical access (connection to communications networks) and access to information itself (the content and services communicated through the network). Access must be open and unrestricted, available at the right time, and affordable.

With its vast domain, geographical variability, seasonal climate, and widely distributed and culturally diverse population, Canada faces many challenges in providing good communications and information services. Canada has met this challenge in part by consistently working at connecting as many households and businesses as possible to communications infrastructure. In 1998, 99 percent of Canadian homes had telephones; 96 percent were connected to cable and 74 percent accessed it. More than 45 percent of Canadian homes had a computer, 32 percent had a modem, and 25 percent had Internet access. Thirty-one percent of Canadian small and medium-sized businesses were connected to the Internet.

The Community Access Program, a key component of the federal government's Connecting Canadians initiative, aims to provide Canadians with affordable public access to the Internet and the skills they need to use it. Further to this initiative, Industry Canada recently announced its intention to make high-speed broadband Internet services available to businesses and residents in all Canadian communities by 2004. Access to high-speed broadband will provide the foundation for improved services such as distance learning and telehealth and improve the access of small business to broader markets.

In March 1999, Canada succeeded in becoming the first country in the world to connect its public schools and libraries to the Internet through the SchoolNet and LibraryNet programs. Building on this success, SchoolNet continues to work with the provinces, territories, and the private sector to extend connectivity from schools to the classroom. The Computers for Schools program provides Canada's schools and public libraries with surplus computer equipment and computer software donated by governments, businesses, and

Official Language of Choice

Canada recognizes that information must be available to all in the official language of their choice. Although English is the current language of choice on the Internet, the Government of Canada wants to ensure that content is available in both of Canada's official languages, English and French. Programs such as Francommunautés virtuelles seek to enhance and increase French-language material, applications, and services on the Internet.

Community Access Program

The Community Access Program (CAP) is helping Canadians, wherever they live, take advantage of emerging opportunities in the new global knowledge-based economy. Combining the efforts of federal, provincial, and territorial governments, community groups, social agencies, libraries, schools, volunteer groups, and the business community, CAP connects people to the Internet and helps them develop information technology skills, exchange ideas with others, research information, post community events, and connect to government programs and services. Under CAP, public locations such as schools and libraries serve as on-ramps to the Information Highway and provide computer support and training.

Universal access is a key component of the program. All people in the connected community, including those who are vision- or hearing-impaired or physically challenged, the elderly, families with young children, and those using temporary mobility aids (such as crutches) or otherwise requiring assistance, should have full access to the location and be able to participate in all the opportunities and programs provided by the program.

CAP, the key component of the Government of Canada's Connecting Canadians initiative, was launched in 1994. It aims to establish up to ten thousand affordable public access Internet sites throughout Canada by 2001. More than four thousand sites have already been created in rural and remote communities, and the program is now expanding to include five thousand urban sites.

individuals to increase access to this technology in a learning environment. To date, the program has delivered more than 195 000 computers and is targeted to place 250 000 computers by March 2001.

Canada is also working with industry to develop tools that will assist industry in becoming more sustainable. The National Round Table on the Environment and the Economy is participating with a wide cross-section of companies to test material and energy eco-efficiency indicators. Strategis, Industry Canada's business information site, links to many programs that promote sustainable development in business and industry. For example, the Canadian Business Environmental Performance Office is a virtual office that supports better environmental performance in Canadian businesses by providing easy and integrated access to providers of information, services, and advice in the areas of waste management; emergency, health, and safety management; climate change; and resource conservation and pollution prevention. It also provides industry-specific information. Several interactive multimedia tools, such as Canadian Environmental Solutions (which includes biotechnology

GrassRoots Programming for Students

The SchoolNet GrassRoots Program offers funding to schools to create innovative, interactive Internet-based projects. As part of the United Nations-sponsored Schools Demining Schools project, St. Elizabeth School in Ottawa, Ontario, developed Students Against Landmines. First-prize winner at the 1999 International Schools CyberFair, this program showcases activities undertaken by students worldwide and reminds people that children can make a difference. Launched in 1998 by the Canadian industry minister and Microsoft CEO Bill Gates, the GrassRoots Program is expected to create twenty thousand school projects by 2001.

and climate change solutions), connect businesses with providers of environmental services.

Government Web sites offer a unique opportunity to make information about sustainable development and government services available to Canadians. Government On-Line is the Government of Canada's initiative to deliver programs, services, and information over the Internet and a key component in its plan to improve service to Canadians. This multiyear project will allow citizens to receive information, programs, and services and interact and do business with the Government, all electronically. Government On-Line complements other ways in which services are delivered to Canadians—in person, by mail, and by telephone.

