The earth's climate is changing, and the impacts of climate change will be felt across national borders, ecosystems, and economic sectors in the decades to come. Responding to climate change is one of the most complex challenges facing all governments. Programs in this area are developing the knowledge, capacity, and experience to enable policy-makers to make informed future decisions and lay the foundation for future action. Canada is also helping countries throughout the world build their knowledge and capacity on climate change.

Investing in Knowledge and Building the Foundation

SCIENCE

Government of Canada

Climate Processes and Modelling

Climate Modelling and Analysis Program
This program develops and uses sophisticated atmospheric and coupled climate models and advanced analysis of observed data and model output to improve understanding of present, past and future climates. The models and analysis tools are used in short-term climate forecasting, for studies of climate predictability and variability, and to project and analyse the future climate change that will result from the anthropogenic changes in the composition of the atmosphere.

Canadian Centre for Climate Modelling and Analysis (CCCma), www.cccma.bc.ec.gc.ca/
Francis Zwiers, (250) 363-8229, francis.zwiers@ec.gc.ca

Climate Processes and Earth Observation Program
This program conducts research to improve the understanding of energy and water cycles and their component processes, particularly in cold climates. The program is also developing and implementing improved remote sensing and field measurement methodologies, and emphasizes the measurement and modelling of land surface processes and the evaluation and application of regional climate and weather models as integrating tools.

Environment Canada, Fisheries and Oceans Canada, Natural Resources Canada,
www1.tor.ec.gc.ca/index.html
Climate Research Branch:
www.msc-smc.ec.gc.ca/crb/home_e.cfm
Mackenzie GEWEX Study (MAGS):
www.msc-smc.ec.gc.ca/GEWEX/MAGS.html
Cryospheric System to Monitor Global Change in Canada (CRYSYS):
www.msc-smc.ec.gc.ca/CRYSYS/
BERMS (Boreal Ecosystem Research and Monitoring Sites):
http://ecsask68.innovationplace.com/
Barry Goodison (Environment Canada), (416) 739-4345, barry.goodison@ec.gc.ca
Allyn Clarke (Fisheries and Oceans), (902) 426-5153, clarkea@mar.dfo-mpo.gc.ca
Josef Cihlar (Natural Resources Canada), (613) 947-1265, cihlar@nrcan.gc.ca

The Climate Research Network
This program engages the energies, ideas and talents of the university community to expand and complement the scientific knowledge and expertise available in the country with respect to climate change and climate variability. It currently consists of a network of nine collaborative research groups in 18 Canadian universities. Each group focuses on a specific area of climate research.

Canadian Institute for Climate Studies (CICS)
www.cics.uvic.ca/
Doug Whelpdale, (416) 738-4869, douglas.whelpdale@ec.gc.ca

Remote Sensing Datasets for
Global Climate Modelling Initiative
This initiative uses global data on surface radiation retrieved from satellite measurements to inform climate modeling researchers. The researchers use these datasets to assess and improve the performance of general circulation models (GCMs).

Natural Resources Canada,
www.ccrs.nrcan.gc.ca
Zhanqing Li, (613) 947-1311, li@nrcan.gc.ca

World Climate Research Programme
The World Climate Research Programme furthers scientific understanding of the climate system and climate processes. Within the program, Canadian scientists are working on the World Ocean Circulation Experiment and the Joint Global Ocean Flux Study to help improve understanding of ocean processes and to contribute to the development of ocean components of climate models. Canada is also participating in the Global Energy and Water Experiment by studying hydrological processes in the permafrost-saturated and largely snow-covered lands of the Mackenzie River Basin.

Environment Canada,
Doug Whelpdale, (416) 739-4869,
douglas.whelpdale@ec.gc.ca

Greenhouse Gas Sources and Sinks

Arctic Climate Science Research Cooperation with Japan
The Arctic Climate Science Research Cooperation is a bilateral multi-disciplinary program involving government and university interests in Canada and Japan. The project will complement existing international climate change programs. Research results will form the basis for policy deliberations on climate change impacts on biodiversity, human conditions, marine habitat, Arctic's role as sources and sinks, long-range transport and storage of pollutants in the Arctic Ocean, etc.

Fisheries and Oceans Canada,
Natural Resources Canada, Environment Canada
Peggy Tsang, (613) 998-2904,
tsangp@dfo-mpo.gc.ca

Greenhouse Gases and Aerosol
Measurement Program
The overall objective of this program is to contribute to our understanding of greenhouse gases and aerosols – their trends, budgets and role in climate change – by carrying out measurements, modeling and process studies with a Canadian focus and by interfacing with other major international programs. There are currently three major areas of research: (i) greenhouse gas and aerosol measurements as part of Canada's contribution to the WMO Global Atmospheric Watch and other international programs; (ii) assessment of the role of the Canadian boreal forest and the Hudson Bay lowlands as sources/sinks of greenhouse gases; and (iii) assessment of the role of natural and anthropogenic aerosols in Canadian climate change.

Environment Canada,
Maris Lusis, (416) 739-4449,
maris.lusis@ec.gc.ca

International Geosphere-Biosphere Program
This multilateral program researches, monitors and assesses biomass burning.

Natural Resources Canada, www.igbp.kva.se
Mike Apps, (780) 435-7305, mapps@nrcan.gc.ca

International Institute for Applied Systems Analysis
The International Institute for Applied Systems Analysis collaborates on research related to forest carbon cycles in the Siberian forest and links with research being conducted by the International Boreal Forest Research Association.

Natural Resources Canada,
www.iiasa.ac.at/Admin/DI/Quarter/00-1/projects/for.html
Robert Stewart, (613) 947-9014,
rstewart@nrcan.gc.ca

Satellite Monitoring of Vegetation
This program uses satellite data to develop and demonstrate procedures for monitoring the seasonal development and carbon uptake of vegetation across the Canadian landmass.

Natural Resources Canada,
www.ccrs.nrcan.gc.ca
Josef Cihlar, (613) 947-1265, cihlar@nrcan.gc.ca

Agriculture

Agriculture and Agri-Food Canada (AAFC)
Research Branch – General Research to
Address Climate Change
The AAFC Research Branch undertakes extensive research and technology development to reduce greenhouse gas emissions from the agricultural sector.

Examples of research include the Prairie Soil Carbon Balance project (launched to refine measurement and verification protocols for soil carbon); studies aimed at reducing uncertainties in agro-ecosystem emissions estimates; farm-level greenhouse gas measurement; understanding the soil carbon storage mechanism, nitrogen flows and nitrous oxide emissions.

Agriculture and Agri-Food Canada,
http://res2.agr.ca/research-recherche/indexe.html
Christian De Kimpe, (613) 759-7824,
dekimpec@em.agr.ca
Ray Desjardins, (613) 759-1522,
desjardins@em.agr.ca

Canadian Economic and Emissions Model for Agriculture (CEEMA)
CEEMA is an integrated agro-ecological economic modeling system developed at Agriculture and Agri-Food Canada that can be used to simultaneously assess the economic and greenhouse gas emission impacts of agricultural policies at regional and national levels. The model is a quantitative tool that can contribute to policy analysis related to Canada's climate change goals through analyses of changing agricultural economics and production practices relative to patterns of greenhouse gas emissions.

Agriculture and Agri-Food Canada
Bob MacGregor, (613) 759-1796

Climate Change Funding Initiative (CCFI)
This initiative helps to improve the scientific understanding of the agriculture sector's contribution to greenhouse gas emissions. The CCFI has four major components. The first focuses on developing and increasing the pool of experts in the field of climate change in Canada by supporting projects involving graduate students in climate change science. The second component places a priority on the creation of science networks. The third brings experts together to share results and develop priorities for future action. Finally, the project sets in motion the coordination of climate change activities in Canadian agriculture within CARC that will continue beyond the CCFI program.

Agriculture and Agri-Food Canada
Canadian Agri-Food Research Council (CARC)
www.carc-crac.ca/english/climatechng/default.htm
Keith MacLeod, (613) 759-7307,
macleodk@em.agr.ca
Les Haley, (613) 759-7333, haleyl@em.agr.ca

Matching Investment Initiative (MII)
The MII increases collaborative research activity between the private sector and Agriculture and Agri-Food Canada (AAFC). The department will match industry's R&D contributions to collaborative research projects up to a maximum of one-for-one. The initiative, by involving industry research investors directly, will also help speed up the process of transferring new technology to the private sector. The MII contributes to the promotion and implementation of greenhouse gas-reducing practices in such areas as soil nutrient management, manure management, grazing strategies, feeding strategies, water management, agroforestry, food processing and soil carbon sequestration.

