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Country profiles on policies to support environment-friendly innovation

Eco-Innovation Policies in Canada

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FOREWORD

The report is part of a series of country profiles on eco-innovation policies developed for eight non-EU OECD members: Australia, Canada, Japan, Korea, Mexico, New Zealand, Turkey and the US. Country profiles are based on extensive desk research and on field missions in selected countries (Canada, Japan, Korea, the US). Country experts have commented earlier drafts of their country profile.

This series complements the eco-innovation roadmaps developed by EU member countries under the Environmental Technology Action Plan. It provides an empirical basis for further investigation on policies to support eco-innovation.

A short introduction presents the background for this series of country profiles, including the methodology, and a brief overview of some of the instruments identified.

The country profiles were drafted by Xavier Leflaive, under the supervision of Brendan Gillespie. Carla Bertuzzi has provided data and information on measurement issues and has drafted selected sections. IEEP was commissioned for the initial desk research and preliminary identification of policy issues. Country experts have provided most valuable inputs, in terms of time, information and policy relevance: Warren Hughes (Department of the Environment, Water, Heritage and the Arts, Australia), Javier A. Gracia-Garza (Environment Canada), Graham Campbell (Natural Resources Canada), Tim Karlsson (Industry Canada), Noriko Kishimoto (Ministry of the Environment, Japan), Kyu-Shik Park (Ministry of Environment, Republic of Korea), Carlos Muñoz Villarreal (Ministry of Environment and Natural Resources, Mexico), Vera Power and Alison Stringer (Ministry for the Environment, New Zealand), David Widawsky (USEPA), Sebahattin Dokmeci (Ministry of Environment and Forestry, Turkey).

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INTRODUCTION

Background

This report is part of the OECD work programme on eco-innovation policies.

The ambition of this report is to provide an empirical inventory of policies in place in Canada to promote eco-innovation. Considering that European countries had developed roadmaps for eco-innovation policies in the context of the European Commission Environmental Technology Action Plan (ETAP), the secretariat prepared an inventory of eco-innovation policies in eight non-EU OECD countries (Australia, Canada, Japan, Korea, Mexico, New Zealand, Turkey and the US). A similar project for China is published separately.

The objective of this work is to complement the knowledge base on eco-innovation policies in OECD countries and to provide empirical material for additional research on policy issues related to eco-innovation. The outline of each country profile is similar to that of ETAP roadmap, to facilitate comparison.

The work was implemented in coordination with country delegations, which have identified experts in each country who could provide additional information and review initial drafts of the country profile of their country.

A consultant (IEEP, Brussels, Belgium) has been commissioned to collect all information publicly available in English on eco-innovation policies in each of the eight non-EU OECD members. Field missions have been organised by the country experts in four countries (Canada, Japan, Korea, the US). During these missions, the secretariat met with the agencies identified and selected by the country expert. Draft country profiles have been developed on the basis of desk research and field missions. They have been reviewed by national experts and revised accordingly. All country profiles present information which was up-to-date at the end of 2007. In most cases, more recent information has been taken into account.

Policy instruments to support eco-innovation

The country profiles confirm that eco-innovation policies deploy a variety of instruments. They have to adjust to the features of the domestic economy, in particular the knowledge base, the size of domestic markets, and the *vigueur* of the venture capital industry.

In most non-EU OECD countries, public research and development (R&D) remains a major orientation. The US and Japan typically allocate significant public finance to environment-related R&D. However, three trends have emerged: i) some countries are concerned by the competition and trade issues related to such support; ii) public resources are increasingly channelled via Departments not directly in charge of environment policies (Energy, Agriculture, Transport), making inter-agency cooperation even more necessary; iii) the role of research organisations is being redefined, to intensify

linkages with the private sector and stimulate the development of marketable outputs; incubators in the US, or the National Institute of Advanced Industrial Science and Technology's (AIST) Technology Licensing Office in Japan illustrate innovative arrangements in this area.

Attracting private funds to finance environmental R&D is another major policy orientation. The main issue is to reduce risks for private investors investing in environmental R&D projects, while making sure that public money is used effectively and does not crowd out private initiatives. A variety of funds have been established to reduce risks to private investors (e.g. Sustainable Technology Development Canada-SDTC in Canada), or incubators (e.g. The Clean Energy Alliance in the US, Environmental Technology Business Incubator in Korea). Measures are taken to stimulate the venture capital industry and to provide incentives for environment-related projects; e.g. this is the role of the Environmental Venture Fund in Korea.

Environment-related performance standards are being set with the aim of stimulating innovation in goods and services. Such standards are pursued in particular in the field of energy and resource efficiency. However, standards may provide disincentives and can only have a lasting positive effect on innovation if they are timely revised. Schemes such as the Top Runner programme in Japan aim to address this challenge.

Market-based instruments are burgeoning in non-EU OECD Countries. A number of new projects and initiatives have been identified at national or local level. One interesting case is the all-encompassing Emission Trading Scheme envisioned in New Zealand, where equitable sharing of responsibility across sectors and stakeholders is based on the principle of equity across sectors.

There is some evidence that, besides environmental policy instruments and regulation, soft instruments such as voluntary commitments, eco-audits and eco-labels play a role as determinants of innovative behaviour in firms. Voluntary initiatives can become mandatory over time (cf. Stand-by Korea). Industry initiatives abound and, in particular contexts, can change the relationship between the administration in charge of environment policies and the business sector. This is illustrated by Performance Tracks in the US, where the US Environmental Protection Agency (USEPA) and firms enrolled in the programme construct a collaborative relationship. This typifies what can be seen as a new phase in environmental policies which sets out to promote broader sustainability, rather than address one single environmental issue. In that perspective, governments rely less on regulatory tools and endeavour to work with industries, in sectors which use materials and/or energy.

In line with the OECD Council Recommendation on Improving the Environmental Performance of Public Procurement [C(2002)3], green procurement initiatives are burgeoning at local and national levels. Guidelines are supported by websites, green products databases, and *pro forma* requests for tenders. The Green Purchasing Network is an international network active in this area.