Although the Internet is fast becoming a leading way for Canadians to access information, the Government of Canada uses a variety of means to convey information. Over the past fifteen years or so, many government sustainability reports have been designed for, and made available to, both decision makers and the interested Canadian public. These reports make environmental information more accessible by integrating it, presenting it in a reader-friendly style, and interpreting it in light of sustainability goals for Canada. For example, federal and provincial/territorial departments' reports on the state of the environment, as well as Environment Canada's *The State of Canada's Environment—1996*, provide comprehensive information on the status of, and trends in, the Canadian environment.

Public Awareness

To inform the public of sustainability issues and offer concrete ways that these issues can be tackled at the grassroots level, the Government of Canada runs a variety of public information programs. It also offers information tools to help in making household and business decisions that support sustainable development. The following are three examples.

- The EnerGuide program for appliances, heating and cooling equipment, houses, and vehicles helps consumers consider energy-efficiency ratings when purchasing these items.

- The Auto$mart Program encourages motorists to buy, drive, and maintain their vehicles in ways that reduce fuel consumption, save money, and benefit the environment.

Canadian Environmental Solutions

Canadian Environmental Solutions is a portable, multimedia information tool designed to provide an instant response to specific environmental problems or situations encountered by all sectors of the economy in both domestic and international markets. Through the use of widely accessible media, such as CD-ROM or the Internet, it provides a compendium of problems encountered in the environment world-wide and the products, technologies, and services that Canadian companies can deliver to resolve them.

The Green Lane

The Green Lane, Environment Canada's Internet presence, is a large and diverse information resource on sustainable development, climate change, clean air, water, weather, and nature. Following a strategic review of the site, Environment Canada is renewing content, navigation, and infrastructure and will place increased emphasis on ongoing audience research to ensure the information provided meets the information needs of Canadians.

- RETScreen is a software program that businesses can use to assess the cost-effectiveness of using renewable energy technologies.

Community Action

Sustainable development happens when communities and individual citizens take action. The Smart Communities Program encourages Canadian communities to use information and communication technologies in new and innovative ways to achieve better health care delivery, education, and business opportunities. Under the Sustainable Communities Initiative, Aboriginal, northern, and rural communities receive assistance in building their capacity to plan and make decisions. The initiative helps communities complete projects that address a community need through better access to geographical information sources and information-processing methods, improved communication and consultation tools, and more effective partnerships with governments, other communities, and the private sector.

EcoAction Community Funding Program

The EcoAction Community Funding Program is an Environment Canada program that provides financial support to community groups for projects that have measurable, positive impacts on the environment. Nonprofit groups and organizations are eligible to apply to the funding program. EcoAction encourages projects that protect, rehabilitate, or enhance the natural environment and build the capacity of communities to sustain these activities into the future. Projects require matching funds or in-kind support from other sponsors.

Smart Communities

Under its Smart Communities Program, the Government of Canada has committed $60 million over three years to support the development of twelve Smart Community demonstration projects, one in each province, one in the North, and one in an Aboriginal community. A key component of the program is the sharing of information and expertise through the Smart Communities Resource Exchange, which integrates information of smart communities' best practices, applications, and technologies. The exchange also networks individuals, governments, companies, universities and colleges, and communities and allows them to share experience and set up alliances.

Public Participation in Decision Making

Increasingly, Canadians want to participate in the decision-making and economic activities related to sustainable use or development of land and natural resources. A key vehicle for this participation is public consultation used to gather information and to help shape government policy and practice, as shown in the following examples.

- Public consultation is a key element of the sustainable development strategies required of all federal departments.

- The federal minister of finance receives advice in the form of pre-budget submissions from environmental groups, business, and other interested parties on various ways to integrate environmental considerations into the budget process.

- The National Round Table on the Environment and the Economy takes an impartial, inclusive approach, with open and free debate, to issues related to the environment and the economy. It invites input from key stakeholders, assimilates research and consultation to clarify the debate, and distributes its conclusions and recommendations to the public.

- The Youth Round Table on the Environment gives Canadian youth, from a range of backgrounds, perspectives, and values, the opportunity to provide input into the development of Environment Canada's policies and programs.