Agriculture and Agri-Food Canada
Pierre Sauriol, (613) 759-7852

Range Management Technology Transfer
The Prairie Farm Rehabilitation Administration (PFRA) investigates and provides technical information on the improvement of management of prairie rangeland resources (about 50 million acres), which can provide significant benefits for greenhouse gas sequestration. PFRA range management staff are working with Research Branch to develop firmer science on carbon sequestration potentials, and other greenhouse gas impacts. Appropriate management of the resources is estimated to result in an important greenhouse gas sink.

Prairie Farm Rehabilitation Administration (PFRA)
www.agr.ca/pfra/land/range.htm
Brant Kirychuk, (306) 780-6948,
kirychukb@em.agr.ca

Forests

Assessing the Carbon Budget of Circumpolar Forests
This project, a joint initiative with the United Kingdom, Russia and Scandinavia, involves collaboration to improve our understanding and management of the role of circumpolar boreal forests in the global carbon budget cycle.

Natural Resources Canada,
Robert Stewart, (613) 947-9014,
rstewart@nrcan.gc.ca

Boreal Ecosystems Productivity Simulator (BEPS) Program
This program uses remote sensing to quantify the terrestrial carbon cycle.

Natural Resources Canada,
www.ccrs.nrcan.gc.ca
Wenjun Chen, (613) 947-1286,
wenjun.chen@geocan.nrcan.gc.ca

Global Observation of Forest Cover (GOFC)
This program aims to improve the quality and availability of satellite observations of forests at regional and global scales and, together with in-situ observations, produce useful, timely and validated information.

Natural Resources Canada, www.gofc.org
Tim Perrott, (613) 947-7953, info@gofc.org

Role of Canada's Forests in the Global Carbon Cycle
This program consists of projects that aim to improve our understanding of carbon storage and release from Canada's forests under past, present, and future conditions. The projects also seek to define and evaluate forest management activities that might enhance and sustain storage of atmospheric carbon in our forests.

Natural Resources Canada,
www.nofc.forestry.ca/climate
Mike Apps, (780) 435-7305, mapps@nrcan.gc.ca

Systematic Climate Observations, Climate Monitoring and Analysis

Canadian Glaciology Program
This program collects and analyzes core samples from high Arctic and Cordilleran glaciers for past temperatures, snow accumulation and atmospheric concentrations of greenhouse gases, contributing to the international body of data that is needed to understand the long- and short-term effects of climate change.

Natural Resources Canada,
http://sts.gsc.nrcan.gc.ca/page1/clim
David Fisher (Arctic glaciers), (613) 996-7623,
fischer@nrcan.gc.ca
Mike Demuth (Cordilleran glaciers),
(613) 996-0235, mdemuth@nrcan.gc.ca

Climate Monitoring and Data Interpretation Program
This program monitors and analyses Canadian and global climate in order to determine the impact of human activities on climate trends and variations. The program uses integrated historical and proxy data sets to extend the climate record back 1,000 to 2,000 years. The program also funds the operation of a permafrost and active layer monitoring network, supporting the detection and monitoring of climate change in the Arctic.

Environment Canada, Fisheries and Oceans Canada, Natural Resources Canada
www.msc-smc.ec.gc.ca/ccrm/ccrm_e.cfm
Bill Hogg (Atmosphere), (416) 739-4348,
william.hogg@ec.gc.ca
Savi Narayanan (Oceans), (613) 993-4658,
narayanans@dfo-mpo.gc.ca
Art Dyke (Proxy data), (613) 992-0643,
adyke@nrcan.gc.ca
Margo Burgess (Permafrost), (613) 996-9317,
mburgess@nrcan.gc.ca

Global Array of Profiling Floats (Argo)
Argo is an international program that will collect ocean data necessary for understanding and predicting phenomena that influence our global climate, enabling the development of integrated atmospheric and oceanographic models. A global array of 3,000 profiling floats will observe the ocean's upper layer in real time. Canada has committed to the purchase of more than 20 floats today, and hopes to commit to 90–150 floats in the overall program.

Fisheries and Oceans Canada,
Environment Canada
Peggy Tsang, (613) 998-2904,
tsangp@dfo-mpo.gc.ca

Global Baseline Surface Radiation Network
Canada participates in an international radiation monitoring network called the Global Baseline Surface Radiation Network. Ground-based measurements are taken continuously using sophisticated equipment. These data are used along with satellite measurements to improve our understanding of how much energy is entering Earth's atmosphere and how much is leaving it. Canadian measurements are taken at Bratt's Lake in Saskatchewan and at the new stratospheric observatory at Eureka, in the Canadian Arctic.

Environment Canada,
Bruce McArthur, (416) 739-4464,
bruce.mcarthur@ec.gc.ca

Ice-core Circum-Arctic Paleoclimate Program (ICAPP)
This program is a Canadian-led international program that collects and studies ice cores around the Arctic in order to determine the timing, rate and cause of past global changes.

Natural Resources Canada,
Roy Koerner, (613) 996-7623,
rkoerner@nrcan.gc.ca

Paleo-Reconstruction of Climate Program
This program is helping support government, university and industry researchers in documenting a wide array of environmental conditions (e.g. tree rings, lake and marine sediments, the fossil record) that have taken place over the past 20,000 years. This information will be added to a major Canadian database that provides information on the long-term climate variability in Canada and its impacts.

Natural Resources Canada,
http://sts.gsc.nrcan.gc.ca/page1/clim/
Art Dyke, (613) 992-0643, adyke@nrcan.gc.ca

Saskatchewan

Canadian Council of Ministers of the Environment (CCME) Indicators Study of Climate Change
This project will develop preliminary indicators of climate change in Canada and publish them in a public-friendly document. The initiative is co-chaired by Environment Canada and Saskatchewan Environment and Resource Management.

Roger Street, (416) 739-4271,
roger.street@ec.gc.ca
Ron Zukowsky, (306) 787-6285,
ron.zukowsky.erm@govmail.gov.sk.ca

Yukon

Northern Climate ExChange
The Northern Climate ExChange serves as a northern entry point into the study of climate change in the circumpolar north. It conducts research and education on the impacts of, and adaptations to, climate change in the north; supports the development of resource efficient technologies and practices that can contribute to mitigating climate change impacts; and facilitates the exchange of scientific, traditional and local knowledge, technology, and expertise via a circumpolar "trade-route".

www.taiga.net/nce
Aynslie Ogden, (867) 668-8735,
aogden@yukoncollege.yk.ca

IMPACTS AND ADAPTATION

Government of Canada

Adaptation and Impacts Research Program
The Adaptation and Impacts Research Program promotes and conducts research designed to increase Canadians' understanding of atmospheric change impacts and the required adaptations. These research activities are designed to provide Canadians with information on the environmental, social and economic risks and impacts caused by vulnerabilities to atmospheric change, variability and extremes, and on the viability of adaptive responses. The program focuses on a number of key research themes (e.g., integrated assessments, health and atmospheric change, human dimensions of weather and climate, water and climate variability and change, integrated air issues, adaptation and impacts science) and works in partnership with selected universities and Canadian and international collaborators.

Environment Canada, www.tor.ec.gc.ca/airg
Roger Street, (416) 739-4271,
roger.street@ec.gc.ca

Adapting to Climate Change Impacts on the Landscape
This program, a combined government, university and industry effort, is assessing how climate change could affect selected aspects of the Canadian landscape in order to help decision-makers determine their adaptation options. Current topics include: sea level rise impacts on the coasts of the Western Arctic and Prince Edward Island, landslides in the Rocky Mountains, slope stability implications for pipelines across Canada, drought frequency on the Prairies, permafrost thaw and impacts on infrastructure in the Northwest Territories, and flooding in the Red River Basin.

Natural Resources Canada,
http://sts.gsc.nrcan.gc.ca/page1/clim/
Paul Egginton, (613) 992-2451,
pegginto@nrcan.gc.ca

Agro-Climate Monitoring and Information Transfer
The unit will be developing a long-term agro-climate strategy for the Branch. The scope of activities, to take place over the next three years, include analyzing

alternative long-term strategies for drought monitoring, reporting and responses, and the application of long range climate forecasts to prairie agriculture; and recommending a preferred course of action to PFRA senior management. The group's activities will also include identification of climate trends and their impact on long-range climate forecasts, as well as management of the Branch's on-going drought monitoring and reporting activities.

Prairie Farm Rehabilitation Administration (PFRA)
www.agr.ca/pfra/pfintroe.htm
www.agr.ca/pfra/pfheade.htm#ac
Brian Abrahamson, (306) 780-8875,
abrahamsonb@em.agr.ca
Alan Stewart, (780) 495-3308,
stewarta@em.agr.ca
Ted O'Brien, (306) 780-6000, obrient@em.agr.ca

Feasibility of Identifying Heat Effects and Mortality in Canadian Seniors as a Basis for Effective Climate Change Risk Management and Adaptation
The objective of the research is to examine the effects of heat and related mortality rates in Canadian seniors. The data collected will serve as a basis for effective climate change risk management and adaptation capabilities.