Some initiatives set out to promote technologies and products developed by one country. Others try to alleviate barriers to the deployment of environment-friendly technologies and products; shared definitions, standards and labels contribute to a level playing field for the creation and diffusion of environment-friendly technologies, products and life-styles. Such efforts are still plagued by institutional problems related to intellectual property rights and international monetary transfers. Typically, the capacity of a national agency to (financially) support one country's side of a multinational joint venture depends on how countries will share the intellectual property rights. Few cooperation projects reach developing countries (with the exception of East Asia, and China in particular).

COUNTRY PROFILE OF CANADA

Introduction and country definitions of eco-innovation

Definitions related to eco-innovation used in the Country

No straightforward definition of eco-innovation has been found in the document reviewed. As defined in Canada's innovation strategy, innovation is the process through which new economic and social benefits are extracted from knowledge (http://innovation.gc.ca/gol/innovation/site.nsf/en/in04144.html). In the national policy on green procurement (http://www.pwgsc.gc.ca/greening/text/proc/pol-e.html), environmentally preferable goods and services are defined as those that have a lesser or reduced impact on the environment over the life cycle of the good or service, when compared with competing goods or services serving the same purpose. Environmental performance considerations include, among other things: the reduction of greenhouse gas emissions and air contaminants; improved energy and water efficiency; reduced waste and support reuse and recycling; the use of renewable resources; reduced hazardous waste; and reduced toxic and hazardous substances.

Institutions playing a major role on eco innovation

The information following institutions and federal bodies play a major role in policies to support eco-innovation in Canada.

At federal level, the site Ecoaction monitors a number of governmental initiatives related to ecoaction, including ecotechnologies.

Government of Canada

The government passes the legislation that sets the requirements (standards, bans, etc.) and targets that create the framework for innovation. This includes, for example, the *Energy Efficiency Act*, and the recently published *Action Plan to Reduce Greenhouse Gases and Air Pollution.*

See http://www.ecoaction.gc.ca/index-eng.cfm

Natural Resources Canada

Natural Resources Canada is the government department which deals with the natural resources sector, forests, energy, minerals and metals, and landmass, as well as related industries. Some of its departments and agencies lead several initiatives in the field of environmental innovation, like the Energy Efficiency Office (EEO), the Office for Energy Research and Development (OERD) and the CANMET Energy Technology Centre (CETC) (www.nrcan-rncan.gc.ca/com).

The Department controls three national laboratories doing research on energy efficiency and emission reductions, for GHG and other contaminants. It implements programmes and provides direct grants for R&D. It works with other departments (Environment Canada, Industry Canada, etc.), whose role is more to set a framework and to highlight issues which need to be addressed. Because a large

majority of GHG emissions is energy-related, Natural Resources Canada's platform and machinery plays a central role; but programmes are managed at intergovernmental level.

The Department works with the provincial governments to identify shared priorities in the energy field. The lack of finance prevents this collaboration from being very concrete.

Environment Canada

Environment Canada is the government department headed by the Minister of the Environment. Among its tasks, it supports the development and transfer of technologies that contribute to its mandate of environmental protection. It also helps private-sector partners bring green technologies to the marketplace. A lot of science and technology supported by Environment Canada is in support of policy and regulatory development.

Industry Canada

Industry Canada is the government department in charge of industry and research. Industry Canada is in charge of the so-called Industry Portfolio, a number of agencies that work with industry and research-related issues. Its focus is on competitiveness and productivity, and Industry Canada sets the appropriate framework. As regards science and technology, it has designed the Science and Technology Strategy; environment and energy are among the four priority areas (along with health and life sciences, and with ICT); the Strategy serves as a reference to identify priority investments (and make proposals to the Ministry of Finance) and to facilitate a coordinated Federal approach with other departments who fund science and technology. As regards eco-innovation, Industry Canada focuses on deployment.

Transport Canada

Transport Canada is responsible for transport policies, regulations and services. Transport Canada, as other departments, is responding to the 'innovation challenge', and is responsible, *inter alia*, for *ecoTRANSPORT*.

See http://www.tc.gc.ca/programs/environment/ecotransport/menu.htm

Foreign Affairs and International Trade Canada

The department hosts the Clean Development Mechanism and Joint Implementation Office, which is the designated national authority for approving emission reduction projects with international partners.

National Research Council Canada

The National Research Council (NRC) is the governmental agency for research and development. It is located in every province in Canada and plays a major role in stimulating community-based innovation. The NRC is composed of over 20 institutes and national programs, including the Institute for Fuel Cell Innovation.

Canadian Environmental Technology Advancement Centres– CETAC

(www.oceta.on.ca**)**

Three CETACs have been established by the federal government across the country to strengthen and grow the environmental industry: OCETA in Ontario, CETAC-West in Alberta and Enviro-Accès in Quebec. They are private, not-for-profit companies. Their respective websites are www.oceta.on.ca, www.cetacwest.com, www.enviroaccess.ca/. Their mandate is to provide business services to small and medium sized enterprises (SMEs) that are commercializing new technologies in the environment and energy sectors. These organisations work with Industry Canada. Environment Canada sits at the table but is not leading.

Sustainable Development Technology Canada (SDTC)

SDTC is a not-for-profit foundation, established by the Canadian Government in 2001, which finances and supports the development and demonstration of clean technologies providing solutions to issues of climate change, clean air, water quality and soil (http://www.sdtc.ca/). SDTC reports to Natural Resources Canada and Environment Canada; Agriculture Canada is now joining, because of biofuel issues; other departments may be invited for discussions on policies and agreements.

SDTC aims at creating an end-to-end cohesive innovation chain, from science to commercialisation, and at bridging the funding and cultural gap that prevents news ideas from reaching a market. It is located outside of government and staffed with people who have both a private sector focus and a public good approach.

SDTC manages to broad funds (see below).

- The sustainable development technology fund (550 million CAN$) is earmarked for climate change and clean air and soil and finances technologies in the area of oil and gas, and hydrogen;

- The Next Generation Biofuel Fund (500 million CAN$).

SDTC reports on the environmental benefits of its action; the organisation has a sunset clause. Project owners report on the unit emission improvement, on the actual impacts of the project; they report on market impacts three years after completion of the project. This helps appreciate the potential economic uptake. This also can inform policy makers, on the barriers to deployment and the actions to be taken.