The Government of Canada is also redesigning policy and programming in a number of areas to create management partnerships with key stakeholders. A key example of this change is Fisheries and Oceans Canada's emerging Canadian Oceans Strategy, which calls for information sharing among governments, Aboriginal organizations, coastal communities, and other stakeholders and interested Canadians. Information on Canada's oceans ecosystems and activities will be used to achieve the strategy's objectives of meeting economic, environmental, and social goals for sustainable development; managing the increasing complexity and diversity of oceans use through integrated management; and engaging communities and stakeholders in making collaborative decisions that affect them.

Participation in Information Sharing for Sustainable Forest Management

Canada's Model Forest Program was initiated by the Canadian Forest Service of Natural Resources Canada to encourage the creation of partnerships locally, nationally, and internationally in order to generate new ideas and on-the-ground solutions to sustainable forest management issues. A model forest brings together, and forms a partnership among, individuals and organizations who share the common goal of sustainable forest management. Partners typically include industrial companies, parks, landowners, all levels of government, Aboriginal peoples, academic institutions, environmental groups, labour, and youth. This cross-section of membership is committed to demonstrating how social, environmental, cultural, and economic interests can be integrated.

The model forest provides a unique forum where these partners can gain a greater understanding of conflicting views, share their knowledge, and combine their expertise and resources to develop innovative, region-specific approaches to sustainable forest management. A model forest acts as a giant, hands-on laboratory in which these leading-edge techniques are researched, developed, applied, and monitored. It encompasses a working-scale land base where the participants have a direct interest and influence over the uses in the forest, while at the same time the rights of participating landowners and land managers are not superseded.

The result of this grassroots approach is solutions to sustainable forest management that work and earn local support. Through the International Model Forest Network Secretariat, located in Canada, many countries have adopted the model forest concept, creating a global network that continues to grow.

Eastern Scotian Shelf Integrated Management Initiative

The eastern Scotian Shelf is the first offshore area selected to apply Canada's new concept of oceans management under the Oceans Act. The area possesses important living and nonliving marine resources, a high level of biological diversity and productivity, and multiple ocean users and activities with a number of existing and potential user conflicts. Effective management of the shelf needs to address a range of issues including resource use, ecological change, marine ecosystem health, and competition for ocean space. The first phase of the project resulted in an overview and use audit to set the groundwork for an oceans management plan. Information sessions will be held with individual stakeholder groups, leading to the creation of a forum comprising representatives from government, industry, communities, nongovernmental organizations, and academia. The forum will serve an advisory role, facilitating broad-based intersectoral input to the development of a long-term oceans management plan for the eastern Scotian Shelf area.

RECOGNIZING WEAKNESSES IN INFRASTRUCTURE AND INFORMATION

Using information effectively to support sustainable development can cause frustration due to barriers created by infrastructure. The number of tools and applications to handle data is constantly growing. Users often find it difficult to keep up with the constant changes in application software to store and read data, and new software is not always compatible with previous versions. A key capability that is often missing is the interoperation of tools obtained from different sources.

Technological progress has driven improvements in geographic information systems (GISs). However, related to remote sensing and information access over the Internet, the ability to analyze and assess data and to assemble information in a comprehensive integrated framework has lagged behind. There is an ongoing need to consider weaknesses in the whole data collection, description (metadata), cataloguing, analysis, assessment, and reporting process and to recommend necessary improvements to eliminate bottlenecks in the information system. Other technical needs include data portability, reusability, extendability, quick access, ease of storage and retrieval, ease of maintenance, longevity, and ease of organization and reorganization of data and information.

Limitations are imposed on data because, among other things,

- knowledge and data gaps exist in information systems supporting sustainable development
- environmental monitoring systems have been working to meet the demand over the past twenty years
- mathematical models used to calculate indicators and project future scenarios may not be validated at the field level
- for reasons of confidentiality, some socioeconomic data are suppressed, resulting in either a reduction of the area for which calculations can be made or a vast generalization of the data.

There is also an urgent need to stabilize data information to some open international standards, particularly in spatial data related to geomatics. For example, the Canada Centre for Remote Sensing chairs one of the most challenging groups within the international

ISO Geomatics Standards

Natural Resources Canada's Canada Centre for Remote Sensing (CCRS) initiated and is leading the development of ISO geomatics standards for imagery and gridded data such as medical, remote sensing, and hydrographic images. Twenty-six countries are participating in this initiative. The CCRS also leads Canada's national program to develop and implement ISO standards for all geomatics information, which involves more than one hundred government and private sector organizations.

standards group ISO/TC 211, which is geared toward developing a framework that will harmonize core data sets.

