Environment Canada Environnement Canada

Science and Technology Partnering: Principles and Practices

S&T Management Committee Report No. 3

Canada

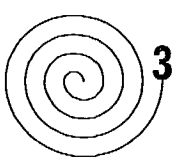
For further information please contact:

Science Policy Branch
Environmental Conservation Service
Environment Canada
Place Vincent Massey
351 St. Joseph Blvd.
Hull, Québec
K1A 0H3

Additional copies of this publication are available from:

Enquiry Centre
Environment Canada
Ottawa, Ontario
Canada K1A 0H3

Tel: 1800 668-6767 (toll free in Canada)
and (819) 997-2800
Fax: (819) 953-2225
E-mail: enviroinfo@ec.gc.ca



Science and Technology Partnering:

Principles and Practices

Science and Technology Management Committee

Report No. 3

February 2000

Contents

S&T PARTNERING: INTRODUCTION

This document presents the philosophy and principles underlying science and technology (S&T) partnering in Environment Canada (EC). The document builds on the federal government's *Science and Technology for the New Century: A Federal Strategy* (1996) and the direction provided in that document to capture both the benefits of partnering and strategies to enhance partnering. The document also supports Element 4 of Environment Canada's own *S&T Management Framework* (1998), which states, among other things, that S&T partnering is an important element of the S&T conducted by the Department. In comparison to other departmental documents on S&T, this document is specifically about S&T partnering. It demonstrates that partnering is a key mechanism used by Environment Canada to promote its vision among all sectors of Canadian society and to fulfill its mission and mandate as set out in its evolving business lines: *A Clean Environment*; *Nature, Weather and Environmental Predictions;* and *Management, Administration and Policy*. For those who are not familiar with the Department's partnering activities, this document explains the importance of S&T partnering for EC's business, the common national goals motivating EC to enter into S&T partnering with others, the relationship between S&T partnering and the enhancement of the Department's scientific leadership, the extent and scope of the Department's S&T partnering activities and the way in which EC puts its S&T partnering initiatives into practice.

Vision & Mission

Vision: *Environment Canada wants to see a Canada where people make responsible decisions about the environment; and where the environment is thereby sustained for the benefit of present and future generations.*

Mission: *Environment Canada undertakes and promotes programs to:*

- *protect Canadians from domestic and global sources of pollution;*
- *conserve biodiversity as a critical element of healthy ecosystems; and*
- *enable Canadians to adapt to weather and related impacts on human health, the economy and environmental quality.*

WHY DOES ENVIRONMENT CANADA ENTER INTO S&T PARTNERSHIPS WITH OTHERS?

Ensuring the highest level of environmental quality throughout Canada is a national goal which requires Environment Canada to build constructive working relationships and strategic partnerships with provinces, territories, Aboriginal peoples, business, international organizations, non-governmental organizations and individual Canadians. It is also Environment Canada's philosophy that effective and productive partnerships are essential to working toward the setting of national approaches to environmental management and sustainability.

Partnering

Environment Canada uses the term partnering to refer to its ongoing policy of building constructive relationships and joining efforts with various sectors of Canadian society and international partners in order to ensure the highest level of environmental quality in Canada and throughout the world.

Thus, not only is partnering important for the conduct of S&T by Environment Canada, but it is also through S&T partnering that Environment Canada builds synergy with other

organizations, levers resources, enhances human resources development, and draws on S&T expertise in other sectors. Partnering increases the Department's scientific credibility and strengthens S&T capabilities in other organizations working with Environment Canada toward mutual goals.

THE IMPORTANCE OF PARTNERING IN ENHANCING THE DEPARTMENT'S SCIENTIFIC LEADERSHIP

Environment Canada conducts science on many national and international environmental issues. Frequently, however, the authority to resolve these issues rests with other organizations, such as provincial and territorial governments. Through partnering, Environment Canada uses its scientific leadership to support and influence the environmental goals of others, such as provincial departments, communities and non-profit organizations. Environment Canada's science is often key to establishing consensus on environmental issues with other organizations.

Partnering also ensures the transfer of knowledge and technology to other sectors within Canada and abroad. This amplifies the benefits of Environment Canada's work by making environmental information and environmental solutions more widely available. It also supports the development of the domestic environmental industry, and thus, leads to economic benefits for Canadians.

THE INCREASING IMPORTANCE OF PARTNERING

Environment Canada has a long tradition of working in partnership with others. Such partnerships are more critical now than ever, because environmental issues are no longer local or even regional in nature. Environmental issues now encompass the globe, and the Department must work with many partners in order to address these issues. The causes and impacts of critical environmental issues today overstep both geographical and political boundaries. Some of these issues are:

- climate change;
- stratospheric ozone depletion and increasing ultra-violet radiation;
- endangered species and decreasing biodiversity;
- toxic chemicals in lakes, rivers and Arctic ecosystems;
- endocrine disruptors in the environment and the food chain;
- interactions of pollutant mixtures and their impacts on human health and the environment;
- increasing extremes of weather;
- the need for adaptation strategies to cope with atmospheric change; and others.

Also, in cooperation with the Department of Foreign Affairs and International Trade, as well as with other federal government departments and agencies, EC participates extensively with partners in the development and implementation of international S&T agreements and scientific research programs.

A number of bilateral memoranda of understanding (MOUs) between the Department and individual countries, moreover, serve as enabling agreements to promote international S&T for the benefit of Canadians. For example, the Department has an MOU with the United States Environmental Protection Agency to conduct collaborative R&D.

PUTTING S&T PARTNERING INTO PRACTICE

Environment Canada has developed policies which guide certain partnering initiatives to ensure consistency with federal directions on S&T. The commercialization policy, *Working in the Marketplace*, provides direction on those S&T activities which involve the potential for commercial development. The policy *Collaborative Positions for S&T Professionals in Environment Canada* pertains to the use of adjunct professorships and similar appointments which foster collaboration with universities. The *Intellectual Property Policy* guides the Department on issues related to ownership of intellectual property that may arise when working with partners.

A common understanding of the principles involved in partnering is essential if Environment Canada is to effectively implement its partnering efforts in a consistent manner. The principles which follow are intended to:

- raise awareness as to the importance and extent of partnering at Environment Canada;
- provide a common set of principles to guide decision making and the implementation of new partnering agreements across the Department; and
- enable Environment Canada to explain to our public and partners the guiding principles under which we operate.

S&T PARTNERING: PRINCIPLES

Environment Canada has developed the following principles to guide the Department's S&T partnering initiatives.

- *S&T partnering will be undertaken in the public interest.*
  Collaborative science and technology must focus on achieving results that are in the public interest, and should not compromise the integrity of the Department.
- *S&T partnering will support departmental and government-wide science priorities.*
  S&T partnering initiatives should contribute to the departmental and government-wide science priorities, which are key to policy development.

- *S&T partnering will enhance EC's capacity.*
  Partnering on science and technology allows access to expertise, facilities and equipment, and financial resources and provides networks which enable the Department's services, directorates and branches to cost-efficiently meet their goals.

- *S&T partnering will foster capacity building in other organizations working toward similar goals.*
  Environment Canada partners on S&T in order to help build both the scientific knowledge and technical capacities of other organizations working toward environmental goals.

- *S&T partnering at Environment Canada will help build consensus among different organizations which have an impact on the environment.*
  In addition to providing access to resources for the Department, partnering should support consensus building among other organizations, including other government agencies, communities and non-profit organizations. Partnering should promote a culture of environmental responsibility and help link knowledge to those who have the means to realize environmental objectives.

- *S&T partnering that involves the private sector will be conducted to minimize competition with that sector.*
  Partnering that involves the private sector will ensure cooperation with private enterprises. Partnering with the private sector should strive to reduce the perception of competition with this sector and be carried out in an open and competitive fashion.