SDTC also provides the government with policy inputs. A particular instrument developed by SDTC is the SD Business Case™, a method to report on primary hurdles to market uptake and on the rationale on how to focus investment in a particular market sector. SDTC draws upon these analyses to inform discussions with governments on opportunities to enhance market uptake driven by smart regulation, for instance in the renewables area (a tax policy to accelerate depreciation) or in biofuels (promoting the next generation feedstock).

SDTC has a catalysing effect: it brings confidence and raises comfort level of clients. All money is grant money, aligned with the development of the project, which can be used to flatten the risk profile of the project.

National Round Table on the Environment and the Economy

The National Round Table on the Environment and the Economy (NRTEE) is a governmental body born in 1988 dedicated to exploring new opportunities to integrate environmental conservation and economic development (www.nrtee-trnee.ca/).

Non-governmental players

Innovation is also encouraged by the private sector and collaborations between the private sector and the government, also with links to universities, exist.

For instance, a list of public and private organisations dealing with the development and/or the promotion of clean energy technologies can be found at http://www.cleanenergy.gc.ca/canada/items_list_e.asp?mode=org.

One useful document is the *Innovation Map: Associations leading innovation in Canada*.

Policy documents related to eco-innovation

Among the main policy documents related to innovations and eco-innovation in Canada, the following have been encountered in the development of this study.

Canada's Innovation Strategy

The policy was launched in February 2002, with the release of two documents: *Achieving Excellence: Investing in People, Knowledge and Opportunity* and *Knowledge Matters: Skills and Learning for Canadians*. The papers highlight goals, milestones and targets to improve innovation, skills and learning. The goals are to boost the economy by nurturing a more knowledge-based workforce, and to build a strong scientific and research environment by 2010.

http://www.innovationstrategy.gc.ca/gol/innovation/site.nsf/en/in04135.html

Advantage Canada: Building a Strong Economy for Canadians

This long-term economic plan by Department of Finance (2006) recognizes that more can be done to turn ideas into innovations that provide solutions to environmental, health, and other important social challenges.

http://www.fin.gc.ca/ec2006/plan/pltoce.html

Mobilizing Science and Technology to Canada's Advantage

This strategy by Industry Canada (2007) sets out a multi-year science and technology agenda. It is the government's plan to achieve the goals set by *Advantage Canada* (see above). Its ambition is to create three advantages for the Canadians: entrepreneurial advantage, knowledge advantage, people advantage. The strategy focuses, among other areas, on environmental science and technologies, natural resources and energy.

http://www.ic.gc.ca/epic/site/ic1.nsf/en/h_00231e.html

It claims that strong and clear environmental laws and regulations that work with market forces will create the conditions for businesses and people to respond to environmental challenges with entrepreneurial innovation: such a framework can attract “new economy” firms and entrepreneurs and incubate environmental-protection industries. This includes the Regulatory Framework for Air Emissions (the plan sets mandatory reduction targets for major industries that produce GHGs and selected air pollutants; companies will be able to choose the most cost-effective way to meet them) and the Comprehensive Chemicals Management Plan.

It sets the role of government: to provide an enabling environment that promotes private investment in R&D, advanced technologies and skilled workers. It creates the EcoTrust for Clean Air and Climate Change to support projects in the provinces and the territories that reduce GHG emissions and air pollution; the government will invest over 1.5 billion CAN$ in the trust.

Policy on Green Procurement

See below for insights (http://www.pwgsc.gc.ca/greening/text/proc/pol-e.html).

Each federal department also periodically publishes its own *Sustainable Development Strategy*, in which sustainable development objectives and action plans are identified. Some of these mention environmental friendly technologies and initiatives. In 1995 '*A Guide to Green Government'* was released, as a framework to guide federal departments in the preparation of their sustainable development strategies.

Policies, Initiatives and instruments – a national inventory

This chapter summarises the main initiatives undertaken in Canada to foster environmental innovation, according to the information available in governmental and other official web sites, and to a series of interviews in Ottawa. The selection focused on those initiatives that clearly support eco-innovation. There may well be other initiatives that focus on innovation more broadly or other on achieving other policy objectives that also have an influence on eco-innovation. For the sake of brevity, this country profile focuses on the initiatives more directly supporting eco-innovation.

Whenever possible the achievements obtained by projects and initiatives have been noted. All currencies are in Canadian Dollars.

Research and Development

Several funds and initiatives have been established to promote the Research and Development (R&D) phase of new environmental technologies.

The Technology and Innovation Research and Development (T&I R&D) Initiative, which was terminated in March 2008, illustrates the rationale beyond most of these initiatives. T&I R&D was established in 2003 to advance promising greenhouse gas (GHG) technologies through R&D. The T&I R&D budget was $115 million over five years, to March 2008.

The Office of Energy Research and Development provided T&I R&D funds directly to partner departments and agencies, which then teamed up with provinces, the private sector and/or universities. To achieve significant GHG reductions in the near term, T&I R&D aimed to ensure that clean technology options which provide incremental advances are brought into the energy economy as quickly as possible, e.g. vehicles with reduced fuel consumption, energy-efficient buildings.

In a complementary vein, the Industry Energy Research and Development (IERD) Program, run by the Canmet Energy Technology Centre (CETC), provided refundable funding assistance to the industrial sector – from small to large enterprises. It supported the development and use of new energy-efficient processes, products, systems and equipment proposed by industry. The program forged links between technology developers and end-users to encourage the widest possible application of technologies. The program is currently being wound down.

Canada has historically been very good at spending public money for R&D. One feature of the Science and Technology Strategy nowadays is to increase private sector participation.

A significant part of the projects presented here is funded by other departments/agencies than Environment Canada or Industry Canada. Ten years ago, these departments could hand out money to develop an idea further: these programmes tend to disappear; they are substituted by such tools as SDTC. These departments typically try to work with others, bringing their policy framework to the table. Natural Resources Canada notes that long-term funding decreases (PERD is its main long term programme; see below) and that funding only stabilises because medium-term funds are available (for a period of 4-5 years), which is an issue for some long term research projects.