SUPPORTING NEW INFORMATION TECHNOLOGIES

Most observers see information and communications technologies as key agents in the far-reaching changes that are overtaking every society on earth as the world enters the new millennium. In 1997, the World Economic Forum ranked Canada first among the G-7 countries by technology potential and second by information technology. Since then, Canada has remained a leader in developing next-generation information technologies.

Remote Sensing and Space Technologies

One of the most effective ways to look at the earth as a whole and to better understand climate change and other vital planetary issues is by monitoring the earth's environment from space. In its Atmospheric Environment programs, the Canadian Space Program studies the dynamics of the atmosphere, the ozone layer, greenhouse gases, and other global climate change phenomena. The Canadian Space Program's Surface Environment programs include the development and use of space-borne technologies for studying the cryosphere; monitoring the sustainable development of Canadian forests; understanding the interaction between land-based ecosystems and climate change; mapping nearshore changes and studying the evolution of coastal zones with their ecosystems; and monitoring the northern offshore marine environment and its interaction with global climate at northern latitudes.

The Canada Centre for Remote Sensing (CCRS) of Natural Resources Canada has research projects under way for the application of remote sensing technologies, including radar, to support sustainable development. For example, CCRS collaborates with other government agencies, resource industries, and environmental consultants to make remote sensing data and techniques useful and economical in regional and local environmental monitoring applications, a new and high-growth area in the geomatics industry. This work is being conducted under the Local Environmental Applications Program initiative using high-resolution imagery in the areas of baseline environmental surveys; impact assessment of human activities

RADARSAT

RADARSAT is an advanced earth-observation satellite program developed by Canada to monitor environmental change and to support resource sustainability. The launch of RADARSAT-1 in 1995 gave Canada and the world access to the first radar satellite system capable of large-scale production and timely delivery of data that meet the needs of commercial, government, and scientific programs. RADARSAT-1 provides a new source of reliable and cost-effective data for environmental and resource professionals worldwide. With a planned lifetime of five years, it is equipped with synthetic aperture radar that can transmit and receive signals to "see" through all weather at any time and obtain high-quality images of the earth. RADARSAT-2, due for launch in 2001, will build on the successes of RADARSAT-1 and offer improved quality of data images to meet the growing world demand for earth-observation information.

and natural disasters; risk mitigation and impact mapping; and environmental monitoring and change detection.

Remote sensing is also being used

- in agricultural applications, to assess crop type and crop conditions, to estimate crop yield, and to map soil characteristics and soil management practices
- to contribute to the mapping and monitoring of surface water resources
- in forestry applications related to climate change monitoring to estimate net primary productivity in forest systems using measures of vegetation parameters such as greenness, growing season length, leaf area index, fraction of photosynthetically active radiation, and absorbed photosynthetically active radiation
- to monitor disasters, such as floods, oil spills, forest fires, hurricanes, and volcanic eruptions
- to monitor weather, sea state, and ice conditions, and as a key element of Environment Canada's meteorological forecast systems.

The transfer of remote sensing technology to developing countries takes place under such programs as GlobeSAR-2, which links Canada to countries in Latin America. The goals of the program are to build a capacity in radar remote sensing in the participating countries; demonstrate applications of RADARSAT for use in priority areas of natural resource management, as identified by participating countries; and support the establishment of linkages between Canadian public and private institutions and their counterparts in Latin America.

Forest Component of Earth Observation for Sustainable Development

Natural Resources Canada's Canadian Forest Service is cooperating with the Canadian Space Agency to develop the Earth Observation for Sustainable Development (EOSD) program. EOSD will rely mainly on Landsat, RADARSAT, and hyperspectral images to monitor land cover, biomass, and disturbances. The program will support and improve Canada's National Forest Inventory by adding seamless satellite coverage to data sets derived from air photo and ground plots. EOSD also develops automated systems to speed the analysis of large volumes of images required to cover Canada's large land base.

High-Speed Connectivity and Network-Based Information Systems

Canada is working to advance information technologies in a variety of ways. A leading example is the Government of Canada's cooperation with CANARIE Inc. (Canadian Network for the Advancement of Research, Industry, and Education). In keeping with its mandate to accelerate Canada's advanced Internet development and use, CANARIE recently launched CA*net 3.

This high-speed optical transport technology has the potential to support sustainable development decision making by applying the power of advanced grids and networks to the management of large volumes of data. For example, Natural Resources Canada's Pacific Forestry Research Centre uses CANARIE's high-speed network to acquire and quickly deliver large data sets, including remote sensing imagery and the national forestry grid. This grid will be used to help manage data from Canadian forests, including satellite data. The network will make data available to government decision makers, as well as individual citizens and special interest groups. Innovations delivered by CA*net 3 are expected to fuel the development of new technologies and applications and eventually reduce the cost of access to Internet capacity. CANARIE is now advising countries around the world on how they can design and build networks similar to CA*net 3.