Health Canada,
Wendy Thompson, (613) 941-1282,
wendy_thompson@hc-sc.gc.ca

Fire Protection – Adaptation Responses to Climate Change
This project aims to improve Canada's fire and insect prediction capabilities and devise improved options and strategies to adapt and respond to future fire conditions.

Natural Resources Canada,
http://nofc.cfs.nrcan.gc.ca/climate/
Brian Stocks, (705) 759-5740 ext. 2181,
bstocks@nrcan.gc.ca

Implications of Climate Change for Canada's Forest: Climate Change Research
This program aims to improve Canada 's understanding and prediction of the impacts of climate change on our forest ecosystems, and develop forest management options and responses for adapting and responding to these impacts.

Natural Resources Canada,
http://nofc.cfs.nrcan.gc.ca/climate/
Robert B. Stewart, (613) 947-9014,
rstewart@nrcan.gc.ca

International Experts Workshop Held in Relation to the Development of International Guidelines for Assessing the Health Impacts of Climate Change
The World Health Organization and the Government of Canada will jointly produce international guidelines for the development of health impacts assessment methodologies in relation to climate change. The guidelines will increase the ability of Canada and other signatory countries of the United Nations Framework Convention on Climate Change (UNFCCC) to assess the health impacts of climate change within their own country by providing methodologies that will enable valid comparisons of impact assessment results and optimum national and international health risk management.

Health Canada, World Health Organization (WHO),
Dieter Riedel, (613) 952-7810,
dieter_riedel@hc-sc.gc.ca

British Columbia

Agriculture – Identification of Agricultural Soil Carbon Sequestration Potential in BC
British Columbia is researching to enable development of a policy for the accounting of agricultural soil sinks. Alternative cropping practices will be identified for areas with a potential to increase soil organic matter. Broad costs for alternative practices and potential carbon credit value will be estimated.

Rob Menes, (250) 356-0191,
robert.menes@gems1.gov.bc.ca

Fisheries – Adaptation in BC's Fisheries Sector
British Columbia is researching climate change impacts on fish and fish habitat; establishing gene banks to protect diversity of fish populations affected by climate change; cooperating with other agencies to restore fish habitat; adopting technology and techniques for selective fisheries; developing and diversifying new fisheries; and communicating with professionals and the public. BC's *Fish Protection Act* and related regulations protect in-stream flows for fisheries and riparian vegetation, helping to mitigate climate change impacts.

www.gov.bc.ca/fish/
Bob Williams, (250) 356-0830,
bob.williams@gems4.gov.bc.ca

Alberta

Alberta Agricultural Research Institute
The Alberta Agricultural Research Institute funds a variety of agricultural research programs, a number of which may have greenhouse gas benefits. The institute's goals are to improve effectiveness in research through collaboration of agencies and researchers; enhance industry competitiveness, profitability and sustainability; promote application of research results by industry; and increase investments in and recognition of research.

www.aari.ab.ca
Ralph Christian,(780) 422-1072,
ralph.christian@gov.ab.ca

Calgary Landfill Design Project
Alberta Environment is a partner with the City of Calgary and the University of Calgary in a project to study landfill designs for the control of landfill gas emissions (including methane). The $50,000 project involves the building of two experimental landfill cells for studying lining/capping materials for landfills.

Raymond Wong, (780) 427-0820,
raymond.wong@gov.ab.ca

Prairie Soil Carbon Balance Research Study
Alberta Agriculture, Food and Rural Development is one of a number of partners supporting a multi-year research study to better understand soil carbon dynamics. The purpose of the study is to develop scientifically sound methods to assess changes in soil carbon based on management practices. This three-year project is being conducted in two phases. Phase I involves a relative comparison of management practices at selected long-term sites for their ability to sequester carbon using soil organic carbon quantity and quality indicators. Phase II of the project involves the Landscape Extrapolation-Modeling aspect of the study.

www.agric.gov.ab.ca
John Keng, (780) 427-3770, john.keng@gov.ab.ca

Research on the Role of Forests
in the Global Carbon Cycle
The Government of Alberta funds the Foothills Model Forest and the Sustainable Forest Management Network to a combined total of $2 million per annum. A portion of this funding supports research into the carbon dynamics of forests and other landscapes of the boreal forest. The Foothills Model Forest has compared the impact of wildfire disturbance and wood products manufacture on the sequestering of carbon.

www.env.gov.ab.ca
Cam McGregor, (780) 422-4571,
cam.mcgregor@gov.ab.ca

Saskatchewan

Climate Change and Fragmented Prairie
Biodiversity: Prediction and Adaptation
A large number of terrestrial and aquatic species on the highly fragmented prairies are at great risk of extirpation through the effects of climate change. The assumption has been that they will move and that others will take their place. This study will provide models of probable adaptation of selected prairie taxa to climate change, and will describe and evaluate possible human responses to those changes in biodiversity.

Kevin Murphy, (306) 787-2941,
kevin.murphy.erm@govmail.gov.sk.ca

A Framework for Assessing Climate Change
Adaptation Options for the Forestry Sector in
the Prairie Provinces
This graduate student project, funded by the Prairie Adaptation Research Cooperative (PARC) through the University of Saskatchewan, will develop a framework for identifying ways in which forest companies can adapt to climate change impacts through modifications to their Sustainable Forest Management system.

www.parc.ca
Mark Johnston, (306) 953-2491,
johnston@derm.gov.sk.ca

Genetics and Breeding (plant and livestock)
The goal of this program is to improve crop and livestock genetics to reduce inputs per unit of output. Programs are focused on improvements such as increased yield (gain in livestock), improved disease/pest resistance, and improved nutrient uptake (feed efficiencies in livestock).

www.agr.gov.sk.ca
Ken Panchuk, (306) 787-0556,
kpanchuk@agr.gov.sk.ca

Multi-Jurisdictional Cooperation on Northern
Climate Change impacts
Saskatchewan Environment and Resource Management is working with Alberta Environment, Manitoba Conservation Department, Nunavut, the Northwest Territories, Yukon, and Natural Resources Canada and

Environment Canada to develop joint project to priorize research on climate change impacts in Northern Canada.

Ron Zukowsky, (306) 787-6285,
ron.zukowsky.erm@govmail.gov.sk.ca

Prairie Adaptation Research Cooperative (PARC)
The Prairie Adaptation Research Cooperative (PARC), established under the Climate Change Action Fund, provides funding for targeted applied research to study adaptation to changes in climate on the Prairies and to better understand the impacts of climate change. PARC will coordinate and encourage collaborative research among sectors and disciplines, and, through the training of new graduates, will act as a focal point for the professional development of researchers in this emerging field of study.

www.gov.sk.ca/enermine
Malcolm Wilson, (306) 787-2618,
malcolm.wilson@sem.gov.sk.ca

Vulnerability of the Western Canadian Boreal Forest to Climate Change
This project will determine the vulnerability of the western boreal forest to climate change in terms of insect/disease outbreaks, frequency and intensity of forest fires and impacts of moisture stress. The focus will be on working with forest industry in identifying these impacts at the Ecodistrict level in ways that are relevant to their operations and planning horizons. Funding is from the Climate Change Action Fund, Impacts and Adaptation Component.

http://sts.gsc.nrcan.gc.ca/adaptation/main.htm
Mark Johnston, (306) 953.2491,
johnston@derm.gov.sk.ca

CLIMATE CHANGE ACTION FUND — SCIENCE, IMPACTS AND ADAPTATION

The Climate Change Action Fund, an initiative of the Government of Canada, has invested $15 million over three years in research that will advance our knowledge of the magnitude, rate and regional distribution of climate change and its impacts on Canada. This will permit us to better estimate the risks of climate change. The program has two components, one focusing on science, and one on impacts and adaptation.

Science

Research into the science of climate change has focused on several key areas identified through a national consultation process: climate model improvements; greenhouse gas sources and sinks, climate monitoring, arctic climate system research and monitoring, climate change scenarios, and climate and weather extremes. Scientists from federal and provincial governments, universities and the private sector have all participated in this program. A selection of projects initiated over the past year is presented below.

Environment Canada
Rob Cross, (819) 997-3840, rob.cross@ec.gc.ca

- Climate Scenarios for the Canadian Impacts Community: Identifying the Needs has helped to identify and provide the climate scenarios that would meet the needs of the climate impacts research community in Canada. This, in turn, will help provide all regions and sectors of Canada with climate model results that are in a form useful for their specific applications. This work is best done through a partnership between researchers working on climate models and those working on the impacts of climate change. The project will also result in the development of a needed national capacity in this area so that similar information and advice will continue to be available. This initiative has links to similar activities internationally.