Natural Resources Canada has a number of procedures to identify and select technologies to be funded. There are a number of panels, where ministers look for advice and recommendations (e.g. the National Advisory Panel on Sustainable Energy Science and Technology, which reported on technological areas where Canada should focus its investments and on approaches the government might use; the 2006 reports focuses on how best to encourage the development and support the widespread commercial deployment of transformative technologies; see NAPSEST, 2006); the Prime Minister recommends that these panels should have a stronger international scope or coverage. The Ministry also surveys regulations in leading countries, to see where they put their money, why and where Canada stands.

Sustainable Development Technology Canada

SDTC manages to broad funds.

- The Sustainable Development Technology Fund (550 million CAN$) was established to bridge the gap in the innovation chain by fast-tracking groundbreaking clean technologies through development and demonstration, in preparation for commercialization, encouraging innovation and collaboration among private, academic and public-sector partners. The Fund is earmarked for climate change and clean air and soil and finances technologies in the area of oil and gas, and hydrogen;

- The Next Generation Biofuel Fund (500 million CAN$) was launched in September 2007, to take advantage of the abundance of suitable biomass materials available in Canada by funding large-scale demonstration facilities and encouraging the growth and retention of home-grown technologies and expertise in Canada.

See: www.sdtc.ca/en/about/index.htm

Achievements: To date, SDTC has approved funding for a total of 144 projects, totalling 342 million CAN$.

Program of Energy Research and Development

The Program of Energy Research and Development (PERD) is a federal, interdepartmental program operated by Natural Resources Canada. It provides funds directly to 13 partner departments and agencies to support early-stage and applied energy R&D in six technology areas: cleaner fossil fuels; cleaner transportation; energy-efficient buildings and communities; energy-efficient industry; power generation; and Generation IV nuclear technologies. The Office of Energy research and Development provides PERD funds directly to partner departments and agencies, which then team up with all kinds of agents (public or private).

Among its initiatives, PERD - in partnership with TEAM (see below) - funds the Bioenergy Development Program[1] to assist industry R&D and commercialization of bioenergy technologies (see: http://www2.nrcan.gc.ca/ES/OERD/english/View.asp?x=1317).

Achievements: The fund size is of $55.3 million per year. PERD currently funds 24 energy R&D programs.

ecoENERGY Technology Initiative

The ecoENERGY Technology Initiative (EcoETI) is an initiative of Natural Resources Canada and Environment Canada launched in January 2007 and consisting of a $230 million investment in clean energy science and technology. The initiative funds research, development and demonstration (RD&D) to support the development of next- generation energy technologies needed to break through to emissions-free fossil fuel production (e.g. clean coal, carbon sequestration, technologies reducing the environmental impacts of oil sands, hydrogen and fuel cells), as well as for producing energy from other clean sources, such as renewables (wind, solar, tidal) and bio-energy. The Initiative also supports the use and integration of clean energy in end-use sectors such as buildings and community systems.

See: http://www2.nrcan.gc.ca/ES/OERD/english/View.asp?x=1603

Other programmes

Other programmes need to be mentioned, although they do not specifically focus on environment-related R&D. they include:

- Industrial Research Assistance Program (IRAP) is a long standing program run by the National Research Council. It provides a range of both technical and business oriented advisory services along with potential financial support to growth-oriented Canadian small - and medium-sized enterprises. Website is www.irap.nrc.gc.ca;

- National Science & Engineering Research Council of Canada (NSERC) has a number of different funding programs that mainly support academic research in universities. More information is available at www.nserc.gc.ca.

Sector- or province-specific initiatives

The Federal state engages in working groups to identify shared priorities with provinces, in the energy sector. The lack of funding prevents this endeavour from baring concrete results yet.

Some programmes are province-specific (e.g. Atlantic Canada), others focus on one particular industry (e.g. sustainable buildings).

Atlantic Innovation Fund

The Atlantic Innovation Fund (AIF), run by the Atlantic Canada Opportunities Agency, is a $300-million, five-year program designed to strengthen the economy of Atlantic Canada by accelerating the development of knowledge-based industry. It supports a wide range of R&D projects, including initiatives related to environmental technologies.

[1] http://www.nrcan.gc.ca/es/etb/cetc/cetc01/htmldocs/Groups/Funding%20Programs/fundprog_bioenergy_e.htm

See: www.acoa.ca/e/financial/aif/index.shtml

Sustainable Buildings and Communities

The Sustainable Buildings and Communities (SBC) is a governmental group, under Natural Resources Canada, which performs building simulation research and development (R&D) to support the development of software for the building industry and to support government programmes; to assess the performance of emerging energy technologies; and to assist manufacturers of energy technologies with the optimization, integration and speed-to-market of their innovations.

See: http://www.sbc-bcd.nrcan-rncan.gc.ca/home_e.asp

Industrial Systems Optimization

R&D activities undertaken by the Industrial Systems Optimization team, under Natural Resources Canada, aim at developing methods and tools that optimise industrial processes. This includes enhancing the energy performance of existing equipment, such as dryers, or the optimization of energy and water consumption over an entire industrial site.

See: http://cetc-varennes.nrcan.gc.ca/en/indus/pp/s_s/rd.html

Technology specific programmes

A number of programmes focus on climate change and/or carbon-related technologies.

Technology Early Action Measures

Technology Early Action Measures (TEAM) is an interdepartmental technology investment program. It brings together partners from all levels of government, industry, and communities to support late stage development and first demonstration of greenhouse gas (GHG) reducing technologies – namely cleaner fossil fuels, energy-efficiency technology, biotechnology, hydrogen economy and decentralized energy production. Industry, Energy and Environment Canada sit at the board where proposals are put forward; they all bring their own perspective.

TEAM is committed to reporting on the performance of each project it funds and the impacts these projects have on reducing GHG emissions. To help in meeting this commitment, a method of evaluating GHG emission reductions as been developed: the System of Measurement and Reporting for Technologies (SMART). Up to $40,000 per project is allocated towards applying SMART.

See: http://www.team.gc.ca/

Achievements: Up to 2005, TEAM financed 106 projects worth a total of 1,017 m$. In December 2000, TEAM received the 'Head of the Public Sector Award' for its 'excellence in policy'. TEAM is winding down and is being merged into the EcoEnergy Technology Initiative (Eco-ETI) Programme (see above).