Supporting such technological advances, Canada is working to ensure favourable tax regimes for information technology research and development. Information technology companies such as Nortel Networks, JDS Uniphase, Ericsson, and Motorola are investing heavily in Canadian enterprise.

Another technology being examined and promoted by the Government of Canada is sustainable development enabling software. Such software can improve the eco-efficiency of an enterprise, providing a management framework that can assist in operationalizing the firm's sustainable development goals. In an evaluation of various enabling software, Industry Canada concluded that many companies are not aware of the potential for their software to promote eco-efficiency. More work is needed to expand industry awareness of this enabling function and to capitalize on it while providing support programs and services to improve the cross-sectoral uptake of these technologies.

Eco-efficiency Enabling Software

Trihedral Engineering of Bedford, Nova Scotia, has produced a software called VTS that can support users in all five of the decision-making stages of managing for eco-efficiency. VTS is an off-the-shelf package that users can tailor to handle the monitoring and control requirements of their projects. In line with the eco-efficiency principles of reduction in the material intensity and the energy intensity of goods and services, VTS initially identifies current use for Stage 1 decision making, generates feasible options for greater efficiency (Stage 2), can be configured to model or simulate options for reduced use (Stage 3), implements and monitors changes relevant in facility processes (Stage 4), and then returns to Stage 1. More than four thousand copies of VTS are now being used in a variety of mission-critical applications, from sub-sea oil and gas production control, through massive telemetry systems, to supervisory control at a 2+ GW hydroelectric complex.

STRIKING PARTNERSHIPS TO FINANCE AND SHARE INFORMATION FOR SUSTAINABLE DEVELOPMENT

Domestic Partnerships

Government of Canada investments in information initiatives and technology are often matched or exceeded by private investment. For example, in 1998, contributions from the Bell Consortium (which included Nortel Networks, JDS Uniphase, Newbridge

Networks, and Cisco Systems Canada) exceeded the federal government's investment of $55 million in CA*net 3, described earlier. CANARIE has also facilitated the development of numerous advanced Internet applications through its strategic research and development investments in small and medium-sized enterprises. Its investments have been matched or exceeded by project participants, creating a leverage ratio of 4:1.

At a more grassroots level, projects approved under the Climate Change Action Fund (CCAF) must have at least 25 percent of their funding from other sources. This funding is in the form of cash and in-kind support (e.g., professional services, volunteer time, materials, supplies, and equipment). At one point in the program, $16 million in CCAF financing had leveraged $38 million in other funding, for a total of $54 million. The network of partners created by the CCAF helps to ensure that projects will continue after CCAF support has ended.

Global Information Networks

Canada participates in a number of international fora that support global sustainability. Following are some examples.

- Canada participates in joint information gathering and sharing related to energy with the International Energy Agency, the Nuclear Energy Agency, the Hemispheric Energy Initiative, and the Energy Working Group of the Asia–Pacific Economic Cooperation.

- Natural Resources Canada's Canada Centre for Remote Sensing is establishing a UNEP Global Resource Information Database site to archive, disseminate, and provide tools for integrating geospatial databases derived largely from remotely sensed imagery.

- Canada promotes the sustainable development of minerals and metals through regional and intergovernmental networks such as the hemispheric Mines Ministries of the Americas (CAMMA); the Asia–Pacific Economic Cooperation Expert Group on Minerals and Energy Exploration and Development; the international study groups on copper, nickel, and lead and zinc; and the recently established Non-ferrous Metals Consultative Forum on Sustainable Development.

Global Minerals and Metals Communication

The Mines Ministries of the Americas (CAMMA) is dedicated to sharing information about sustainable development policies and technologies for minerals and metals across the hemisphere. In 1999, Canada helped establish a CAMMA Web site and agreed to manage it for two years as a tool for fostering international cooperation and encouraging the open exchange of information, policies, databases, and best practices.

- Within the World Climate Research Programme, Canadian scientists participate in several large-scale international climate studies. As a member of the World Meteorological Organization, Canada maintains a monitoring network that contributes to the Global Climate Observing System and the World Weather Watch. Environment Canada maintains the World Ozone and Ultraviolet Radiation Data Centre.

- Environment Canada manages a centre at the National Water Research Institute to support the Global Environment Monitoring System for water (GEMS/Water) under the United Nations Environment Programme.