  Environment Canada
  Roger Street, (416) 739-4271,
  roger.street@ec.gc.ca
  Doug Whelpdale, (416) 739-4869,
  doug.whelpdale@ec.gc.ca

- Developing a National Upscaling Strategy for Carbon Budgets of Canada's Forest Ecosystems Using Remote Sensing, Tower Flux and Inventory Data will lead to a better understanding of the role of Canadian forests in addressing climate change, by improving national estimates of how much carbon is stored in Canada's forests. This project will combine the measurement of carbon dioxide exchanged between the ecosystem and the atmosphere, obtained from tower-based instruments, with satellite information on what types of vegetation are in the forests. The use of satellite imagery will also allow scientists to develop models of the amount of carbon in our forests, to assist in predicting how forests are responding to climate change.

Canada Centre for Remote Sensing,
Natural Resources Canada
Jing M. Chen, (613) 947-1266,
jing.chen@ccrs.nrcan.gc.ca

- Establishing Approximations for Sloping Bottom Boundary Layers to be Incorporated into Ocean General Circulation Models will use modeling studies to understand and quantify the important mixing processes of water in the oceans. Once researchers understand the main processes that occur on a small scale, they can calculate the mixing processes for major continental shelves and deep-ocean ridges.

  Fisheries and Oceans Canada
  Ming Li, (250) 363-6343,
  lim@pac.dfo-mpo.gc.ca

- Improving the Approximation of Ice Cloud Radiation Processes in Canadian Climate Centre Global Climate Models is addressing how to improve the portrayal of processes associated with ice clouds in regional and global models of the climate system. "Ice clouds" are clouds that exist in environments cold enough for water to freeze, and these clouds regularly cover about 30% of the globe. The ice crystals making up the ice clouds come in a variety of sizes and shapes — a feature that makes them and their effects on solar and terrestrial radiation more difficult to represent in climate models. Findings from this project will be included in the Canadian Climate Centre Global Climate Model, and the researchers will also investigate the consequences for climate simulations.

  Atmospheric Science Program, Department of Oceanography, Dalhousie University
  Qiang Fu, (902)-494-6448, qfu@atm.dal.ca

- Improving Approximations of Land Surface Snow Processes for Canadian Climate Models will test approximations for snow cover against observational snow cover data from various Canadian sites. Snow cover is an important part of the climate system and at present is not well represented in climate models. The project will also investigate the phenomenon of blowing snow, which is not currently considered in models. As a result, the climate model will represent snow cover more accurately. It will also lead to more precise predictions of snow cover and other climate variables.

  Environment Canada
  Diana Verseghy, (416) 739-4422,
  diana.verseghy@ec.gc.ca

- Improving the Representation of the Interaction between Clouds and Radiation in Canadian Climate Models will develop, test and implement new radiative transfer algorithms in the Canadian Global Climate Change Model (GCM). These algorithms address the interaction between clouds and radiation, both solar and terrestrial, at scales unresolved by the GCM. The algorithms will aid in the production of a more realistic climate model, thereby helping scientists simulate climatic change caused by increased concentrations of greenhouse gas emissions and atmospheric aerosol.

  Environment Canada
  Howard Barker, (416) 739-4909,
  howard.barker@ec.gc.ca

- Modelling Regional Climate Changes in the Canadian Inland Seas: The Gulf of St Lawrence and Hudson Bay will advance the development of a regional ice-ocean climate model component for the Eastern Canada Regional Climate Model by producing regional ice-ocean climate scenarios for these two Canadian inland seas. These scenarios will show what conditions could be like in those areas in the future if carbon dioxide levels continue to increase.

  Fisheries and Oceans Canada
  François J. Saucier, (418) 775-0791,
  saucierf@dfo-mpo.gc.ca

- Northern Oceans Dimethylsulfide Emissions Models (NODEM) is aimed at improving our understanding of how naturally occurring sulfur sources (e.g. microalgae) from northern oceans affect climate change. It will also help us predict the effect of climate change on oceanic dimethylsulfide (DMS) production. This issue is important, as it has been hypothesized that a rise in global temperature could foster DMS production, which could partially counter the greenhouse effect.

  Fisheries and Oceans Canada
  Maurice Levasseur, (418) 775-0608,
  levasseurm@dfo-mpo.gc.ca

- Scaling of Cold Season Land Surface Processes and Its Application to Improving Land Surface Parameterizations in Canadian Climate Models will improve the way snow-covered land surfaces, particularly at more local scales, are represented in Canadian climate system models. Researchers will conduct modeling studies for snow cover for different regions and

seasons with the aim of better predicting cold season climatic conditions across Canada.

Environment Canada
Kit Szeto, (416) 739-4889, kit.szeto@ec.gc.ca

- Sulphate Aerosol Forcing in Canadian Climate Models is conducting research to improve the way in which climate system models represent the processes involving sulphate aerosols in the atmosphere. Sulphate aerosols are solid or liquid particles suspended in the air, and aerosols are produced by both human activities and natural processes. These sulphur-containing substances are important as they cool the atmosphere, thus partially countering the warming effect of greenhouse gases. By understanding the combined effects of greenhouse gases and sulphate aerosols, we will be better able to predict the future climate.

  Atmospheric Science Program,
  Department of Physics, Dalhousie University
  Ulrike Lohmann, (902) 494-2324,
  ulrike.lohmann@dal.ca

Impacts and Adapation

The Impacts and Adaptation sub-component of the CCAF-SIA provides funding for targeted research to better understand the impacts of climate change on the regions and sectors of Canada, and how we can adapt to these impacts — now and in the future. The Impacts and Adaptation sub-component has also contributed to the development of a national network that brings together government, university and private-sector researchers and stakeholders to address climate impacts and adaptation. A selection of impacts and adaptation projects is presented below.

Natural Resources Canada,
http://sts.gsc.nrcan.gc.ca/adaptation
Pamela Kertland, (613) 943-0650,
pkertlan@nrcan.gc.ca

- Adaptation of Prairie Cities: The Role of Climate is assessing alternative urban decision-making models in order to promote adaptation to a range of future climates. The project will examine how four major cities (Edmonton, Saskatoon, Regina and Winnipeg) and four small cities (Brandon, Swift Current, Prince Albert and Grande Prairie) use climate information within their current decision-making processes. The project will also review the climatic sensitivity of key activities and the possible impacts of climate changes. The project involves the Saskatchewan Research Council (City Climate Advisory Group), the Achitectural Association of Saskatchewan, Alberta Environmental Protection, Manitoba Conservation, Saskatchewan Environment and Resource Management, and SaskPower.

  Saskatchewan Research Council,
  www.src.sk.ca/climatology
  Virginia Wittrock, (306) 933-8122,
  wittrock@src.sk.ca

Climate Change Environmental Assessment of Agricultural Producers' Investment Strategies in the Montreal Region assesses the extent to which the investment strategies of agricultural producers in the richest agricultural region of Quebec increase, decrease or remain neutral to maintaining or improving these farms' resilience and adaptability to climate change.

Université de Montréal,
http://sts.gsc.nrcan.gc.ca/adaptation/
Pierre André, (514) 343-8051
andrep@ere.umontreal.ca

- Climate Change, Permafrost Degradation and Infrastructure Adaptation: Community Case Studies in the Mackenzie Valley is examining sensitivity to the impacts of permafrost degradation in the North under climate warming in order to determine infrastructure needs that include future adaptation measures and strategies. The study is being conducted in the towns of Norman Wells and Tuktoyaktuk in the Northwest Territories. The project also involves Enbridge Pipelines (NW) Ltd, ESSO Resources, and EBA Engineering Consultants.

  Natural Resources Canada,
  http://sts.gsc.nrcan.gc.ca/adaptation/
  Stephen Robinson, (613) 992-0612,
  srobinso@nrcan.gc.ca

- Development of Model Adaptation Strategies to Reduce Health Risks from Summer Heat in Toronto will help develop short- and long-term climate adaptation strategies for Toronto, including the development of an extensive urban reforestation plan and an effective Heat-Health Watch/Warning System. The published studies will enhance understanding of the potential urban impacts of climate change. The project involves the City of Toronto (Public Health Department), the Toronto Atmospheric Fund, and the University of Delaware.

City of Toronto,
www.city.toronto.on.ca/taf
Philip Jessup,
(416) 392-0271, taf@city.toronto.on.ca

- Effect of Recent Climate Change on the Early Marine Growth Rates of Juvenile Salmon in the Strait of Georgia is assessing whether recent changes in plankton dynamics and increases in water temperature, which result from climate change, have combined to reduce the growth rates of juvenile salmon in the Strait of Georgia. The Straight of Georgia is one of the most productive marine ecosystems in Canada and serves as a critical nursery area for juvenile salmon.