The Canadian CO2 Capture and Storage Technology Network (CCCSTN)

The CCCSTN under Natural Resources Canada provides information for the coordination of research, development and deployment efforts of national carbon capture and storage (CCS) initiatives as well as timely information on technology advancements. On its web site it is possible to find a

network of experts, current project information and links to other related information which aim to accelerate the development and deployment of CCS.

See: http://www.nrcan.gc.ca/es/etb/cetc/combustion/co2network/

Institute for Fuel Cell Innovation R&D Program

The institute, which is part of the National Research Council, manages a program aimed at advancing fuel cell science and technology and accelerating the commercialization of these technologies through collaborative R&D, licensing and the creation of new enterprises. The program is applied to four strategic areas: Polymer Electrolyte Membrane Fuel Cells, Solid Oxide Fuel Cells (SOFC), Hydrogen and Alternative Fuels and Integrated Energy Systems Demonstrations.

See: http://ifci-iipc.nrc-cnrc.gc.ca/main_e.html

Verification of technologies

Environmental Technology Verification (ETV) Programme

The ETV Programme is Canada's verification programme for environmental technologies. It is run by ETV Canada, a private sector company that operates under a licence agreement with Environment Canada. ETV verifies the environmental performance claims associated with projects and programs, as well as technologies and technological processes. In that context, verification provides the marketplace with the assurance that environmental performance claims are valid, credible and supported by quality independent test data and information.

In Canada, ETV is considered as a decision support tool for the government (contributing to Environment Canada's regulatory agenda, by ensuring that reliable data on the environmental performance of technologies is available), as a benchmarking tool for regulated industry and a marketing tool for environment industry (technology developers).

ETV Canada reports some 60 certificates had been awarded by the end of 2007, some 30 to 40 test plans have been developed.

A technology verification tool (SMART) has also been developed in the context of the Technology Early Action Measures (TEAM) investment program.

See: http://www.etvcanada.ca/

Community Energy Systems Program

The Community Energy Systems Program (CES), under Natural Resources Canada, identifies and develops opportunities for Canadian communities to use district heating and cooling, combined heat and power (co-generation), waste heat recovery, thermal storage, and local sources of renewable energy, particularly biomass. CES operates a laboratory to test and develop district energy technologies.

See: http://www.cetc.nrcan.gc.ca

Performance Targets

Some performance targets have been developed under the Energy Efficiency Act and the R-2000 Standard.

The Energy Efficiency Act (EEA)

The federal EEA (set in 1995) includes standards for energy efficiency for a range of products. Upcoming amendments will either set a minimum energy performance standard for a series of new products or will make existing standards more stringent for others. The amendments will come into force between 2007 and 2010.

*Achievements***:** Broadening and strengthening the Act means that 80 percent of the energy used in homes and businesses will soon be regulated. Over time, the set of planned new regulations will address about 20 currently unregulated products, and will tighten requirements for 10 products.

See http://www.nrcan-rncan.gc.ca/media/newsreleases/2007/200704b_e.htm

R-2000 Standard

Developed in partnership with Canada's residential construction industry, R-2000 is an initiative of the Natural Resources Office of Energy Efficiency. It aims to promote the use of cost-effective energy-efficient building practices and technologies. The R-2000 Standard is based on an energy consumption target for each house and a series of technical requirements for ventilation, air tightness, insulation, choice of materials, water use and other issues. The requirements are about 40 percent better that existing building codes. The result is new houses that use at least 30 percent less energy than conventional new houses.

See:http://oee.nrcan.gc.ca/residential/personal/new-homes/r-2000/About-r-2000.cfm?attr=4

*Achievements***:** Since its introduction, over 20 years ago, close to 900 builders have been licensed to build R-2000 homes, and more than ten thousands R-2000 homes have been built and certified.

Mobilisation of Financing

The Canadian private sector is reluctant to invest in R&D. SDTC and tax incentives are meant to engage the private sector in funding R&D (e.g. Scientific Research and Experimental Development Program, which provides tax incentives to support industrial scientific research and experimental development in Canada).

A number of funds and programmes exist to stimulate private investment in eco-innovation. A significant portion is focused on clean energy. Other instruments aim at facilitating application in particular industries (transport and freight, building and construction…).

Clean-energy related funds

Industry can submit proposals under two new funds:

- A $125 million fund to advance carbon capture and storage technologies that will reduce greenhouse gas emissions from the oil sands and coal-fired electricity plants;

- A $15 million fund to advance the development of technologies that will reduce the environmental impacts of oil sands production, such as tailings ponds.

Similarly, the Renewable Energy Technologies Program (RETP), run by the CANMET Energy Technology Centre of Ottawa (CETC), supports the improvement of the economics and efficiency of renewable energy technologies. Technologies include: bioenergy (combustion, biochemical conversion of biomass to ethanol, thermochemical conversion of biomass to bio-oil and biogas, and biomass preparation and handling); small hydro projects (less than 20 megawatts); active solar applications; and wind energy. See: www.cetc.nrcan.gc.ca and http://www2.nrcan.gc.ca/ES/OERD/english/view.asp?x=1563.

Emerging Technologies Program

The Emerging technologies Programme (ETP), run by the Canmet Energy Technology Centre (CETC), identifies technical barriers to increasing the energy efficiency of Canadian industries by providing up to fifty per cent funding assistance. ETP supports the development and implementation of technological solutions that contribute to a cleaner environment, improved energy efficiency and productivity, higher quality products, reduced waste, and a stronger market position for Canadian companies.

Clients to-date include the pulp and paper, iron and steel, cement, oil and gas, and food and beverage sectors. All industrial sectors are eligible.

Buildings Energy Technology Program

The Buildings Energy Technology Program (BET), run by the Office for Energy Research and Development (OERD) accelerates the development and use of energy-efficient residential and commercial building technologies, from R&D and field trials through to technology transfer and commercialization. Working domestically and internationally with associations, governments and industry, the program funds projects that involve research and development, dissemination and deployment related to building technologies and tools that increase energy efficiency, lessen environmental impacts and are replicable to the housing and commercial building industry. Total funding varies from $150,000 to $300,000 per fiscal year.