S&T PARTNERING: PRACTICES

The following are examples of partnership that illustrate the nature of partnering activities, and highlight the principles underlying these activities, in Environment Canada. These examples and others (see Appendix) show the breadth and variety of EC's S&T partnering activities.

NETWORK WITH OTHER S&T PERFORMERS

CLIMATE RESEARCH NETWORK

Objective: To engage the energies, ideas and talents of the university and private sector communities in providing the scientific knowledge required for climate change policy making.

Details: The Climate Research Network (CRN) was created in 1994 and consists of a network of Collaborative Research Groups which each focus on a particular element of the climate research agenda. The Network has enabled Canada to make significant contributions to the Intergovernmental Panel on Climate Change (IPCC) and the Kyoto process.

Partners: The CRN involves 16 universities across Canada and supports over 100 researchers, students and support staff.

PROVIDE SPECIALIZED TECHNICAL AND R&D SUPPORT

ENVIRONMENTAL TECHNOLOGY CENTRE

Objective: To support the Department's national and international mandates for environmental protection by providing specialized technical and research and development (R&D) support.

Details: The Centre focuses on technologies for the measurement of air pollutants in ambient air and from mobile and stationary sources; the analysis of organic and inorganic components in diverse sample matrices; the assessment and clean-up of leaking hazardous waste sites; and the prevention and response to pollution emergencies such as oil and chemical spills. Laboratory and field activities are divided among six divisions: Analysis & Air Quality Division, Emergencies Engineering, Emergencies Science, Microwave-Assisted Processes, Emissions Research and Measurement, and Special Programs.

Partners: Partners in research and development include government partners as well as those in the private and university sectors. In addition, some technical support services are undertaken with the Centre's partners. Some R&D is also done in cooperation with international partners.

International S&T partnering allows the Department to advance Canada's environmental agenda in other countries, enhance capacity building, and collaborate on research. Through memoranda of understanding, bilateral and multi-lateral agreements, Environment Canada networks and partners on specific initiatives such as oil spill monitoring and clean-up with Norway, environmental protection technologies with the U.S. Environmental Protection Agency, and climate change with the World Meteorological Organisation. International partners include international organizations, government representatives, academia, and the industry/consulting sector in both Canada and the partnering country.

LINK SCIENCE TO PLANNING AND IMPLEMENTATION

BAY OF FUNDY ECOSYSTEM PARTNERSHIP

Objective: To foster wise conservation and management of the Bay's resources and habitats by disseminating information, by monitoring the state of the ecosystem, and by encouraging cooperative activities.

Details: The Bay of Fundy Ecosystem Partnership (BoFEP) was initiated in order to build on the work of the scientific network, the Fundy Marine Ecosystem Science Project (FMESP). The creation of BoFEP, in 1997, linked the scientific enterprises involved with FMESP to the many other stakeholders which share an interest in the Bay of Fundy and its resources. BoFEP works to network among these participants and to promote and facilitate assessment of the state of the Bay of Fundy ecosystem as well as long-range planning and integrated management.

Partners: Partners include EC Atlantic Region, the New Brunswick Department of Fisheries and Aquaculture, the Huntsman Marine Science Centre, the Conservation Council

of New Brunswick, the Clean Annapolis River Project, the Acadia Centre for Estuarine Research, the Department of Fisheries and Oceans, and other stakeholders in the Bay of Fundy region.

BUILD CONSENSUS AMONG DIFFERENT GROUPS

RESEARCH CONSORTIUM IN THE PULP AND PAPER SECTOR

Objective: To focus chemical and biological advances on the problem of reducing the impact of pulp mill effluent on the environment.

Details: A consortium at the Pulp and Paper Centre of the University of Toronto has pulled together eight scientists, 12 private sector companies, and one provincial environmental agency. The Consortium studies process changes to reduce environmental impacts of pulp mill effluent.

Partners: Partners are EC scientists acting as adjunct professors at the University of Toronto; the University of Toronto; 12 private sector companies (from four countries); and the Ontario Ministry of the Environment.

BUILD HUMAN RESOURCES IN ENVIRONMENTAL FIELDS

AES SCIENCE SUBVENTIONS

Objective: To ensure that (a) there is an adequate supply of university graduates trained in areas of strategic importance to EC; (b) broad knowledge base exists to support AES science and technology needs; and (c) academic centres of expertise exist in priority areas.

Details: The AES Science Subvention Program provides research grants to eligible staff at Canadian universities in the area of atmospheric and related sciences. Research proposals are peer-reviewed by AES scientists, and the final selection is made by a committee consisting of four AES research directors and four university professors. Selection criteria include scientific excellence and relevance to AES objectives.

Partners: The program currently supports research at 16 to 20 universities. The Natural Sciences and Engineering Research Council (NSERC) was a partner in the program from 1990/91 to 1996/97.

*The **Centre de Recherche en Calcul Appliqué** (Centre for Research on Computation and its Applications) was established to stimulate technology transfer from universities to industry, to foster a high-quality scientific environment in Quebec, and to promote the training and hiring of highly qualified personnel in scientific computation. Created in 1991, the Centre is a research corporation primarily funded by the province of Quebec studying advanced numerical computation applications in the areas of fluid mechanics, astrophysics and the environment. The Centre brings together scientists in Quebec who use numerical methods for scientific applications, both in industry and in universities, so that they may be fully informed about both the major problems which must be resolved and the expertise available. The Centre is a non-profit corporation with collaborators from academia, industry and government including EC's Atmospheric Environment Service.*

INTERNATIONAL ENVIRONMENTAL YOUTH CORPS PROGRAM

Objective: To provide employment opportunities and work experience for youth and to strengthen the capacity of the Canadian environment industry.

Details: The International Environmental Youth Corps (IEYC) provides Canadian university and college graduates under the age of 30 with international internships with Canadian exporters of environmental technologies and services. The program also supports the work of Canadian environmental non-governmental organizations (ENGOs) that are doing international work in sustainable development projects.

Partners: IEYC is a collaboration among EC, the Canadian Council for Human Resources in the Environment Industry (CCHREI), Human Resources Development Canada (HRDC), industry, private companies, non-governmental organizations and universities.

ACCESS EXPERTISE IN SPECIFIC FIELDS

CANADIAN COOPERATIVE WILDLIFE HEALTH CENTRE

Objective: To promote the management and conservation of wild animals in Canada through the application of veterinary medical science.

Photo: Tony Beck

Details: The Canadian Cooperative Wildlife Health Centre (CCWHC) was established as a cooperative organization among Canada's four veterinary colleges. The central activity of the Centre is surveillance of wild animal diseases in order to provide a better understanding of wildlife disease and disease processes in Canada. This is achieved through programs to enhance the detection of disease by field personnel, diagnostic services provided by regional centres, a national database of wildlife disease occurrences, and regular reporting of relevant information.

Partners: CCWHC is a partnership of Canada's four veterinary colleges and other collaborators. The Centre is sponsored by federal, provincial and territorial governments in Canada, as well as the Canadian Wildlife Federation, Ducks Unlimited Canada, AgrEvo Canada, DowElanco Canada, and Novartis.

SHARE FACILITIES AND EQUIPMENT

PACIFIC ENVIRONMENTAL SCIENCE CENTRE

Objective: To provide the science in support of EC's regional programs, as well as to facilitate other important environmental goals in partnering arrangements.

Details: The Pacific Environmental Science Centre, located in North Vancouver, British Columbia, and completed in November 1994, provides core laboratory and field operations in support of the Department's regional programs in ecosystem science, environmental protection, emergency response, shellfish, water quality, and environmental quality monitoring. Through the Canada/British Columbia Laboratory Agreement, the Science Centre also provides most of the environmental laboratory requirements of the province. The site, which includes a wildlife conservation area, is owned by the Vancouver Port Corporation and managed and controlled by Environment Canada under a memorandum of understanding.