  University of British Columbia,
  www.eos.ubc.ca/
  John Dower, (604) 822-2496,
  jdower@eos.ubc.ca

- The Prairie Adaptation Research Cooperative is an interdisciplinary research network established to facilitate coordination and adaptation research on the Prairies, build research capacity and improve the understanding of the potential impacts of climate change on Canadian prairie provinces. The cooperative also conducts research necessary to develop appropriate adaptation strategies.

  Natural Resources Canada, Governments of Alberta, Saskatchewan, Manitoba, www.parc.ca
  Don Lemmen, (613) 992-5861,
  dlemmen@nrcan.gc.ca

- Sea Level Rise and Climate Change: Impacts and Adaptation Needs – Prince Edward Island: A Case Study is using leading-edge technologies, including LIDAR mapping, to obtain detailed information about how changes in sea level, storm surges, waves and sea ice will affect the coastal zone of Prince Edward Island. The project forms the basis for planned comprehensive research in Atlantic Canada and the development of adaptation strategies to cope with sea level rise. The project involves Dalhousie University, the Government of Prince Edward Island (Department of Technology and Environment), and the Institute for Catastrophic Loss Reduction.

  Environment Canada, Natural Resources Canada, Fisheries and Oceans Canada
  http://agc.bio.ns.ca/coastweb/pei/index.html
  Martha McCulloch, (902) 426-9200,
  martha.m.mcculloch@ec.gc.ca

  Don Forbes, (902) 426-7737,
  dforbes@nrcan.gc.ca

POLICY DEVELOPMENT

Government of Canada

Canada's Clean Development Mechanism (CDM) and Joint Implementation (JI) Office
The Government of Canada's CDM and JI Office, established in 1998, is the federal government focal point on the Clean Development Mechanism and Joint Implementation, two project-based mechanisms under the Kyoto Protocol. The Clean Development Mechanism allows Canada to implement greenhouse gas emissions reduction projects in developing countries in order to help Canada meet its Kyoto target. Joint Implementation allows Canada to work with other developed countries to meet Canada's emissions targets through jointly implemented emissions reduction projects.The Office facilitates Canadian participation in the CDM and JI, evaluates and approves project proposals submitted by Canadian entities and assists with host country approval processes, including strategic cooperation agreements with the host countries. It also provides technical guidance to companies participating in the CDM and JI.

Department of Foreign Affairs and International Trade, www.dfait-maeci.gc.ca/cdm-ji/
Sushma Gera, (613) 944-0051,
sushma.gera@dfait-maeci.gc.ca

National Energy Use Database (NEUD) Initiative
This initiative enables the Government of Canada to monitor and evaluate progress towards its goal of limiting greenhouse gas emissions, provide information to support the development of future initiatives, and ensure the development of a base of expertise in the analysis of energy consumption at the end-use level in Canada. The development of energy end-use data includes reviews of existing data, assessment of information needs, expansion of existing surveys or the creation of new ones to meet these data needs, and the establishment of energy end-use data and analysis centres at selected universities across Canada.

Natural Resources Canada,
http://oee.nrcan.gc.ca
Tim McIntosh, (613) 943-2396,
tmcintos@nrcan.gc.ca

Participation in the Development of a National Implementation Strategy on Climate Change
The Government of Canada has worked with provincial and territorial governments, as well as with interested stakeholders including industry, scientists, the business community, non-governmental organizations, and individual Canadians, to build a national implementation strategy to respond to climate change, including Canada's international commitments. Sixteen Issues Tables, involving some 450 experts from multiple perspectives, examined the costs, impacts, and benefits of implementing the Kyoto Protocol and the options open to Canada in developing a climate change strategy. The Analysis and Modelling Group, part of the Issue Table process, used the Issue Tables input to form options for broad policy approaches to meet the climate change challenge. Their work has been the foundation for the development of the National Implementation Strategy and the First National Climate Change Business Plan of measures to implement the strategy.

Climate Change Secretariat,
www.nccp.ca
David Oulton, (613) 943-2669,
daoulton@ccs.gc.ca

British Columbia

Assistant Deputy Ministers' Climate Change Committee
The Assistant Deputy Ministers' (ADMs) Climate Change Committee co-ordinates BC government policy development and program initiatives on climate change. The committee includes ADMs from all provincial agencies affected by climate change or climate change policies.

www.elp.gov.bc.ca/epd/epdpa/ar/climate/
Mark Gillis, (250) 356-5475,
Mark.Gillis@gems8.gov.bc.ca

British Columbia Greenhouse Gas Forum
The BC Greenhouse Gas Forum was initiated in 1997 and comprises representatives of local government, industry, business, labour, environmental groups and other interests. It advises the Minister of Environment, Lands and Parks, and the Minister of Energy and Mines, on climate change policy and facilitates the development and implementation of greenhouse gas reduction measures. Forum reports include *Plan for Early Action* (1998) and *Promising Phase 1 Climate Change Measures* (2000).

www.elp.gov.bc.ca/epd/epdpa/ar/climate/
Laura Porcher, (250) 356-0664,
laura.porcher@gems1.gov.bc.ca

Green Economy Working Group
The Green Economy Working Group is a ministerial committee of cabinet that supports BC businesses and communities in a transition toward a more sustainable local and global economy. This ministerial committee is overseeing the Green Economy Initiative, which includes the development and implementation of a number of measures that will result in greenhouse gas reductions.

www.gov.bc.ca/ges/
Green Economy Secretariat, (250) 387-1949,
ges.feedback@gems4.gov.bc.ca

Greenhouse Gas Mitigation Guidelines under BC's Environmental Assessment Process
British Columbia is initiating a consultation process to review the potential of establishing guidelines for greenhouse gas mitigation plans for projects reviewed under BC's Environmental Assessment Process. Under the draft guidelines, plans would be submitted and approved as part of the overall project approval.

Warren Bell, (250) 387-4773,
warren.bell@gems8.gov.bc.ca

Ozone Depleting Substances Legislation
Amended in 1999, the BC *Ozone Depleting Substances and Other Halocarbons Regulation* establishes stricter controls on ozone depleting substances and includes controls on halocarbons (HFCs), of which most are potent greenhouse gases.

www.elp.gov.bc.ca/epd/epdpa/ar/ozone/index.html
John Sutherland, (250) 387-9936,
John.Sutherland@gems6.gov.bc.ca

Urban Areas – Assessment of Options for Reducing Greenhouse Gases (GHG) in the Greater Vancouver Region
An assessment of options to reduce air pollutants in the Greater Vancouver region is being conducted by the Greater Vancouver Regional District and BC Environment. The work will include an estimate of greenhouse gas reductions, reductions of other air contaminants, estimated costs of reduction, and

associated benefits, including improvements in air quality and public health impacts. This work has future extensions to assessments for the Lower Fraser Valley and other urban regions.

Hu Wallis, (250) 356-0345,
hu.wallis@gems5.gov.bc.ca

Alberta

Participation in the Development of the National Implementation Strategy
The Government of Alberta is actively involved in the National Implementation Strategy for climate change. The Alberta and federal governments are co-chairs of the National Climate Change Process. Alberta stakeholders have been active participants in all 16 national tables dealing with climate change issues. Approximately 50 Albertans from government, industry and non-governmental organizations are members of all of the 16 National Climate Change Process Issue Tables and Working Groups.

www.nccp.ca
Bob Mitchell, (780) 422-8464,
bob.mitchell@gov.ab.ca

Saskatchewan

Greenhouse Gas Initiatives in Saskatchewan Agriculture
This initiative will summarize the currently available information on greenhouse gas and carbon sequestration in Saskatchewan agriculture and review and discuss policy options for emission abatement. It will also identify various economic scenarios for Saskatchewan agriculture industry and producers and provide options and recommendations.

Ken Panchuk, (306) 787-0556,
kpanchuk@agr.gov.sk.ca

Saskatchewan Stakeholder Advisory Committee on Climate Change (SSACCC)
This committee provides a forum for discussion of climate change issues by affected businesses, industry, non-governmental organizations and government agencies.

eru@cas.uregina.ca
Dan McFadyen, (306) 787-2523,
dan.mcfadyen@sem.gov.sk.ca
Ron Zukowsky, (306) 787-6285,
ron.zukowsky.erm@govmail.gov.sk.ca

Nova Scotia

Climate Change Human Resources Development Initiative
The goal of this initiative is to develop highly qualified personal in the areas of climate change and greenhouse gas management in the agricultural sector. Two, three-year positions will be created: 1) Climate Change Research Chair and 2) Environmental Management Research/Outreach Coordinator. Work will include research into carbon storage in soils and public education and outreach on climate change to the agricultural sector.