See: http://www2.nrcan.gc.ca/ES/OERD/english/view.asp?x=1548

Transportation related programmes

The Hydrogen, Fuel Cells and Transportation Energy program (HyFate), run by the CANMET Energy Technology Centre of Ottawa (CETC), works in partnership with industry to develop and deploy leading-edge transportation technologies that minimize environmental impacts, such as: alternative fuels and advanced propulsion systems; advanced energy storage systems; emissions control technologies; vehicle transportation systems efficiency; and fuelling infrastructures.

See: http://www.nrcan.gc.ca/es/etb/cetc/cetc01/htmldocs/Groups/hyfate_e.htm

The Canadian Transportation Fuel Cell Alliance (CTFCA), managed by Natural Resources Canada, is a $33 million, seven-year demonstration program for hydrogen infrastructure. Partners include technology developers, fuel providers, auto manufacturers, federal and provincial governments, academia and non-governmental organizations. The CTFCA demonstrates and evaluates the technical feasibility as well as the economic and emissions implications of hydrogen refuelling

options for fuel cell vehicles. The initiative also establishes a supporting framework for hydrogen refuelling by assisting in the development of codes and standards as well as certification and training programs.

See: http://www.nrcan.gc.ca/es/etb/ctfca/index.html

The ecoFREIGHT program, under Transport Canada, aims to reduce the environmental and health effects of freight transportation through the use of technology. It consists of two programmes:

- *The Freight Technology Demonstration Fund* - which provides the freight transportation industry with cost-shared funding for real world testing of freight transportation technologies that have the potential to reduce the emissions of air pollutants and greenhouse gases.

- *The Freight Technology Incentive Program* – which provides cost-shared funding to companies and non-profit organizations in freight transportation to help them purchase and install proven emission-reducing technologies.

See: http://www.tc.gc.ca/programs/environment/ecofreight/menu-eng.htm

Market-based Instruments

One illustration of market based instruments is the 1.5 billion CAN$ budget the Government has committed toward putting emission-free energy on the grid. MBIs of relevance to eco-innovation in Canada include:

- Wind Power Production Incentive
- Pilot Emission Removals, Reductions and Learnings
- ecoAUTO Rebate Program
- Quebec royalty system
- Emissions trading
- Green budget and subsidy reform

Wind Power Production Incentive

This is a federal initiative launched in 2001 and consisting of a production incentive for electricity from wind turbines An initial incentive payment of 1.2¢/kWh of production, gradually declining to 0.8¢/kWh, was introduced for qualifying projects commissioned between April 2002 and 2007. The total budget is $260 million[2]. The commitment of funds for wind energy projects under the WPPI program ended on March 31, 2007.

See: http://www.canren.gc.ca/programs/index.asp?CaId=107

Pilot Emission Removals, Reductions and Learnings (PERRL)

Through PERRL, the federal government buys the rights to verified greenhouse gas emission reductions from eligible projects for a fixed price per tonne. The total budget is $15 million. The initiative was launched in 2002 and terminated in December 2007.

[2] Source: http://www.fiscallygreen.ca/

See: http://www.ec.gc.ca/perrl/home_e.html

Achievements: PERRL's first auction round resulted in signed purchase contracts for 899,606 tonnes of greenhouse gas emission reductions at an average price of $3.33/tonne from four landfill gas projects[2].

ecoAUTO Rebate Program

The ecoAUTO Rebate Program, under Transport Canada, encourages consumers to buy fuel-efficient vehicles by offering rebates from $1000 to $2000, to people who, beginning March 20, 2007, buy a fuel-efficient vehicle. $160 million over two years have been allocated to offer performance-based rebates on new light duty vehicles.

See: http://www.tc.gc.ca/programs/environment/ecotransport/ecoauto.htm

Quebec royalty system

The province is introducing a hydrocarbon royalty (or carbon levy) that will be applied to all greenhouse-gas-emitting businesses in the energy sector. The amount of the royalties will be calculated on the basis of the level of carbon dioxide equivalent emissions from each form of energy. The revenues will be channelled into a Green Fund, estimated to consist of $200 million per year, to finance climate change actions. The ambition is to reduce greenhouse gases in Quebec by 10 million tons a year by 2012[3].

Emissions trading

Ontario has introduced a cap and trade system for emissions of nitrogen oxides and sulphur dioxide from power plants. The federal government is considering to develop a domestic inter-firm trading system.

The Montreal Climate Exchange, the first environmental products financial market in Canada, was also set up in 2006.

Green Procurement

Initiatives related to green procurement are taken at both federal and regional/provincial levels.

A new green procurement policy came into effect in April 2006. It focuses on the integration of environmental performance considerations into the procurement decision-making process including planning, acquisition, use and disposal. It does allow green procurement targets to be set as appropriate. There are guidelines and tools (e.g. environmental awareness tool kit for green procurement) available to help take procurement decisions and help set green procurement targets. A range of organisations are supporting the development of green procurement, including the Office of Greening Government Operations (OGGO), Environment Canada and Natural Resources Canada. OGGO was created in 2005 within Public Works and Government Services Canada, to accelerate the greening of the government's operations; it works closely with other federal departments, particularly the Treasury Board Secretariat and Environment Canada.

See http://www.pwgsc.gc.ca/greening/text/proc/pol-e.html

[3] See also http://www.kyotosmart.net/pdf/case_quebec.pdf

Awareness raising and training

Initiatives include:

- Advanced Technology Vehicles Program
- ecoTECHNOLOGY for Vehicles
- ecoENERGY Efficiency
- Freight Efficiency & Technology Initiative
- Fuel Consumption Program
- Environmental Choice Program
- RETScreen
- EnerGuide Program
- Clean energy portal
- Events and Trade fairs

ecoTECHNOLOGY for Vehicles

The Government of Canada has launched the ecoTECHNOLOGY for Vehicles Program to help Canadians make informed choices when purchasing a vehicle. The program includes in-depth testing and publishing of the safety and environmental performance of a range of emerging technologies for use in light-duty vehicles. The program showcases green technologies at auto shows across the country, provides consumers with information, fosters partnerships with the automobile industry across the country to help identify and take action on barriers to the introduction of environmental technologies.