Partners

The Centre is a partnership of Environment Canada, the Vancouver Port Corporation, the District of North Vancouver, and the Wild Bird Trust of B.C.

Environment Canada partners with universities through support for chairs and through co-location. In addition, many Environment Canada scientists are adjunct professors at Canadian universities. The following example demonstrates the tangible benefits possible through one form of department-university partnering: co-location.

Atmospheric Environment Service's UBC Partner Levers $2.7 Million Towards Joint Studies
In 1998, the Sustainable Development Research Institute (SDRI), AES's partner at UBC, was successful in receiving support for two major initiatives. "Reconciling Ecological Carrying Capacity and Human Well-Being: Exploring Alternative Futures for the Georgia Basin" will be funded by the Social Sciences and Humanities Research Council (SSHRC). This activity will examine the reconciliation of ecological limits with human welfare. AES researchers located at SDRI will focus on bringing atmospheric change issues into the research.
The CO_2 Calculator project will see the continued development and marketing of a Canadian-specific personal CO_2 emissions calculator with the potential to motivate Canadians to reduce their CO_2 emissions through lifestyle and behavioural changes. The proposal brings together Environment Canada, the David Suzuki Foundation, Petro Canada, Torrie Smith Associates, and NRCan.

SUMMARY

Partnering is becoming more and more critical to solving environmental issues that are increasingly global in nature. In describing the Department's partnering activities, this document provides a rationale for the Department's involvement in partnering by showing how partnering is essential in working towards the setting of national approaches to environmental management and sustainability. It demonstrates that Environment Canada's science is essential to establishing consensus on environmental issues with other organizations, both nationally and internationally. The document also provides the reader with a number of examples of Environment Canada's policy documents and some partnering practices that are designed to effect the Department's partnering philosophy. Environment Canada will continue to pursue partnering as a key activity to achieve an overall objective of environmental sustainability.

Appendix

Examples of Environment Canada's S&T Partnering Arrangements

Contents

ENVIRONMENT CANADA'S S&T PARTNERING ARRANGEMENTS

Partnering[1] arrangements are essential to the delivery of EC's mandate. Partnering maximizes the effectiveness of programs by allowing the Department to increase capacity through leveraging resources from other organizations.

The following examples are only a partial list of EC's S&T collaborations. These examples illustrate the diversity within and opportunities presented through S&T partnering at Environment Canada.

AES SCIENCE SUBVENTIONS

Objective: To ensure a supply of university graduates trained in areas of strategic importance to EC, and to support the existence of academic centres of expertise in priority areas.

Details: The AES Science Subvention Program provides research grants to university researchers within atmospheric and related sciences. In 1997/98, the Program offered approximately $600,000, which, it is estimated, leveraged at least an equal amount of resources from the universities in professors' salaries and laboratory and computing facilities.

Partners: The Program was run as a joint initiative with the Natural Sciences and Engineering Research Council (NSERC) until Program Review reductions forced NSERC to withdraw its one-to-one matching of funds. The Program supports research at 16 to 20 universities.

ATLANTIC COOPERATIVE WILDLIFE ECOLOGY RESEARCH NETWORK *(ACWERN)*

Objective: To elucidate the mechanisms and processes through which wildlife populations respond to ecological change on land and at sea.

Details: ACWERN was established in 1994 to enhance links among three major universities and between the universities and governmental and non-governmental institutions. The Network sets out to fill gaps in regional expertise and to address research questions important to conservation of the region's natural environment. The Network also aims to assist the Canadian Wildlife Service of Environment Canada with pure and applied research that enhances conservation and management programs for marine, aquatic and terrestrial ecosystems. The work is organized around three research themes: effects of landscape structure on biota, ecological responses of seabirds to environmental change, and selected management issues. By January 1998, the Network had initiated over 30 projects; supervised 23 graduate students, 18 honours students, 1 technician, and 1 post-doctoral fellow; published or accepted 19 papers (5 entirely from ACWERN work) and submitted a further 12 papers (including 3 describing ACWERN results).

[1] The term partnering is used here to avoid the specific legal definition of partnership as it is used in business partnerships.

Partners: The Network is headed by the Chairs, located at the University of New Brunswick, at Acadia University, and at Memorial University of Newfoundland. In addition, the management board has representatives from the three universities and from the Canadian Wildlife Service. To engage other partners the Chairs have as a primary goal the development of research contacts and collaborations with faculty from their respective institutions, with researchers at regional offices of the Canadian Wildlife Service, and with researchers in other universities, and governmental and non-governmental institutions outside their respective regions. Primary funding is provided jointly by Environment Canada and NSERC's University-Government Research Partnership Program. Further material support comes from the universities, which provide space, some funding, and administrative support.

ATLANTIC ENVIRONMENTAL PREDICTION INITIATIVE *(AEPRI)*

Objective: To conduct research and development for regional environmental simulation and prediction on all time scales in the Atlantic region.

Details: The Atlantic Environmental Prediction Initiative is a scientifically driven program which aims to provide top-quality science leading to both publishable results and practical outcomes. This project includes development of as comprehensive an environmental prediction system as possible with a focus on maritime environmental aspects such as regional atmosphere/ocean/ice/wave model coupling and the parameterization of related physical processes. A major first step will be the construction and testing of an integrated regional prediction system. Environment Canada staff will be located at Atmospheric Environment Branch offices and at the Department of Oceanography at Dalhousie University. Expected benefits include development of a strong research and development activity in atmospheric science and ocean science in the Halifax area and improvement of forecasts for the Atlantic region, as well as for other areas where atmosphere/ice/wave interactions are important. In addition, the initiative will train highly qualified personnel in priority areas and result in new and improved environmental prediction products. The Atlantic region of Canada is considered to be an ideal location to undertake such an initiative. In addition to being a hyperactive environmental area, it already has a solid base of government and university expertise specializing in atmospheric and oceanic sciences, and operational meteorology.

Partners: Climate and Atmospheric Research Directorate, Canadian Meteorological Centre, and Dalhousie University.

AVIAN BOTULISM

Objective: To control avian botulism which killed as many as half a million waterfowl at Old Wives Lake, Saskatchewan, during summer and fall 1997.

Details: Scientists are trying to identify environmental factors that trigger avian botulism, estimate the impact on the population, and determine the effectiveness of carcass collection in reducing mortality. The project is also assessing the feasibility of treatment for selected species during outbreaks.

Partners: EC Prairie and Northern Region, the National Water Research Institute, the University of Saskatchewan, the Canadian Cooperative Wildlife Health Centre, the Institute for Wetland and

Waterfowl Research, Ducks Unlimited Canada, Saskatchewan Environment and Resource Management, and the California Waterfowl Association.

BAY OF FUNDY ECOSYSTEM PARTNERSHIP

Objective: To foster wise conservation and management of the Bay's resources and habitats by disseminating information, by monitoring the state of the ecosystem, and by encouraging cooperative activities.

Details: The Bay of Fundy Ecosystem Partnership (BoFEP) was initiated in order to build on the work of a scientific network, the Fundy Marine Ecosystem Science Project (FMESP). FMESP itself was funded by EC and Fisheries and Oceans Canada and brought together scientists from these and other organizations. The creation of BoFEP, in 1997, linked the scientific enterprises involved with FMESP to the many other stakeholders which share an interest in the Bay of Fundy and its resources. These include community and First Nations groups, resource harvesters, scientists, resource managers, coastal zone planners, industry, business interests, government agencies, and academic institutions. BoFEP works to network among these participants and to promote and facilitate assessment of the state of the Bay of Fundy ecosystem and long-range planning and integrated management. Specific research projects, conservation activities and other initiatives of this "Virtual Institute" are undertaken by multidisciplinary working groups constituted as needed.