- Canada hosts the Canadian Biodiversity Information Network, a national node in the United Nations Convention on Biological Diversity Clearing-house Mechanism, a global system of Internet-based databases that, among other things, helps build capacity to achieve convention goals, including the sustainable use of biodiversity.

GEMS/Water

The Global Environment Monitoring System for water (GEMS/Water) participates in global water assessments undertaken by the United Nations and carries out research into regional and global freshwater quality. More than one hundred countries now participate in the GEMS/Water network, contributing data from their national monitoring programs to help build a global database for rivers, lakes, and groundwater. GEMS/Water also addresses the development of technical capacity in participating countries through UN-sponsored training courses in the field of water resources management.

Partnerships with Developing Countries

The Canadian International Development Agency (CIDA) is the primary agency for delivering Canada's development assistance program and the technical cooperation program with economies in transition. Recognizing the value of the Information Highway in supporting its development goals, CIDA is realigning its way of doing business to place the creation, transfer, and management of knowledge at the centre of its activities.

For example, CIDA

- established the new $100-million Canada Climate Change Development Fund under the federal budget in 2000 to help developing countries in the areas of greenhouse gas emission reductions, carbon sequestration, adaptation, and core capacity building for climate change

- co-funds an initiative called Bellanet to help international development organizations use information and communication technologies to work together more effectively

African Use of Information and Communication Technologies

The Acacia Initiative is an international effort led by Canada's International Development Research Centre (IDRC) to empower sub-Saharan African communities with the ability to apply information and communication technologies (ICT) to their own social and economic development. By using these technologies to their own ends, disadvantaged communities in Africa may be able to shift some of the decision making away from metropolitan centres and international development organizations toward the places where development challenges are faced most acutely.

One key partnership is with the African Information Society Initiative (AISI), which unites African governments and donors in a framework to extend the use of information, communication, and related technologies for development. Led by the United Nations Economic Commission for Africa, AISI provides a uniquely African perspective on the opportunities and challenges of that continent in an emerging information age.

Acacia will work mainly with rural and disadvantaged communities, particularly their women and youth groups. These communities are often isolated from ICT networks yet demonstrate enormous creativity and enterprise living in an environment with little in the way of services and information. With Acacia, IDRC intends to support this creativity and enterprise by demonstrating the benefits of a local capacity to use information and communication in solving local development problems.

- offers training in information management strategy and tools to English-speaking government decision makers in developing countries through its Strategic Information Management Program

- developed and currently manages three capacity-development Web sites for the International Association of Impact Assessment used by developing countries.

Canada has ministerial memoranda of understanding (MOU) with many countries. These MOUs establish a framework under which collaborative projects can be undertaken in the areas of environmental management policies, approaches, and tools; environmental pollution prevention and control approaches; development of national science capacity; conservation and sustainable resource management policies, practices, and technology transfer and solutions; and exchange of information on a range of environmental issues. Canada also has arrangements for technical cooperation with many countries.

LOOKING FORWARD

From major advances in information technologies to the inclusion of ordinary citizens in information sharing, Canada has explored many options for doing a better job of building sustainable development on having the right information at the right time and using it wisely to make good decisions.

Despite success in some areas, Canada continues to face challenges in dealing with information. The following are some of these challenges.

- During the years when many governments were under fiscal restraint, core data sets and environmental monitoring systems were not maintained at satisfactory levels. It will take time to rebuild these systems.

- Information technology is advancing so quickly that the Government of Canada may not be able to continue to promise universal access.

- More must be done to standardize the way information is gathered, handled, interpreted, and applied.

- Appropriate training must be made accessible to user groups.

At the same time, advances in technology may make access to information more affordable in the future and help developing countries improve their capacity to deal with issues of sustainable development. Canada is in a good position to enter into partnerships with these countries, to mutual benefit.