Robert Gordon, (902) 893-6561,
gordonrj@gov.ns.ca

Nova Scotia Climate Change Strategy
The Government of Nova Scotia is producing a climate change strategy for the province, including a list of suggested early actions. Consultations with stakeholders were held at six locations in Nova Scotia in November 1999. An Interdepartmental Committee on Climate Change was formed to develop a strategy using the results of the consultation process and other appropriate resources.

www.gov.ns.ca/natr/climate
George Foote, (902) 424-8168, gffoote@gov.ns.ca

Northwest Territories

Development of a Strategy to Control Greenhouse Gas Emissions in the Northwest Territories
The initiative will result in the development of a strategy to control greenhouse gas emissions in the Northwest Territories (NWT) by March 31, 2001. Specific objectives to be accomplished in the strategy include increasing awareness in the NWT of the issue of global climate change and the need to control greenhouse gas emissions; engaging all northerners including government, non-government, industry, and the general public, to take action to control greenhouse gas emissions; and identifying and implement achievable and practical actions that can be undertaken immediately, as well as longer-term actions which will result in future, sustained reductions in greenhouse gas emissions in the NWT

www.ssimicro.com/~ghgs/index.html
Lloyd Henderson, (867) 873-7654,
lloyd_henderson@gov.nt.ca

Nunavut

Development of a Strategy to Control Greenhouse Gas Emissions in Nunavut
The purpose of this program is to develop a strategy to control greenhouse gas emissions in Nunavut. The process would include a broadly based stakeholder consultation approach to obtain input from residents in order to develop options, priorities, and recommendations for government policy and programs, and also for recommendations from Institutes of Public Government, corporations, business, stakeholders, and the public. Development of the strategy will increase awareness in Nunavut of the issue of global climate change and the need to control greenhouse gas emissions; encourage all northerners (government, non-government, industry, general public) to voluntarily take strong action to control greenhouse gas emissions; identify and implement achievable and practical actions that can be undertaken immediately, as well as longer-term actions which will result in future, sustained reductions in greenhouse gas emissions, taking into consideration the economic, environmental and social costs and benefits; and identify economic opportunities that may arise from the use of cleaner, more efficient equipment and technology.

Earle Baddaloo, (867) 975 5910,
ebaddaloo@gov.nu.ca

DOMESTIC EMISSIONS TRADING

Government of Canada

Baseline Protection Initiative (BPI)
This initiative, scheduled for launch in late 2000, will allow greenhouse gas emitters to register eligible actions they have taken since 1990 so that the emissions reductions realized from these actions will be included or "protected" in their emissions baseline.

Natural Resources Canada,
http://oee.nrcan.gc.ca
Marie Maher, (613) 947-2076,
mamaher@nrcan.gc.ca

Greenhouse Gas Emission Reduction Trading Pilot (GERT)
This multi-stakeholder initiative involving federal, provincial and local government agencies, industry, and environmental groups, is pilot-testing some of the key elements of project-based emission credit trading for greenhouse gas emissions in the Canadian context. The pilot's objectives are to inform policy development on emission trading by reviewing emission reduction projects and trades; develop approaches, tools, and methodologies to support a greenhouse gas trading market; and provide practical experience with emission reduction trading for Canadian companies, governments and other stakeholders.

Natural Resources Canada,
www.gert.org/whatsnew
Warren Bell, (250) 387-4773,
warren.bell@gems8.gov.bc.ca

British Columbia

Greenhouse Gas Emission Reduction Trading Pilot
The Government of British Columbia is spearheading the national Greenhouse Gas Emission Reduction Trading (GERT) Pilot Project to test the effectiveness of emission trading to decrease greenhouse gas emissions. The GERT Pilot is recognized internationally as being on the leading edge of finding practical approaches to emission trading. The GERT pilot has been extended to December 31, 2001.

www.gert.org/index.htm
Warren Bell, (250) 387-4773,
Warren.Bell@gems8.gov.bc.ca

Alberta

Greenhouse Gas Emission Trading (GERT)
Alberta is a member of the voluntary baseline and credit greenhouse gas emission trading pilot, established to learn about the feasibility of emission reduction credit trading in Canada and to encourage early emission reduction projects. The Alberta government encourages Alberta energy companies to participate in the GERT pilot to strengthen their original commitment to the Voluntary Challenge and Registry Inc. and to voluntary greenhouse gas emission reductions. Twelve such projects have been posted to the GERT Web site, totaling more than 792,000 tonnes of annual CO_2 emission reductions.

www.gert.org
Don Macdonald, (780) 422-7872,
don.macdonald@gov.ab.ca

KEFI-Exchange
KEFI-Exchange Inc., a privately owned Alberta company, operates Canada's first internet based electronic greenhouse gas emission reductions exchange. The KEFI-Exchange offers emission reductions through an exchange service to a broad group of affected parties. Using the KEFI-Exchange, parties are able to buy and sell greenhouse gas emission reductions that are surplus to the needs of others. These emission reductions can then be applied towards an entity's individual commitment to reduce greenhouse gas emissions.

www.kefi-exchange.com
Brock John, (403) 210-2144,
bjohn@kefi-exchange.com

Saskatchewan

Saskatchewan Environment and Resource Management (SERM)-SaskPower Carbon Offset Agreement
Through this initiative, 5 million trees will be planted in the provincial forest. The resulting forest carbon reserves will generate carbon credits by removing areas of provincial forest from harvesting, establishing ecological reserves, and reforesting areas harvested in the past. SERM is transferring these credits to SaskPower in exchange for funding to carry out the reforestation. Credits equivalent to approximately 6 million tonnes of carbon will be transferred.

www.gert.org
Tony Baumgartner, (306) 787-3435,
tony.baumgartner.erm@govmail.gov.sk.ca
Mark Johnston, (306) 953-2491,
johnston@derm.gov.sk.ca

INTERNATIONAL INITIATIVES

Government of Canada

APEC Energy Working Group (EWG)
This working group is the primary vehicle for multilateral energy cooperation and information sharing with the Asia Pacific region (including China). EWG seeks to enhance understanding of policy issues and build the capacity of developing economies to implement energy policies consistent with sustainable development. Expert groups deal with energy efficiency and conservation, "clean" use of fossil fuels, new and renewable energy technology; and energy data and outlook, including CO_2 inventories and indicators.

Natural Resources Canada,
www.apecenergy.org.au
Gil Winstanley, (613) 996-2993,
gwinstan@nrcan.gc.ca

Canada Climate Change Development Fund (CCCDF)
The goal of the Canada Climate Change Development Fund is to contribute to Canada's international objectives in climate change by promoting activities in developing countries that seek to address the causes and effects of climate change while at the same time contributing to sustainable development and poverty reduction. The focus of the CCCDF will be on technology transfer and related activities in four programming areas: emission reduction, carbon sequestration, adaptation and core capacity building for climate change.

www.acdi-cida.gc.ca
Susan Pereverzoff, (819) 953-2182,
susan_pereverzoff@acdi-cida.gc.ca

Canada / European Union Science and Technology (S&T) Agreement
This broad agreement covers all fields of science and technology including energy and enables Canadian researchers from either the public or private sectors to submit proposals for participation in the European Union's Framework Research and Development programs. The agreement also provides opportunities to participate in basic and applied research in non-nuclear energy.

Natural Resources Canada
Kim Smith, (613) 995-5299,
ksmith@nrcan.gc.ca

Climate Change Compendium
The Climate Change Compendium is being undertaken by the Climate Change Knowledge Network, coordinated by the International Institute for Sustainable Development. The Compendium will present a framework for analyzing climate-related information; a guide to implementation of the United Nations Framework Convention on Climate Change (UNFCCC) and Kyoto Protocol, and a teaching tool for capacity building workshops and educational courses.

http://iisd.ca
Susan Pereverzoff, (819) 953-2182,
susan_pereverzoff@acdi-cida.gc.ca

Climate Change Knowledge Network

The Climate Change Knowledge Network (CCKN) is comprised of 14 research institutes from developing, developed and transitional countries. It is coordinated by the International Institute for Sustainable Development. The goal of the CCKN is to enhance the capacity of developing and developed countries to shape an effective, sustainable and equitable climate change regime.

www.iisd.ca
Susan Pereverzoff, (819) 953-2182,
susan_pereverzoff@acdi-cida.gc.ca

Hemispheric Energy Initiative (HEI)

This initiative is the primary vehicle for multilateral energy cooperation and information sharing with Latin America. Under this initiative, Canada co-chairs the Climate Change Working Group with Argentina, promoting information exchange and the identification of areas for future cooperation linked to energy-efficient buildings and equipment, including the development of energy standards.