Partners: Partners include EC Atlantic Region, the Department of Fisheries and Oceans, the New Brunswick Department of Fisheries and Aquaculture, the Huntsman Marine Science Centre, the Conservation Council of New Brunswick, the Clean Annapolis River Project, and the Acadia Centre for Estuarine Research. EC's involvement with BoFEP fosters further linkages — for example, the Third Fundy Science Workshop, in 1999, will be principally sponsored by Mount Allison University, EC and BoFEP.

BOREAS — BOREAL ECOSYSTEM-ATMOSPHERE STUDY

Objective: To understand the interactive processes between the boreal forest and the atmosphere in order to assess the role of the boreal forest in global climate change.

Details: The Boreal Ecosystem-Atmosphere Study (BOREAS) is a large-scale international interdisciplinary experiment in the northern boreal forests of Canada. Its goal is to improve our understanding of the boreal forests — how they interact with the atmosphere, how much CO_2 they can store, and how climate change will affect them. BOREAS aims to learn to use satellite data to monitor the forests, and to improve computer simulation and weather models so scientists can anticipate the effects of global change. The AES investment, approximately $1.5 million, has leveraged about $30.5 million from NSERC and NASA, for a 20:1 ratio. Environment Canada is now the leader for the follow-up project (Boreal Ecosystem and Monitoring Sites—BERMS) with CFS and Heritage Canada as contributing partners.

Partners: The major partners are NSERC, Canada Centre for Remote Sensing, National Research Council, Canadian Forest Service, Environment Canada, and Agriculture and Agri-Food Canada, on the Canadian side, as well as National Aeronautics and Space Administration, National Oceanic and Atmospheric Administration, National Science Foundation, and

Environmental Protection Agency, from the United States. However, the project involves scientists from universities, government agencies and institutes from Canada, the United States and other countries (including France, Scotland, Russia and Australia).

BRÉCO BIRD SCARING BUOY

Objective: To develop a sound system incorporated into a buoy to scare birds away from oil spills and in this way reduce the mortality rate associated with spills and the costs associated with cleaning.

Details: In the marine environment, probably the most serious environmental threat to seabirds, in terms of high rates of mortality, is spills. Impacts from oil spills are intensified when they occur during periods when the birds congregate, particularly in staging areas during migration. The most dramatic example is the Exxon Valdez oil spill in Alaska in 1989, when 40,000 tonnes of petroleum products were accidentally released, resulting in the documented death of over 30,000 birds.

Efforts to save oiled birds during the last 20 years by different environmental organizations, including the Canadian Wildlife Service (Quebec Region), have focused on trying to clean them. Although this approach seems a very valid one that must continue to play a major role in emergency response planning, the prevention aspect, particularly as it concerns deterrent techniques that rapidly frighten birds away from an oil spill, warrants special attention. The CWS has been working actively for the past decade to test existing deterrents and develop new ones specific to sea ducks and other seabirds. Moreover, a review of the literature on 22 oil spills that have occurred in various parts of the world since 1955 shows that these groups of birds are much more likely than others to be affected by marine spills. For example, sea ducks such as the Common Eider, scoters and the Oldsquaw, as well as seabirds such as murres and guillemots, make up close to 97% of birds affected by spills.

Further research recently led to development of a sound system incorporated into a buoy. The main features of this buoy are the capability of emitting different sequences of combinations of 10 to 12 different sounds at irregular intervals and an intensity of 130 dB at 1 metre; a radio signal beacon so it can be located at any time; operating capacity for three consecutive days without a battery change (the batteries can be changed quickly by the operator); and a self-contained system designed to follow a drifting oil slick or to be anchored along a contaminated shoreline. The field tests conducted by the CWS on the Bréco buoy have demonstrated its effectiveness in frightening marine birds away, particularly sea ducks. The CWS believes strongly that this buoy is a major leap forward in the technology of scaring birds.

Partners: Canadian Wildlife Service (Quebec Region) and Bréco Innovation Inc.

CANADA-SOUTHERN CONE ENVIRONMENTAL TECHNOLOGY INITIATIVES

Objective: To support the transfer of Canadian environmental expertise and know-how, in order to improve environmental performance (primarily related to waste and wastewater management), to the public and private sectors of Argentina, Chile, and Uruguay.

Details: As part of the Canada-Southern Cone Environmental Technology (CANSCET) Initiatives, the Rio Colorado River Basin Management Project, Waste Minimization in the Metal Plating

Sector, and the Environmental Management Systems Project are being implemented in Argentina. The Environmental Impact Assessment Project, Forestry Sustainable Development Project, Indicators for Sustainable Development Project and the Internet Site/Information Systems Project are being established in Chile. In addition, the Environmental Risk Analysis for Environmental Emergencies Project, the Maritime Emergencies Oil Spills/Shoreline Countermeasures Project, and the Clean Technology Transfer in the Dairy Industry Project are being implemented in Uruguay.

Partners: EC's Canadian partners for this initiative include federal government agencies, as well as organizations in the private, academic and non-profit sectors. Partners in Argentina, Chile and Uruguay are from the government, private and academic sectors.

CANADIAN CENTRE FOR CLIMATE MODELLING AND ANALYSIS

Objective: To conduct research in coupled and atmospheric climate modelling, sea-ice modelling, climate variability and predictability, tracer transport and other areas.

Details: The Canadian Centre for Climate Modelling and Analysis (CCCma) is a division of the Climate Research Branch of the Atmospheric Environment Service and is located on the University of Victoria campus. Studies include a transient climate change experiment, which takes the effects of historical and projected changes in greenhouse gas concentrations and sulfate aerosol distributions into account for the period between the years 1850 and 2100. Selected data from these simulations will be contributed to the Intergovernmental Panel on Climate Change (IPCC) Data Distribution Centre to facilitate its use for climate impact studies. Diagnostic studies of both the observed and simulated climate system are also an integral component of CCCma's work. The Centre has developed an extensive climate diagnostics package that is used by a number of groups within the Atmospheric Environment Service, in the Climate Research Network, and in the Canadian university community. This climate diagnostics package has been emulated elsewhere.

While CCCma participates in a broad range of international studies and programs, individual members are involved with organizations such as the Working Group on Coupled Modelling, the Arctic Climate System Study, SPARC (Stratospheric Processes and their Role on Climate) and other committees and working groups. CCCma contributed to 1990 and 1995 IPCC reports. The Centre also provides graduate study opportunities in several areas, and its scientists offer courses through the University of Victoria's School of Earth and Ocean Sciences (SEOS).

Partners: CCCma is located at the University of Victoria and engages graduate students and post-doctorates in the Centre's programs. The Centre is also involved in extensive collaboration, including data and information sharing, with a number of international and domestic partners.

CANADIAN COOPERATIVE WILDLIFE HEALTH CENTRE

Objective: To promote the management and conservation of wild animals in Canada through the application of veterinary medical science.

Details: The Canadian Cooperative Wildlife Health Centre (CCWHC) was established in 1992 as a cooperative organization by Canada's four veterinary colleges. The central activity of the Centre

is surveillance of wild animal diseases in order to provide a better understanding of wildlife disease and disease processes in Canada. This is achieved through programs to enhance the detection of disease by field personnel and through diagnostic services provided by regional centres. A national database of wildlife disease occurrences and regular reporting of relevant information to government and non-government wildlife agencies and to the public are also part of the Centre's programs. EC does not have in-house capability in wildlife disease science and, therefore, relies on its partners within the CCWHC in order to effectively manage the migratory bird resource and other wildlife of federal interest.