See: http://www.tc.gc.ca/programs/environment/etv/menu-eng.htm

ecoENERGY Efficiency

Through the ecoENERGY Efficiency Initiative, the Office of Energy Efficiency (OEE) works to improve energy conservation and energy efficiency in every sector of the economy. The OEE offers grants and incentives and other resources, including workshops for professionals, statistics and analysis, awards and free publications. The initiative includes several programs, namely:

- ecoENERGY for Buildings and Houses: provides publications, training, tools and other technical information to help choose energy efficiency measures and practices for buildings; standards and rating systems have also been developed;
- ecoENERGY for Industry: assesses companies' capacity to reduce energy use; trains managers in energy efficiency and conservation; identifies least-cost options for reducing companies emissions and; provides a forum for sharing information on new technologies and best practices;
- ecoENERGY for Personal Vehicles: provides motorists with tips on buying, driving and maintaining their vehicles to reduce fuel consumption and GHG emissions;
- ecoENERGY for Fleets: emphasize information-sharing, workshops and training to help fleets increase their fuel efficiency;

- Transportation: programs to encourage manufacturers voluntary initiatives on fuel efficiency (Vehicle Efficiency), increase efficiency of federal fleets (Federal Vehicles) and inform the public about alternative fuels (Alternative Fuels)

Freight Efficiency & Technology Initiative

The Freight Efficiency and Technology Initiative is a five-year initiative of Transport Canada designed to reduce the growth of greenhouse gas (GHG) emissions from freight transportation. It consists of three components:

- the Freight Sustainability Demonstration Program: demonstrating and encouraging the uptake of innovative technologies and efficient best practices within the freight transportation sector

- Voluntary Performance Agreements: soliciting the freight transportation industry's participation in emissions reduction initiatives; and

- Training and Awareness amongst freight operators: increasing fuel efficiency and environmental awareness

See: http://www.tc.gc.ca/programs/environment/freight/FETI/menu.htm

Achievements: The freight initiative has a budget of $14 million and is expected to result in approximately 2 mega tonnes of GHG emissions reduction by 2010.

Environmental Choice Program

The Environmental Choice Program (ECP) is a certification program for "green" products and services run by the company Terra Choice, under a license agreement with Environment Canada. The programme helps consumers identify products and services that are less harmful to the environment. The program awards green products and services with an environmental certification mark (EcoLogo^{M}) recognised in North America. A web site provides information on environmentally-responsible products and services and links to companies who participate.

See: www.ecologo.org/en/

RETScreen

The RETScreen International Clean Energy Decision Support Centre**,** managed by the CANMET Energy Technology Centre, seeks to build the capacity of planners, decision-makers and industry to implement renewable energy and energy efficiency projects. This objective is achieved by: developing decision-making tools (e.g. RETScreen Software) that reduce the cost of pre-feasibility studies; disseminating knowledge to help people make better decisions; and by training people to better analyse the technical and financial viability of possible projects.

See: http://www.retscreen.net/

Achievements: The RETScreen software has saved $240 million in Canada and $600 million $600 million dollars by 2004, and was used in about 200 countries. The initiative won the Canadian Government's 2001 'Head of the Public Service Award' for excellence in service delivery[4].

EnerGuide Program

EnerGuide is a Natural Resources Canada initiative that helps consumers purchase the most energy-efficient equipment on the market, in order to increase public awareness of the link between energy and the environment and to promote the opportunities opened up by energy-efficient technology. This on-line tool shows how much energy appliances consume in a year of normal service and makes it easy to compare the energy efficiency of each model to others of the same size and class.

See: http://oee.nrcan.gc.ca/Equipment/english/index.cfm?PrintView=N&Text=N

Clean energy portal

Cleanenergy is a web portal providing resources and information about clean energy, i.e. on: contacts details of Canada's clean energy firms, key technologies and government resources central to clean energy and climate change; and Canadian and international climate change initiatives.

Events and Trade fairs

Several trade fairs and events promote environmental innovation and technology in Canada. Among these: Globe (held in Vancouver, BC, on even calendar years; www.globe.ca), Americana (held biannually, in Montreal, Quebec, on odd calendar years; www.americana.org/); both promote environmental innovation, but Globe focuses on the Asian market, whereas Americana looks South (e.g., Mexico, South America).

Other events include: the Green Building Festival Conference (www.greenbuildingfest.com), the Cleantech Forum (http://cleantechnetwork.com/), the business of Climate Change Conference (www.thebusinessofclimatechange.com/), the CanSIA Solar Conference (http://www.cansia.ca/conference2007.asp), the Canadian Waste & Recycling Expo (www.cwre.ca), etc.

Industry Canada organises a number of workshops across the country, to bring vendors and buyers together.

Acting globally

Canada collaborates with many developed and developing countries to promote research and implement projects on eco-innovation and environmental technologies, and to promote exports of Canadian environmental technologies (via provincial industry associations):

- CDM and JI: There is active work in this area with MOUs (Memorandum of Understanding) completed for a range of countries[5]. Projects have to be approved by Canada's *Clean Development Mechanism and Joint Implementation Office*. Initiatives supported included projects dealing with energy efficiency, landfill gas capture, renewable energy, etc.

[4] http://www.retscreen.net/ang/impact.php

[5] With: Poland, Ukraine, Latvia, Korea, Chile, Colombia, Costa Rica, Nicaragua, Tunisia, Uganda. http://www.nrcan.gc.ca/es/etb/cetc/cep/CDM-JI%20Workshop%20-%20About%20CDMJI%20Office.pdf

- *Canadian Initiative for International Technology Transfer*: the initiative, under the CANMET Energy Technology Centre (CETC), helped identify and develop climate change technology transfer to both developed and developing countries through Canadian businesses and non-government organizations[6]. It ran from 2002 to 2007;

- *Commission for Environmental Cooperation (CEC)*: it is an international organization created by Canada, Mexico and the United States under the North American Agreement on Environmental Cooperation (NAAEC). The CEC was established to address regional environmental concerns, help prevent potential trade and environmental conflicts, and promote the effective enforcement of environmental law. Among its programs and projects, it helps identify opportunities for cooperation and trade in environmental goods and services including renewable energy and energy efficiency;

- Canada, Mexico and the United States have a long history of bilateral cooperation on energy science and technology. In 2007 the three countries signed a *Trilateral Agreement for Cooperation in Energy Science and Technology* to fuel joint developments to seek cleaner and more efficient ways to use energy[7].