Natural Resources Canada,
www.americasenergy.org
Teresa Marty, (613) 996-8141,
tmarty@nrcan.gc.ca

Intergovernmental Panel on Climate Change (IPCC)

The Intergovernmental Panel on Climate Change was created in 1988 by the United Nations Environment Program and the World Meteorological Organization to assess the available scientific information and the potential impacts and to formulate strategies to respond to climate change. More than 30 Canadian scientists have contributed to the IPCC's Third Assessment Report (scheduled for release in 2001), which will provide a comprehensive and up-to-date assessment of the scientific, technical, and socio-economic dimensions of climate change; and to the Special Reports on carbon sinks, technology transfer, greenhouse gas inventories, and emissions scenarios (completed in 2000).

www.ipcc.ch
Joan Masterton (Environment Canada),
(416) 739-4321, joan.masterton@ec.gc.ca
Paul Samson (Natural Resources Canada),
(613) 996-7631, pasamson@nrcan.gc.ca

International Energy Agency (IEA)

The IEA, the primary multilateral forum dealing with global energy issues, emphasizes climate change policy options and their impacts, and develops International Collaborative Research and Development agreements. Under the IEA, Canada is participating in 23 Implementing Agreements with a climate change or environmental science and technology component.

Natural Resources Canada, www.iea.org
Gil Winstanley (international energy),
(613) 996-2993, gwinstan@nrcan.gc.ca
Graham Campbell (implementing agreements),
(613) 995-8860, gcampbel@nrcan.gc.ca

Memoranda of Understanding (MOU)

Canada has memoranda of understanding with several countries on issues relevant to climate change.

- The MOU with the Chinese Ministry of Water Resources involves cooperation in small hydropower research and development, training of technical personnel and technology transfer.

  Natural Resources Canada
  Claude Barraud, (613) 996-6087,
  cbarraud@nrcan.gc.ca

- The MOU with the Korean Ministry of Commerce, Industry and Energy (MOCIE) established a Canada-Korea Joint Working Group (JWG) on Greenhouse Gas Reduction that seeks to promote discussion and information exchange, and facilitate bilateral cooperation on climate change. The MOU also provides opportunities for joint projects under the Clean Development Mechanism (CDM)/Joint Implementation (JI) mechanisms of the Kyoto Protocol to the United Nations Framework Convention on Climate Change (UNFCCC), particularly in the area of energy.

  Natural Resources Canada
  Jean Cooper, (613) 996-6474,
  jcooper@nrcan.gc.ca

- The MOU with the Korean Institute of Energy Research (KIER) provides for cooperation on energy and environmental research and development, and on technology transfer.

  Natural Resources Canada
  Martin Aubé, (613) 996-6004,
  maube@nrcan.gc.ca

- The MOU with the Mexican Secretariat of Energy provides for cooperation to increase energy efficiency in both countries and encourage use of alternative energy. The MOU also enhances trade, investment, technical and other exchanges with respect to energy-efficient products, energy management services and alternative energy goods and services.

  Natural Resources Canada
  Nick Marty, (613) 996-6629,
  nmarty@nrcan.gc.ca

- The MOU with the United States Department of Energy provides for cooperation in research and development in all areas of non-nuclear energy research and development, including energy efficiency in buildings, industry and transportation, renewables and cleaner fossil fuels. Cooperation is effected through Implementing Arrangements.

  Natural Resources Canada
  Hamid Mohamed, (613) 995-5782,
  hmohamed@nrcan.gc.ca

Canadian International Development Agency (CIDA) Activities Related to Climate Change

The Canadian International Development Agency is the lead agency responsible for delivering Canada's official development assistance (ODA) and official assistance (OA) programs. The primary objective of the ODA program is to support sustainable development in developing countries in order to reduce poverty and to contribute to a more secure, equitable and prosperous world. The OA program supports democratic development and economic liberalization in Central and Eastern Europe and the former Soviet Union, by building mutually beneficial partnerships. Working with partners in the private and public sectors in Canada and in developing countries and with international organizations and agencies, CIDA supports projects and programs in more than 100 countries around the world. Much of CIDA's programming contributes, directly or indirectly, to global climate change efforts. The following is a summary of CIDA aid projects that contain a climate change element.

For information on all of these initiatives, please e-mail climate_secretariat@acdi-cida.gc.ca

Emissions Reduction

Bangladesh

Environmental Management Program – This project aims to strengthen the institutional capacity of Bangladesh's Department of Environment. Activities include establishing environmental management demonstration areas and implementing environmental initiatives which can help reduce greenhouse gas emissions, e.g., a demonstration project targeting the conversion of rickshaws to natural gas.

Bolivia

Oil and Gas Project Phase II – This project has assisted Bolivia in building the capacity to develop environmental regulations and guidelines and contributed to increases in gas reserves which will help reduce CO_2 emissions in Bolivia and Brazil.

Brazil

Electricity Energy Efficiency Project – Through this project, the Brazilian National Energy Efficiency Program (PROCEL) is building its capacity by drawing on successful Canadian models of demand-side management to change consumer patterns of electricity consumption and to improve efficiencies, in order to slow the expansion of electrical energy consumption.

Central America

Regional Electrical Energy Project – This project supports the reform of the electrical sub-sector and enhances regional collaboration in the exchange of electricity. Its activities include increasing efficiencies, reducing losses, introducing demand side management, helping develop strategies for increased use of hydro electric resources and providing support for an initiative to determine the feasibility of importing natural gas into the region. The project builds the capacity of the region to effectively manage its energy resources. The outcome of these initiatives is the reduction of the level of CO_2 emissions.

China

Canada-China Cooperation Project in Cleaner Production – In this project, emphasis is placed on pollution prevention, conservation of raw materials and energy, eliminating toxic raw materials, etc. by strengthening institutional capacity to implement cleaner production. In collaboration with China's State Economic and Trade Commission and national Environmental Protection Agency, the project will

strengthen the institutional capacity of these institutions to promote the implementation of Cleaner Production (CP).

Canada/China Jiangsu SME Applied Management and Environment Project – This projects seeks to build management and environmental/business capacity for Small and Medium-sized enterprises through increasing awareness and demonstration projects around waste minimization, cleaner production (CP), etc. The project will also support sectoral linkages and information exchange between Canadian industries and Jiangsu village enterprises in the focus sectors of the project (initially chemical and metal working).

Comprehensive Transport Management Training – This project is designed to strengthen China's managerial, planning and operational practices in the transportation sector, resulting in decreased greenhouse gas emissions from this sector.

Energy Efficiency in Building Projects – This project aims to build the capacity of China's Ministry of Construction to develop energy efficiency standards for buildings, based on Canadian technology, thereby reducing greenhouse gas emissions. The objective of this project is to improve atmospheric quality and reduce energy consumption through rationalized energy use in the civilian building sector.

Oil and Gas Technology Transfer Programme – This seven-year project assists in the optimal recovery of China's oil and gas resources by upgrading the capacity of selected petroleum institutions and research centres. Canadian experts were sent to China to conduct specialized courses in various aspects of oil and gas engineering, and selected Chinese experts were sent to Canada for the latest training in oil and gas technology used in Canada.

Strategic Energy Planning for Southern China – This project transfers appropriate processes and techniques to build capacity in China for developing a comprehensive strategy to provide power and coal for Southern China within an economically, environmentally and socially sustainable energy management framework.

Sustainable Resource Development – The project aims to ensure that sustainable development of the petroleum resources and to adopt effective measures to protect and improve the environment in petroleum exploration and development (e.g reduce flaring).

Columbia

Energy, Mining and Environment – This project involves strengthening two ministries, Environment and Mines and Energy. Project activities include providing assistance for energy efficiency and conservation, as well as expanded use of natural gas, thereby reducing greenhouse gas emissions.

Costa Rica

Productive Sector Modernization – This project seeks to build capacity for more efficient production in small and medium sized industries, with resulting lower greenhouse gas emissions.

Egypt

Electricity Sector Reform Special Institutional Support Program – This project aims to support reform of the energy sector in Egypt and encourage greater efficiency, through capacity building of local authorities to reduce electricity losses.

Guinea

Energy Sector Program Planning – This project supports the development of energy sector programming and training through the development assistance program.

Haiti

Create a Model Electrical Utility at Jacmel (part of Technical Assistance to EDH-Phase II) – The project is creating the first electrical utility which will operate with low losses in Haiti. This is being achieved mainly through training and development of the electrical utilities staff.

India

Boiler Emission Upgrade – This project aims to increase the capacity of Indian stakeholders through increased awareness of, and means to introduce viable technology to revamp old and failing power plans using Circulating Fluidized Bed technology (CFB).

Canada Energy Efficiency Project – This project builds Indian capacity to promote environmentally sound development through public and corporate policy-making and cooperation in the fields of energy efficiency and greenhouse gas emissions.