Partners: CCWHC is a partnership of Canada's four veterinary colleges together with other collaborators. The Centre is sponsored by federal, provincial and territorial governments in Canada, as well as the Canadian Wildlife Federation, Ducks Unlimited Canada, AgrEvo Canada, DowElanco Canada, and Novartis. In 1998/99, EC contributed $200,000, while other government departments, industry and ENGOs contributed over $165,000.

CANADIAN ENVIRONMENTAL TECHNOLOGY ADVANCEMENT CENTRES

Objective: To help small and medium-sized enterprises (SMEs) commercialize environmental technologies and to, thereby foster a capacity for sustainable development in Canada.

Details: The three Canadian Environmental Technology Advancement Centres (CETACs) are CETAC-West, responsible for the four western provinces; the Ontario Centre for Environment Technology Advancement; and Enviro-Access, responsible for Quebec and Atlantic Canada. They were established in 1993 and early 1994 under the Green Plan. Private sector, not-for-profit corporations that operate at arm's length from governments, they provide a wide range of services to environmental SMEs, including business development counselling, assistance in raising capital, market research, and technical assistance.

Partners: The CETACs have developed a wide range of partners that assist in fulfilling their mandate. These include provincial research organizations and institutions, universities, the National Research Council's Industrial Research Assistance Program, provincial government departments, regional municipalities, private sector service providers (e.g. consultants and law firms), individual investors, industrial associations, regional development agencies (Western Economic Diversification, Fednor, and FORD-Q), and the Commission for Environmental Cooperation under NAFTA.

CANADIAN NETWORK OF TOXICOLOGY CENTRES

Objective: To undertake research, training, and analysis and communication of information on toxicology issues related to ecosystem and human health through innovative, multidisciplinary teamwork and partnerships between the public and private sectors.

Details: The Canadian Network of Toxicology Centres (CNTC) is a network of collaborating institutions which includes participants from academia, government and industry. The CNTC was formed in 1988 by the signing of a memorandum of understanding by three existing centres: the Centre for Toxicology at the University of Guelph, the Toxicology Research Centre at the University of Saskatchewan, and the Centre interuniversitaire de recherche en toxicologie de l'Université de Montréal et de l'Université du Québec à Montréal. The Network was funded during

1992/97 through Canada's Green Plan. Environment Canada, as the major government sponsor and supporter, continues to provide financial support for fiscal year 1998/99.

Partners: Support for CNTC programs comes from Environment Canada and leverages counterpart funds from other government agencies and departments, the private sector and international sources. The Network encourages the establishment of joint, cooperative research and educational projects among network members, federal and provincial government research establishments, and industry. In fiscal 1998/99, the CNTC has effectively leveraged the core Environment Canada funding by a ratio of almost 2:1.

CENTRE DE RECHERCHE EN CALCUL APPLIQUÉ

(Centre for Research on Computation and its Applications)

Objective: To intensify the technology transfer from universities to industry, to foster a high-quality scientific environment in Quebec, and to promote the training and hiring of highly qualified personnel in scientific computation.

Details: Created in 1991, the Centre de Recherche en Calcul Appliqué is a research corporation primarily funded by the province of Quebec. The Centre focuses on the study of advanced numerical computation applications in the areas of fluid mechanics, astrophysics and the environment. The Centre brings together scientists in Quebec who use numerical methods for scientific applications, both in industry and in universities, so that they may be fully informed about both the major problems that must be resolved and the expertise available.

Partners: AES, academia, industry and government partners.

CLIMATE RESEARCH NETWORK

Objective: To engage the energies, ideas, and talents of the university and private sector communities in providing the scientific knowledge required for climate change policy making.

Details: The Climate Research Network (CRN) was created in 1994 and consists of a network of Collaborative Research Groups. Each Collaborative Research Group focuses on a particular element of the research agenda. In addition, the AES climate modelling group located at the University of Victoria integrates the output of the Network. The AES investment of $2.6 million in 1996/97 was estimated to have leveraged an additional $2.95 million in that same year, for a doubling of the investment. The Network has enabled Canada to make significant contributions to the Intergovernmental Panel on Climate Change (IPCC) and the Kyoto process.

Partners: The CRN involves 16 universities across Canada and supports over 100 researchers, students and support staff.

CRYSYS

Objective: To develop capabilities to monitor and better understand variations in major components of the cryosphere (sea ice, lake ice, snow cover, glaciers, ice caps and frozen ground/permafrost).

Details: CRYSYS investigators use in-situ, airborne and satellite data, as well as modelling, in their research on the cryosphere. This initiative offers Canadian scientists opportunities to play a significant role in developing methods for extracting information on the cryosphere from conventional and remote sensing systems. It also provides Canadian scientists with a link to the data and information system of NASA's Earth Observing System, and allows CRYSYS investigators access to the huge volumes of satellite data being archived under the EOS program.

Partners: CRYSYS is led by the Atmospheric Environment Service of Environment Canada and currently involves over 30 researchers from 14 universities and 4 federal agencies. CRYSYS research activities also contribute to the objectives of other international research programs such as GEWEX (Global Energy and Water Cycle Experiment), ACSYS (Arctic Climate System Study) and ARCSS (Arctic System Science Data Coordination Center).

ENVIRONMENTAL ADAPTATION RESEARCH GROUP

Objective: To ensure that information is available to Canadian decision and policy makers on the environmental, social and economic impacts caused by vulnerabilities to atmospheric change, variability and extremes and on the viable adaptive responses to these impacts.

Details: The Environmental Adaptation Research Group (EARG), established in April 1994, works within the Climate and Atmospheric Research Directorate, within AES. The research results and information provided can be used by Canadians (e.g. decision and policy makers within communities, organizations, the private sector and government) to promote and facilitate adaptation to atmospheric change, variability and extremes and to assist in identifying the need for other response options (e.g. mitigation when impacts and/or adaptation response are deemed unacceptable or insufficient). Multidisciplinary cooperation and the engagement of other components of the Canadian and international research communities are fundamental to delivery of this research program. It is also essential that both the natural and human or social sciences collaborate in addressing the identified research questions. Partnering, facilitated by co-location on campus, encourages this collaboration.

Partners: EARG currently has staff at four locations across Canada: AES Headquarters in Downsview, Ontario; the Institute for Environmental Studies at the University of Toronto; the Sustainable Development Research Institute at the University of British Columbia; and the Faculty of Environmental Studies at the University of Waterloo. Memoranda of agreement (five-year terms) established for each university identify the objectives of partnering and co-location arrangements. EARG also maintains links with stakeholders and external partners (e.g. the insurance industry, U.S. Global Change Research Program, International Joint Commission, and NAFTA Commission for Environmental Cooperation) in order to achieve its objectives.

ENVIRONMENTAL SCIENCE AND TECHNOLOGY ALLIANCE CANADA

Objective: To promote environmental research and technology application and ensure diffusion of benefits of this research to a large number of Canadian companies of all sizes.

Details: Environmental Science and Technology Alliance Canada (ESTAC) is an alliance of businesses and universities that undertake environmental research and development and promote environmental technology application and diffusion throughout Canadian industry. ESTAC's vision is a Canadian industry/university/government alliance committed to sustainable development through excellence in environmental and industrial research and development. ESTAC's mission is to sponsor innovative and relevant research and development; promote the application of research results for technological development; contribute to the success of member companies; uniquely leverage the combined resources of stakeholders; emphasize science and technology for materials and energy conservation and the preservation of the environment; and foster the training and development of highly qualified scientists and engineers. Examples of projects to date include: scented geraniums for removing heavy metals from soil; safer route for the production of isocynates (polyurethane polymers) without the use of phosgene; and eliminating industrial waste via biotreatment.