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Canadian Environmental Quality Guidelines:
http://www.ec.gc.ca/ceqg-rcqe/index.htm
Canadian Geoscience Knowledge Network:
http://www.cgkn.net
Canadian Global Change Program:
http://www.globalcentres.org/cgcp
Canadian Government Information Locator Service:
http://gils.gc.ca/gils/info_ea.html
Canadian Government Information on the Internet:
http://dsp-psd.pwgsc.gc.ca/dsp-psd/Reference/cgii_index-e.html
Canadian Government Information:
http://www.nlc-bnc.ca/cangov/egovinfo.htm
Canadian Health Network:
http://www.canadian-health-network.ca
Canadian Heritage:
http://www.pch.gc.ca
Canadian Heritage Information Network:
http://www.chin.gc.ca
Canadian Institute for Environmental Law and Policy:
http://www.cielap.org
Canadian International Development Agency:
http://www.acdi-cida.gc.ca
Canadian Inventory of Resource Sharing:
http://www.nlc-bnc.ca/resource/cirs95/eshractc.htm
Canadian Museum of Nature:
http://www.nature.ca
Canadian Pollution Prevention Information Clearinghouse:
http://www.ec.gc.ca/cppic
Canadian Radio-television and Telecommunications Commission:
http://www.crtc.gc.ca
Canadian Rural Information Service:
http://www.agr.ca/progser/cris_e.phtml
Canadian Rural Partnership:
http://www.rural.gc.ca
Canadian Seniors Policies and Programs Database:
http://www.sppd.gc.ca
Canadian Soil Information System:
http://res.agr.ca/CANSIS/_overview.html
Canadian Technology Network:
http://www.nrc.ca/ctn
Canadian Water Resources Association:
http://www.cwra.org
Canadian Wildlife Service:
http://www.cws-scf.ec.gc.ca
Canadian Women's Health Network:
http://www.cwhn.ca
Canadian Workplace Research Network:
http://www.cwrn-rcrmt.org
CEONet:
http://ceonet.ccrs.nrcan.gc.ca
CEPA Environmental Registry:
http://www.ec.gc.ca/CEPARegistry
Clean Air Site:
http://www.ec.gc.ca/air/menu_e.shtml
Commission on Sustainable Development:
http://www.un.org/esa/sustdev/csd.htm

Commissioner of the Environment and Sustainable Development:
http://www.oag-bvg.gc.ca/domino/cesd_cedd.nsf/html/menu_e.html
Community Access Program:
http://cap-pac.ic.gc.ca
Connecting Canadians:
http://www.connect.gc.ca
Department of Finance Canada:
http://www.fin.gc.ca
Department of Foreign Affairs and International Trade:
http://www.dfait-maeci.gc.ca
Department of Justice Canada:
http://canada.justice.gc.ca
Ecological Monitoring and Assessment Network:
http://www.cciw.ca/eman/intro.html
ÉcoRoute de l'information:
http://ecoroute.uqcn.qc.ca/en/gen/info/index.html
Electronic Commerce in Canada:
http://www.e-com.ic.gc.ca
EnerGuide:
http://energuide.nrcan.gc.ca
Environment Bureau–Agriculture and Agri-Food Canada:
http://www.agr.ca/policy/environment/eb
Environment Canada—The Green Lane:
http://www.ec.gc.ca
Environmental Health Program:
http://www.hc-sc.gc.ca/ehp/ehd
Federation of Canadian Municipalities:
http://www.fcm.ca
First Nations SchoolNet:
http://www.schoolnet.ca/aboriginal
Fisheries and Oceans Canada:
http://www.ncr.dfo.ca
Freshwater Website:
http://www.ec.gc.ca/water
GDSourcing—Research and Retrieval:
http://www.gdsourcing.com
GEMS/Water (Global Environment Monitoring System Freshwater Quality Programme):
http://www.cciw.ca/gems
GeoConnections:
http://www.geoconnections.org
Government Electronic Directory Services:
http://canada.gc.ca/search/direct500/geds_e.html
Government of Alberta:
http://www.gov.ab.ca
Government of British Columbia:
http://www.gov.bc.ca
Government of Canada:
http://canada.gc.ca
Government of Canada Climate Change Web Site:
http://www.climatechange.gc.ca
Government of Canada Policy Research Initiative:
http://policyresearch.schoolnet.ca
Government of Manitoba:
http://www.gov.mb.ca
Government of New Brunswick:
http://www.gov.nb.ca
Government of Newfoundland and Labrador:
http://www.gov.nf.ca
Government of Nova Scotia:
http://www.gov.ns.ca
Government of Nunavut:
http://www.gov.nu.ca
Government of Ontario:
http://www.gov.on.ca
Government of Prince Edward Island:
http://www.gov.pe.ca
Government of Quebec:
http://www.gouv.qc.ca/XmlDev/Site/Dhtml/Anglais/IndexA.html
Government of Saskatchewan:
http://www.gov.sk.ca
Government of the Northwest Territories:
http://www.gov.nt.ca
Government of Yukon:
http://www.gov.yk.ca
Great Lakes Information Network:
http://www.great-lakes.net
Hemispheric Energy Initiative:
http://www.americasenergy.org
Human Resources Development Canada:
http://www.hrdc-drhc.gc.ca
Indian and Northern Affairs Canada:
http://www.inac.gc.ca
Information Highway Advisory Council:
http://strategis.gc.ca/SSG/ih01015e.html
Intergovernmental On-Line Information Kiosk:
http://www.intergov.gc.ca
International Association for Impact Assessment:
http://www.iaia.org
International Copper Study Group:
http://www.icsg.org
International Council for Local Environmental Initiatives:
http://www.iclei.org
International Council on Metals and the Environment:
http://www.icme.com
International Development Research Centre:
http://www.idrc.ca
International Energy Agency:
http://www.iea.org
International Institute for Sustainable Development:
http://iisd1.iisd.ca
International Lead and Zinc Study Group:
http://www.ilzsg.org
International Nickel Study Group:
http://www.insg.org
Man and the Biosphere—Canada/MAB Program:
http://www.cciw.ca/mab/intro.html
Meteorological Service of Canada:
http://www.msc.ec.gc.ca
Millennium Eco-Communities:
http://www.ec.gc.ca/eco/main_e.htm