Canada-India Rural Energy – This project aims to increase the utilization of alternative energy technologies among poor households in India. It also seeks to strengthen the capacity of a network of non-

governmental organizations to deliver energy-related activities. An educational component of the project includes the development of curricula related to energy for secondary schools.

Chamera Hydroelectric Project – This project seeks to upgrade the capacities of the National Hydroelectric Power Corporation to design and construct a 540 mW hydroelectric dam.

CII Environmental Management Programme – This project is designed to improve the capacity of the Confederation of Indian Industry's Environmental Management Division to participate in, raise awareness of, and promote cooperation in the development of environmental policies for industry.

Energy Infrastructure Services Project – This project will strengthen the capacity of the Indian government and Central Electricity Research Commission in the areas of organizational restructuring and policy reforms required to improve the efficiency and environmental management in the energy sector in two states.

IDUKKI Dam Project – This project aims to increase the availability and efficiency of electricity in Keralla State through reduction of energy losses in the transmission and distribution systems.

Kerala State Electricity Board Systems Enhancement Project – This project aims to increase the availability of electricity in Kerala State in part through reduction of energy losses in the transmission and distribution systems. It will also build capacity for operating efficiency related to water and energy-use management.

MOEF Institutional Strengthening – This project will strengthen the capacity of the Ministry of Environment and Forests to address a broad range of environmental issues one of which is converting three-wheel vehicles to natural gas, thereby reducing greenhouse gas emissions.

Latin America/Caribbean

ESMAP Refinery Project – This project is assessing the impact of applying new and cleaner fuel specifications to the refining industry in the Latin American and Caribbean regions. The long term benefits of this project include increased capacity in the refinery industry and improved air quality and reduced emissions.

Pakistan

Oil and Gas Programme – This program will strengthen the capacities of government and private sector institutions to manage their oil and gas resources in a more sustainable manner.

Strategic Technical Assistance and Responsive Transfer Fund – This project will support the four programming priorities in Pakistan: energy, social sector, environment and private sector development. This is a Government of Canada-managed fund which responds to requests from the Pakistan government.

WARSEK Rehabilitation Project – This project will assist the Water and Power Development Authority to rehabilitate the WARSEK dam and power station through engineering services, capacity building and technology transfer.

Peru

Petroleum Regulatory Assistance – This project focuses on strengthening the regulation and monitoring of the hydrocarbon sector. With a better regulatory system for the natural gas sector, the use of this resource will replace current fuels resulting in lower emissions.

Senegal

OMVS – Impact Assessment and Studies of Electrical Distribution network – The studies will help build capacity by determining the best design for high voltage transmission lines which will improve the efficiency of the distribution network, thereby reducing GHG emissions.

South America

Energy and Environment Project , Latin American Energy Organization (OLADE) – This project is developing capacity within the region to strengthen environmental and regulatory frameworks to allow for sound development and sustainable use of fossil fuel resources.

Environment Project with the Regional Petroleum Companies (ARPEL) – This project promotes and advances standardized approaches to environmental protection in the region. Two components deal with energy efficiency and reducing emissions from vehicles and industries.

Southern Africa
Development Community (SADC) Industrial Energy Management Project – The project is increasing the capacity of consulting engineers, industrial firms and educational institutions in the SADC region to develop industrial energy management programs, undertake energy efficiency projects and offer education/training programs in energy conservation and management.

Tunisia
Project to Transfer Know-How for the Development of Co-Generation Units – To provide ANER and three offices of Tunisian firms with the necessary training to enable them to develop and disseminate co-generation technology as a result of the transfer of technological know-how and the creation of appropriate institutional, tax, economic and legal conditions.

Zimbabwe
Strengthening of Ministry of Environment – This project seeks to strengthen the capacity of the Ministry of Environment to address issues related to energy efficiency and providing assistance to professionals in the environmental sector.

Carbon Sequestration

Argentina
Fire Management Technology (Technology Transfer Fund sub-project) – The British Columbia Forest Service (BC Ministry of Forests) is working with the Argentinean National Fire Management Organization to develop a national infrastructure for the prevention and management of forest fires in Argentina.

Cameroon
Support to environmental protection – The objective of this project is to support civil society in Cameroon in its efforts to implement national forest policy in a manner that is developmentally sustainable.

Sustainable forest management – The objective of this project is to support the implementation of Cameroon's sustainable forest management policies through institutional support to MINEF.

Chile
Chiloe Model Forest (Technology Transfer fund sub-project) – The International Model Forest Network Secretariat, housed at Canada's International Development Research Centre, is working with the Chilean Ministry of Agriculture to enhance its capacity to introduce Canada's "model forest" approach in Chiloé.

China
Kunming Horticulture Exposition – This project provides support for reforestation and enhanced awareness of the importance of trees for environmentally sustainable development in China. It therefore will contribute to protection of carbon sinks.

Costa Rica
Economic Development for Economic Conservation – This project supports ecological conservation through organic agriculture and appropriate ecotourism initiatives. Through improved agricultural practices and conservation of forests, it may contribute to reduced greenhouse gas concentrations in the atmosphere.

Honduras
Broadleaf Forest Development – Through this project, sustainable forest management practices are being introduced to reduce deforestation, improve knowledge about protection and harvesting of forests, and manage land use. The result is the protection of carbon sinks.

India
Tree Growers Cooperative – This project seeks to create a truly sustainable model for village-based community forestry through local capacity building. It will contribute to the protection and enhancement of valuable carbon sinks.

Indonesia
KALTIM Social Forestry Project – This project seeks to build capacity for the establishment of an approach and methodology for community-based forest management which will result in a more sustainable management of carbon sinks.

Jamaica
Green Fund Extension – This project supports community-based initiatives which will contribute to the sound management and conservation of Jamaica's natural resources and improve advocacy and development through more effective networking. Sub-projects have dealt with alternative sources of energy and improved agriculture and agroforestry practices.

South America
Globesar II (RADARSAT) – This project is assisting in resource management by tracking deforestation and reduction of wetlands. This knowledge will contribute to increased capacity of South American decision-

makers to sustainably manage their forest resources. This will result in the protection of these important carbon sinks.

Southeast Asia

Asia Regional Fire Danger Ratings System – This project seeks to increase Asian capacity to develop long-term solutions for responding to and monitoring forest fires in the ASEAN region.

Tree Link – This project helps to build the capacity of the region to manage their forest resources. Specifically, it supports the development and implementation of policies and practices for forest renewal, conservation and protection, in response to the disastrous 1997 forest fire season, recent flooding and increased international pressure through the Kyoto Protocol to address climate change.

Southern Africa

Zambezi Wetlands Conservation – The primary objective of this project is conservation and sustainable use of the Zambezi wetlands. This will be accomplished through information dissemination to decision makers which will help build their capacity to manage these wetlands. A by-product of such action is the preservation of a carbon sink.

Core Capacity Building for Climate Change

China

China Council for International Cooperation on Environment and Development – The project assists China in developing integrated policies highlighting the critical linkages between environmental sustainability and economic and social development. It supports the China Council for International Cooperation on Environment and Development, a high-level non-governmental consultative organization which strengthens cooperation and exchange between China and the international community on environment and development.

Honduras

Natural Resource Management – This project seeks to build capacity for effective policies related to the sustainable management of natural resources including forests, agricultural land, water, and marine/coastal areas. Sub-components of the project focus on helping Honduras establish a focal point for participation in the Clean Development Mechanism and a Cleaner Production Centre, as well as sponsoring a study on energy-efficiency opportunities in Honduras.

India

Environment Facility – This umbrella project seeks to enhance Indian capacity to implement sustainable development activities in the water and energy sector. There are over 15 projects currently underway, a number of which have a climate change component (e.g., tree plantations, coastal wetlands, wind energy, etc.).

Indonesia

Collaborative Environmental Project – This project seeks to strengthen environmental policies and regulations, provide support to universities, and develop and demonstrate small projects for dealing with a variety of environmental issues.

Southeast Asia

Urban Environmental Management – This project aims to establish effective and sustainable environmental management educational programs and business services at the Asian Institute of Technology. It also provides opportunities for Canadian environmental companies to demonstrate technologies and services.

Adaptation

China

Hebei Dryland Project – This project develops and transfers ecologically sound dryland management technology and improves water efficiency, as well as balanced fertilization practices.

Indonesia

North Sulawesi Water Resources Institutional Development Project – This project aims to improve the management, design, construction, monitoring, and flood control for the water sector. This will contribute to increased capacity of local groups, such as the North Sulawesi Public Works Water Resources Unit and local affiliated groups, to adapt to climate change.

Mali

Environmental Rehabilitation and Food Security – This project builds capacity in local, decentralized institutions to deal with natural resource management and supports specific environmental interventions as they relate to both adaptation to desertification due to climatic changes and to improved food production.