Partners: Industrial members include Air Products, Alberta Research Council, Apollo, Bayer, Conestoga-Rovers, Consumers Gas, Dow Chemical Canada Inc. DuPont, ICI, Imperial Oil, Monsanto, Nova, OCETA, Praxair, Rhodia, Sterling Pulp Chemicals, Syncrude, Trojan, Uniroyal, and Water Technology. University partners include Alberta, Brock, Calgary, Carleton, Daltech, École Polytechnique, Guelph, Laval, Manitoba, McGill, McMaster, New Brunswick, Ottawa, Queen's, Saint Mary's, Saskatchewan, Toronto, Trent, Victoria, Waterloo, Western Ontario and Windsor. The 1998-99 ESTAC Board of Directors includes representatives from industry, universities and government (including the Director General of the Environmental Technology Advancement Directorate, who is a Member at Large).

ENVIRONMENTAL TECHNOLOGY CENTRE

Objective: To support the departmental mandate for environmental protection by providing specialized technical and R&D support.

Details: The Centre focuses on technologies for the measurement of air pollutants in ambient air and from mobile and stationary sources; the analysis of organic and inorganic components in diverse sample matrices; the assessment and clean-up of leaking hazardous waste sites; and the prevention and response to pollution emergencies such as oil and chemical spills.

Partners: Most of the R&D work, and some of the technical support services, are undertaken in cooperation with the public, private and academic sectors. Some R&D is also done in cooperation with international partners. Contractors working on and off site perform a significant part of the work.

ENVIRONMENTAL TECHNOLOGY VERIFICATION PROGRAM

Objective: To accelerate the application of innovative technologies that address current environmental priorities, while enhancing the credibility of Canada's environment industry in domestic and international marketplaces.

Details: Launched on April 1, 1997, the Environmental Technology Verification (ETV) Program provides independent third-party assessment and validation of performance claims made by vendors for their technology. A Government of Canada "Verification Certificate" is provided to successful companies that meet their performance claims. This enables innovative environmental technologies to readily access the marketplace, and existing and proven technologies to penetrate new markets. By providing a level playing field with similar initiatives in other countries, the ETV Program ensures that Canadian companies are competitive.

Partners: The ETV Program was developed by Environment Canada, in the lead role, and Industry Canada, with input from the environment industry sector. It is delivered privately by ETV Canada Inc. under a 10-year Licence Agreement with Environment Canada. Direction and advice is provided through the Inter-Provincial Working Group (IPWG), which has also established a Statement of Recognition indicating that ETV verification accelerates the regulatory approvals and permitting process. An important tenet of the ETV Program is reciprocity with similar programs.

GENIE NETWORK (GEOREFERENCED ENVIRONMENTAL NETWORK FOR INFORMATION EXCHANGE)

Objective: To use the Internet to facilitate cooperation between the various responders during an environmental emergency.

Details: During an environmental emergency, a number of different responders, rarely located at the same site, are called upon to act. Establishing an efficient, realistic and coordinated action plan when responders must work at a distance from each other can be a problem and can cause delays that impair the effectiveness of the response. Using a map common to all responders, each partner can add the information at its disposal and make it available to the other agencies through the file-transfer protocol (FTP) server. The data in circulation may consist of texts (weather forecasts, status reports) or georeferenced mapping information (site of incident, modelling, environmental issues, environment protection missions, etc.). The Network also includes a database allowing the identification of sensitive zones, their nature and the people to be contacted if necessary.

The way GENIE works is relatively simple. Starting with a digital base map, each partner works on its own to add the information it has; this information is added to the map in the form of new digital map layers and is transmitted through the FTP server. From this moment on, all the responders have virtually instant access to the new data. Thus, in the case of an oil spill, it is possible to obtain the location of the spill, predict its development (modelling), identify the sensitive zones to be protected (spawning grounds, crustaceans, wildfowl, municipal and industrial water supply points, etc.), determine the type of shoreline on which the work will be done, establish the types of oil recovery missions, and so forth. In addition, GENIE contains a database that allows the instant identification both of sensitive zones and of the people to be contacted should any of these zones be affected. There are two types of information distributed through the FTP server: text and graphics. Status reports and weather forecasts are transmitted as text, while the other elements

are distributed as georeferenced mapping information (oil slick, deployment of equipment, modelling, environmental issues, location of incident, etc.). All this information is sent to the server, thus providing access for each responder to the data it needs to include in its own digital map. Whether the emergency is an oil spill, a train derailment or other type of incident, GENIE works in the same way.

Partners: This project has attracted the interest of many stakeholders from various levels of government, private firms and quasi-public agencies. A number of these have already joined the project to collaborate with the Environmental Emergencies Branch of Environment Canada. The group includes the Air Issues Section and the Hydrology Division of Environment Canada, the Maurice Lamontagne Institute, the Canadian Wildlife Service, Fisheries and Oceans Canada, Eastern Canada Response Corporation Ltd. (ECRC) and the Canadian Coast Guard.

GLOBAL ENERGY AND WATER CYCLE EXPERIMENT

Objective: To understand and model the high-latitude water and energy cycles that play roles in the climate system, and to improve our ability to assess the changes to Canada's water resources that arise from climate variability and anthropogenic climate change.

Details: Canada is contributing to the World Climate Research Program's (WCRP's) Global Energy and Water Cycle Experiment (GEWEX) through the participation of many researchers in programs such as radiation efforts, precipitation and satellite climatology, cloud system modelling and hydrology modelling. In particular, Canada is carrying out an investigation of the water and energy cycles of the Mackenzie River, under a program called the Mackenzie GEWEX Study (MAGS). Under this program, a series of large-scale hydrological and related atmospheric and land-atmosphere studies is being conducted over the Mackenzie Basin. Within this region, there are many important cold-region phenomena such as snow and ice processes, permafrost, arctic clouds and radiation interactions, etc. that are essential components of any global climate system model.

Partners: GEWEX, as a core program of the World Climate Research Program, is linked to a large number of national and international agencies, committees and studies. The Scientific Steering Group membership includes individuals from universities, government and research institutes. Participants in MAGS include EC (AES and National Hydrology Research Centre), and individuals from Agriculture and Agri-Food Canada, the National Research Council, universities across Canada, utilities, the National Sciences and Engineering Research Council (NSERC) and other organizations. The MAGS effort is part of a collaboration among five regional experiments, characterized by quite different conditions and located in different regions of the world. Because the Mackenzie River is a major contributor of fresh water to the Arctic Ocean, MAGS is contributing to another WCRP project, the Arctic Climate System Study (ACSYS).

INDUSTRIAL RESEARCH CHAIRS — AES

Objective: To promote atmospheric science in Canadian universities.

Details: AES has participated in supporting a total of six Chairs, three of which are currently still being supported by AES. These Chairs, prompted initially by the tenuous state of atmospheric science at Canadian universities, provide funding for a five-year period, after which the university accepts full responsibility. Chairs have been established at Dalhousie, McGill, York and Toronto

universities. It is estimated that the first four Chairs leveraged 3.5 times the AES funds from the partners. The fifth Chair, at the University of Toronto, has leveraged 2.5 times the original amount in direct funds, and many times the original amount as "in-kind" support, such as access to satellites.

Partners: AES, NSERC, universities and the private sector.

INTERNATIONAL ENVIRONMENTAL YOUTH CORPS PROGRAM

Objective: To provide employment opportunities and work experience for Canadian university and college graduates under the age of 30 through international internships with Canadian exporters of environmental technologies and services.