Mineral Resources Forum:
http://www.natural-resources.org
Mines Ministries of the Americas:
http://www.camma.org
Mining Association of Canada:
http://www.mining.ca
The National Atlas of Canada Online:
http://www.atlas.gc.ca
National Environmental Indicator Series:
http://www.ec.gc.ca/ind
National Forestry Database Program:
http://nfdp.ccfm.org
National Library of Canada Research and Information Services Reference Policy:
http://www.nlc-bnc.ca/services/erpolicy.htm
National Office of Pollution Prevention:
http://www.ec.gc.ca/nopp
National Pollutant Release Inventory:
http://www.ec.gc.ca/pdb/npri/index.html
National Round Table on the Environment and the Economy:
http://www.nrtee-trnee.ca
National Water Research Institute:
http://www.cciw.ca/nwri-e/intro.html
Natural Resources Canada:
http://www.nrcan.gc.ca
Natural Resources Canada—Inventory of Mining Industry Practices to Conserve Wildlife and Habitat in Canada:
http://mmsd1.mms.nrcan.gc.ca:80/business/inventory/WEBCR4~1.htm
Non-ferrous Metals and their Contribution to Sustainable Development Web Site:
http://www.nfmsd.org
Northern Information Network:
http://www.inac.gc.ca/nin
Nuclear Energy Agency:
http://www.nea.fr
Oceans Program Activity Tracking System:
http://www.dfo-mpo.gc.ca/canoceans
Office of Energy Efficiency:
http://oee.nrcan.gc.ca
Organisation for Economic Co-operation and Development:
http://www.oecd.org
Parks Canada:
http://www.parkscanada.pch.gc.ca
Parliamentary Internet Parlementaire:
http://www.parl.gc.ca
Pollution Prevention Summit:
http://c2p2.sarnia.com/summit
Quebec–Labrador Integrated Knowledge System (Q-LInKS):
http://qlinks.ucs.mun.ca
Renewable Energy and Sustainable Energy Systems in Canada:
http://www.newenergy.org
RETScreen International:
http://retscreen.gc.ca
Royal Canadian Mounted Police:
http://www.rcmp-grc.gc.ca
St. Lawrence Observatory:
http://www.osl.gc.ca
SchoolNet:
http://www.schoolnet.ca
Science and the Environment Bulletin:
http://www.ec.gc.ca/science
SDinfo:
http://www.sdinfo.gc.ca
Smart Communities:
http://smartcommunities.ic.gc.ca
State of Canada's Environment Infobase:
http://www1.ec.gc.ca/~soer
Statistics Canada:
http://www.statcan.ca
Strategis—Canada's Business and Consumer Site:
http://www.strategis.gc.ca
Student Connection Program:
http://www.scp-ebb.com
Sustainability of Arctic Communities:
http://taiga.net/sustain
Sustainable Communities Initiative:
http://www.sci.gc.ca
Sustainable Community Indicators Program:
http://www.ec.gc.ca/scip-pidd
Transport Canada:
http://www.tc.gc.ca
United Nations Development Programme:
http://www.undp.org
United Nations Environment Programme:
http://www.unep.org
United Nations:
http://www.un.org
VolNet (Voluntary Sector Network Support Program):
http://www.volnet.org
Web Accessibility Initiative:
http://www.w3.org/WAI
World Business Council for Sustainable Development:
http://www.wbcsd.ch
World Health Organization:
http://www.who.org
Worldwatch Institute:
http://www.worldwatch.org