Details: The International Environmental Youth Corps (IEYC) is a two-year initiative which seeks to strengthen the capacity of the Canadian environment industry by providing environmental exporters with skilled interns. The program also supports the work of Canadian environmental non-governmental organizations that are doing international work in sustainable development projects. Internships are from 6 to 12 months in length and involve practical work on significant international projects.

Partners: IEYC is a collaboration among EC, the Canadian Council for Human Resources in the Environment Industry, Human Resources Development Canada (HRDC), industry, private companies, non-governmental organizations and universities.

INTERNATIONAL MEMORANDA OF UNDERSTANDING AND BILATERAL AGREEMENTS

Objective: EC engages in international activities to protect the health and safety of Canadians and Canadian ecosystem from foreign threats; to support the broader sustainable development agenda; and to support the Government of Canada's broader economic and foreign policy agenda.

Details: International engagements aim to advance Canada's environmental agenda in the other country and strengthen areas of need by co-financing or cost-recovering areas of research priority within EC. (Examples include research into oil spill monitoring and clean-up with Norway and research and development related to environmental protection with the U.S. Environmental Protection Agency, U.S. Minerals Management Service and U.S. Coast Guard.) In addition, international initiatives advance the Government of Canada's foreign policy, enhance environmental cooperation, and enhance capacity building in other countries.

Partners: Partners include representatives from various levels of government, academia and the industry/consulting sector in both Canada and the partnering country (e.g. the United States, Mexico, China, Brazil, Chile, Taiwan, India, Pakistan, Russia, Poland, Argentina, Chile and Uruguay).

MITE (METALS IN THE ENVIRONMENT) NETWORK

Objective: To conduct research relevant to policy decisions concerning metals on the sources and effects of metals in the environment, as well as on the processes controlling the fates of those metals.

Details: The MITE Network provides important support to EC in its many regulatory activities and international agreements concerning metals in the environment. These include the UNECE Protocol for Metal Emissions, the NAFTA Hg Action Plan, CEPA (smelters emissions and effluents), CEAA assessment of mining sites such as Voisey's Bay, and others. The outputs of this initiative are correct assessments of the sources of metals to particular environments and correct assessments of metal effects on various biota. On this basis, sound policy advice can be provided to regulatory bodies or as part of international agreements.

Partners: Current partners in the Network are EC, Natural Resources Canada, Fisheries and Oceans Canada, Agriculture and Agri-Food Canada, and Health Canada; 11 Canadian universities from Manitoba to Dalhousie; 35 Mining Association of Canada (MAC) companies, including the "big five" of Inco, Falconbridge, Noranda, Hudson Bay Mining and Smelting, and Cominco; and Ontario Hydro. EC contributes resources in the form of time (salaries) and operating costs to do joint research. The amount leveraged from this project, measured in terms of direct funding by industry and other partners, ground field support by industry, as well as salaries of scientists and facilities of partnering departments and universities, is estimated to total at least $2 million.

MONTREAL 2000 ELECTRIC VEHICLE PROJECT

Objective: The Montreal 2000 Electric Vehicle Project is designed to form a network of 15 to 20 organizations, with commercial or institutional vehicle fleets, that would be interested in acquiring, among them, a total of 40 electric vehicles for regular use in their fleets.

Details: Like most major cities, Montreal is grappling with the problem of urban smog caused by NOx and VOC emissions, despite the existence of very strict air pollution regulations. The reduction in greenhouse gas emissions is a major factor in the climate change issue. Furthermore, the use of electric vehicles will make it possible to reduce CO2 emissions by more than 3.8 tonnes per vehicle per year.

The project has four components: purchasing assistance to help municipalities and private enterprise reduce the extra purchase cost; development of a private and public recharging infrastructure; the study program — the 40 electric vehicles will be equipped with instrumentation as part of the research project, the purpose of the evaluation program being to document the benefits, for the organizations, users and society, of using electric vehicle in commercial and institutional vehicle fleets in an urban setting; and the user support program, to simplify the purchasing procedures and promote the exchange of information and mutual support among the initial users.

The partners are proud of this new application of hydroelectric power, a clean, renewable energy source, for surface transportation. This energy system also helps solve the problem of reducing greenhouse gases, one of the major environmental issues of our time.

Partners: This two-year project is valued at $3 million. It has grown out of cooperation between industrial and government partners and will cover the greater Montreal area. The project has five main partners: Hydro-Quebec, the governments of Canada (Climate Change Action Fund, or CCAF) and Quebec, Norvik Traction Inc. and the Centre d'expérimentation des véhicules électriques du Québec (CEVÉQ). The extra cost for purchase of the 40 electric vehicles will total $1.27 million, to be paid by the users.

MULTILATERAL FUND FOR THE IMPLEMENTATION OF THE MONTREAL PROTOCOL

Objective: To encourage the promotion of Canadian environmentally sound technologies, products and services; contribute to the global reduction of ozone-depleting substances; and assist developing countries party to the Montreal Protocol in meeting their obligations.

Details: The Technology Transfer Office of the Environmental Technology Advancement Directorate (ETAD), head of the Canadian delegation to the Executive Committee to the Multilateral Fund for the Implementation of the Montreal Protocol, has coordination and management responsibility for bilateral assistance projects approved under the Fund. Canada is one of the few donor countries to reserve the maximum 20% of its annual $5.7 million contribution (80% CIDA, 20% Environment Canada) for technology transfer projects.

Partners: Canada has participated in 11 bilateral projects to date in Brazil, Chile, China, India and Venezuela, and is currently involved with two new projects in St. Lucia and Guyana. Partners also include Canadian technology developers, and consultants as well as the implementing agencies of the Multilateral Fund: UNDP, UNEP, World Bank and UNIDO.

NATIVE MUSSELS IN THE LOWER GREAT LAKES BASIN

Objective: To stem the demise of native mussels in the lower Great Lakes.

Details: Studies from The Nature Conservancy show that over half of North America's mussel species are imperilled as a result of commercial harvesting, habitat destruction, pollution and other factors. To address this, two researchers, one from the National Water Research Institute and the other from the University of Guelph, are studying sites to identify and protect critical populations of mussels in the lower Great Lakes drainage basin.

Partners: Partners include the National Water Research Institute, the University of Guelph, and the Canadian Wildlife Service and World Wildlife Fund Canada, both through the Endangered Species Recovery Fund. The project also has links with the Committee on the Status of Endangered Wildlife in Canada (a body comprising government, academic and non-government experts) and the Recovery of Nationally Endangered Wildlife strategy (which includes representatives of NGOs and different levels of government).

NORTH AMERICAN RESEARCH STRATEGY ON TROPOSPHERIC OZONE — CANADA-U.S.A.-MEXICO

Objective: To enhance research and assessment on tropospheric ozone.

Details: AES participates in the North American Research Strategy on Tropospheric Ozone (NARSTO) program, a public/private partnership with a primary mission to coordinate and enhance policy-relevant research and assessment on tropospheric ozone, in order to determine useful strategies for local and regional ozone management. NARSTO undertakes to establish and maintain communication channels between its scientific effort and its client community of planners, decision makers, stakeholders, and strategic analysts. The program also provides a cross-organization planning process, in order to determine the most effective strategies for scientific investigation.

Partners: AES collaborates with partners from government, industry and academia in Canada, Mexico and the United States on this initiative.

NORTH AMERICAN WATERFOWL MANAGEMENT PLAN *(NAWMP)*

Objective: The objective of NAWMP is to restore North American waterfowl populations to the levels of the 1970s by securing, enhancing and managing wetland and upland habitat across the continent. Under NAWMP, the Interior Wetlands Program (IWP) is destined to provide innovative solutions for protecting British Columbia's interior wetlands.

Details: In 1992 the IWP in British Columbia created partnerships with landowners and range managers to develop methods for protecting wetlands and promoting sustainable use of grazing lands by the cattle industry. The IWP exemplifies the North American Waterfowl Management Plan's goals of waterfowl conservation through partnering. It is funded through Environment Canada's Fraser River Action Plan and delivered by Duck Unlimited Canada. The Action Plan has focused on restoring and maintaining the health of the Fraser River Basin. The target area of the IWP is the lower and mid-elevation grasslands and open forest range lands which predominate in the Fraser River Basin.

Partners: Environment Canada collaborates with rangers, government agencies, municipalities, First Nations, industry and community groups.

PACIFIC ENVIRONMENTAL SCIENCE CENTRE

Objective: To provide the science in support of EC's regional programs, as well as to facilitate other important environmental goals in partnering arrangements.

Details: The Pacific Environmental Science Centre, located in North Vancouver, British Columbia, provides core laboratory and field operations in support of the Department's regional programs in ecosystem science, environmental protection, emergency response, shellfish, water quality, and environmental quality monitoring. The site, which includes a wildlife conservation area, is owned by the Vancouver Port Corporation and managed and controlled by Environment Canada under a memorandum of understanding. The MOU with the Port Corporation conserves the site for wildlife and

protects an adjacent intertidal area, which is an important resting area for waterfowl. Through the Canada/British Columbia Laboratory Agreement, the Science Centre also provides most of the environmental laboratory requirements of the province.

Partners: The Centre is a partnership of Environment Canada, the Vancouver Port Corporation, the District of North Vancouver, and the Wild Bird Trust of B.C.

PESTICIDE RESEARCH IN THE PRAIRIES

Objective: To understand the environmental effects, fate and pathways of agricultural pesticides on the prairie ecozone.

Details: This research enables EC to evaluate pesticides approved for use and is important in building an understanding of the ecological consequences of pesticide use in the Prairie and Northern Region. This work has found that ambient concentrations of pesticides in inland aquatic habitats are typically below levels of concern for human health and protection of wildlife. However, high precipitation events on the Canadian prairies during the pesticide application season have a negative effect on the ecology of wetlands.

Partners: Environment Canada, the University of Alberta, the University of Saskatchewan, Agriculture and Agri-Food Canada, Ducks Unlimited, Wildlife Habitat Canada, and the Canadian Wildlife Federation.

PROGRAM OF ENERGY RESEARCH AND DEVELOPMENT (PERD)

Objective: To support research in the non-nuclear energy sector, including the economic and environmental impacts of these energy forms.

Details: PERD supports the development of diverse environmentally and economically sustainable energy production and end-use technologies which promote the competitiveness of industries in all regions of Canada. It also provides a technical basis for codes, standards and regulations. The projects funded under PERD are organized into five areas, or Tasks, each of which has an interdepartmental committee that designs, reviews and assesses the portfolio of R&D activities in its respective area. These committees can have members from a variety of sectors including industry, academia, and provincial and federal governments. The Program is open to participation from other countries via collaborative agreements with PERD participating departments. Further, PERD has fostered strong linkages to international energy R&D activities through a memorandum of understanding with the U.S. Department of Energy and the collaborative R&D Program of the International Energy Agency. The Program has also fostered strong linkages with the European Union and the Asia-Pacific Economic Community.

Partners: PERD is led by NRCan and supports and complements the energy-related R&D activities of 11 federal departments and agencies. About 60% of PERD resources (over $36 million) is contracted out to a variety of industries, utilities, provincial research organizations and universities across Canada. The remaining research funds are allocated to internal programs in participating departments. Canadian energy R&D investment levers R&D investment by other countries, and often results in opportunities for Canadian firms abroad, or for the importation of technologies for domestic application.

RESEARCH CONSORTIUM IN THE PULP AND PAPER SECTOR

Objective: To focus chemical and biological advances on the problem of improving bleaching effluent quality.

Details: A consortium at the Pulp and Paper Centre of the University of Toronto has pulled together eight scientists, 12 private sector companies (from four countries) and one provincial environmental agency. The Consortium studies process changes to reduce environmental impacts of pulp mill effluent.

Partners: Partners are EC scientists acting as adjunct professors at the University of Toronto; the University of Toronto; Alberta-Pacific Forest Industries Inc., Canada; Aracruz Cellolose S.A., Brazil; Avenor Inc., Canada; Boise Cascade Corporation, U.S.A.; International Paper, U.S.A.; Irving Forest Services Ltd., Canada; Japan Carlit, Japan; Nippon Paper Industries Co. Ltd., Japan; Potlach Corporation, U.S.A.; Sterling Pulp Chemicals, Ltd., Canada; Tembec Inc., Canada; Weyerhaeuser Company, Canada; and the Ontario Ministry of the Environment.

SCIENCE HORIZONS PROGRAM

Objective: To further environmental science, while providing support and training to young scientists.

Details: The EC Science Horizons program is an ongoing initiative which provides promising young scientists and post-secondary graduates mentoring and coaching by experienced scientists and program managers. The program also provides the youth participants with hands-on experience working on environmental projects. Projects involve a six-month to one-year placement for a youth (generally under 30) who is an unemployed or underemployed young scientist or post-secondary graduate. EC regional offices negotiate project proposals directly with potential employers, who come from the private, academic or non-governmental sector and who provide a minimum of 30% of the costs of the project.

Partners: EC Science Horizons is a collaboration among EC, Human Resources Development Canada (HRDC), universities, community groups, provinces, industry and non-governmental organizations. HRDC is providing $1.1 million in funding for each year of the program.

SCIENCE LINKAGES — ATLANTIC REGION

Objective: To respond to the knowledge and information needs identified by the community-based Atlantic Coastal Action Plan (ACAP) sites in their planning processes and to strengthen the linkages between ACAP sites and EC scientists, engineers and economists.

Details: The Science Linkages program contributes to a better understanding of Atlantic Canadian ecosystems and of the impact of human activity on the ecosystem by promoting partnering between ACAP sites and EC scientists, engineers and economists. Proposals are received and reviewed by a broadly based committee on the basis of scientific and technical merit, formation of partnerships, environmental impact and the level of priority for the site. Each ACAP site is itself a partnering initiative involving government agencies, community representatives and others.

Partners: Submissions must be submitted jointly by an ACAP site and an Environment Canada scientist, engineer or economist. While ACAP provide $15,000 in funding in 1998/99, only one-third of the funding for ACAP-Science Linkages projects came from the ACAP Science Linkages funding.

SUSTAINABILITY OF ARCTIC COMMUNITIES

Objective: To examine the sustainability of Arctic communities dependent upon migratory caribou and investigate the possible effects of climate change on those communities.

Details: Biological, social, economic and climate change expertise is being used to model the effects of climate change on the Porcupine caribou herd and on communities that use this species for sustenance.

Partners: Canadian Wildlife Service scientists from the Pacific and Yukon offices of EC, the U.S. National Science Foundation, Arctic community representatives, the University of Alaska, the Institute for Social and Economic Research, and the Institute of Arctic Biology participate in this collaborative arrangement.

WATERSHED MANAGEMENT 2000 (SÃO PAULO)

Objective: To improve water quality management in the State of São Paulo, Brazil.

Details: Watershed Management 2000, a three-year project that was launched in 1997, has three main outcomes. First, the project has undertaken to set up a computer-based decision support system for the Piracicaba River Basin. The second goal is to improve sewage and sludge management in the Metropolitan São Paulo Region. Finally, the project will augment institutional linkages between Canada and the State of São Paulo.

Partners: Financial support is provided by the Canadian International Development Agency (CIDA), EC and several Brazilian agencies responsible for environmental preservation and water and sewer management. The project draws on Canadian expertise from both the private sector and government, including federal departments and provincial and municipal authorities.