- The *Asia-Pacific Partnership for Clean Development and Climate* engages in cooperative research and application of technologies.

However, Natural Resources Canada notes that resources are scarce and not earmarked for international cooperation; intellectual property right issues, constraints on international money transfers also hinder international cooperation on R&D and technological issues.

Country Synthesis

Overview of policies and measures

Canada's Gross Domestic Expenditures on Research and Development (GERD) as a percentage of GDP was 1.89 per cent in 2004, lower than its peak of 2.05 per cent in 2001 though higher than in 1999[8]. This is about one percentage point below the EU target for R&D expenditure set by the EU Lisbon Strategy, namely 3% of GDP by 2010. However, it is higher than the 2002 average GERD in EU15 and previous candidate countries, i.e. 1.76%.

Several initiatives are in place to foster environmental innovation, and technology in particular. These include clear and effective policy frameworks (including on air pollution, GHG emissions and dangerous chemical substances); the EcoEnergy Technology Initiative; and supporting collaborative research initiatives in the provinces and territories.

Most initiatives fund research and development or cradle-to-grave development of new products, in a technology push approach. However, the government is withdrawing from direct R&D spending as this creates issues with WTO, NAFTA… At Industry Canada, the direction is rather towards promoting competitiveness and productivity, by setting up the appropriate framework.

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[6] See http://www.nrcan.gc.ca/dmo/aeb/aeb-rpts-2006-E05010-e.htm

[7] See http://www.nrcan.gc.ca/media/newsreleases/2007/200766a_e.htm

[8] See Canada's Performance Report 2005 - Annex 3 - Indicators and Additional Information http://www.tbs-sct.gc.ca/report/govrev/05/ann301_e.asp#a3green

Environment Canada and Industry Canada have instruments to create markets. Now the domestic market may not be large enough to stimulate a response from the industry.

Notable initiatives are the ETV Program (on technology verification), the Energy Efficiency Act (on efficiency targets), and the new federal policy on green procurement. Some market-based instruments promote renewable energy sources and fuel efficient vehicles, while a carbon levy is being applied in Quebec.

The role of globalisation

There is a substantial collaboration of Canada with the US and Mexico in the development of international/ North American initiatives. Commissions and Working Groups, as well as tri-lateral agreements, have been created to discuss and develop cross-border projects, e.g. on environmental performance verification, energy and trade of green products. An eco-label widely recognised in North America has been created (the EcoLogo).

Collaboration in the field of environmental innovation with developing countries and economies in transition has been carried on through CDM and JI and other frameworks, especially on energy efficiency. Canada is also very active in promoting its model for environmental performance verification abroad, including in developing countries such as Bangladesh.

Lessons

- A number of not-for profit organisations have been created by the Canadian Government to deal with environmental technology and innovation – such as the three CETACs and Sustainable Development Technology Canada. This arms-length relationship to government is a feature of the Canadian approach to eco-innovation (and especially of Environment Canada). It should be noted that foundations and CETACs are third-party, arm's- length, not-for-profit organizations and primarily federally funded, the CETACs focus on business services whereas the foundations focus on providing direct funds for research, development and demonstration of new technologies. The funds given to the CETACs on an annual basis are very modest in comparison to the funds that are distributed annually by the foundations for technology innovation projects.

- A large number of funds support the development and deployment of eco-innovation and technology, especially the R&D phase. Some of these initiatives encourage explicitly collaborations between the public and the private sector. Clean energy is one of the areas that receive most of the attention - hydrogen and fuel cells in particular.

- There is a rich articulation between regulation and innovation. At Environment Canada, innovation is geared towards improved regulation and monitoring. At the same time, the Clean Air regulation agenda includes a technology fund: non complying companies pay a penalty to a fund that will support technologies to help compliance.

- Canada has a well established system (ETV) for verifying the environmental performance claims associated with projects and programs, and technologies. ETV also collaborates in the area of verification with the US South Korea and Japan and with a similar initiative in the European Commission.

- Energy performance standards are set by law. The regulation has recently been broadened to cover 80 percent of houses and business energy use. National standards have also been developed for energy efficiency in buildings

- Canada has in place a number of market-based instruments promoting renewable energy, green house gases emissions reduction and fuel efficient vehicles. Quebec also recently implemented a carbon tax. A cap and trade system for NOx also exists in Ontario.

- A new green procurement policy has been recently issued in Canada, allowing green procurement targets to be set as appropriate. Guidelines and tools are available to help green procurement decisions.

- Several initiatives (funds, market based instruments and awareness rising) aim to promote cleaner fuels and/or reduced emissions from the transport sector. Some of these are especially targeted to the freight sector.

- Canada, Mexico and the United States have a long history of bilateral cooperation on energy science and technology. Examples of regional collaboration in the field of environment and innovation are the *Commission for Environmental Cooperation and the North America Working Group on Environmental Enforcement and Compliance Cooperation*.

- Canada is also involved in a number of projects on environmental cooperation with developing countries – e.g. through CDM mechanism and other projects on energy efficiency.

- The possibility of spill-over effects has been identified and discussed at Federal level. However, to restrict support to eco-innovation which can address domestic environmental issues would restrain the number of projects. Moreover, the general analysis is that the Canadian industry will also benefit from projects and innovations even though foreign suppliers may benefit first (e.g. the pulp and paper industry imports German equipments and machinery, but the improved environmental performance will benefit the Canadian industry as well).

- Environment Canada is looking for indicators to assess the environmental impact of its programmes in favour of green technologies.

Appendices

Summary table

Actions	Initiatives
Research and Development	Sustainable Development Technology Fund Technology Early Action Measures Program of Energy Research and Development ecoENERGY Technology Initiative Atlantic Innovation Fund Sustainable Buildings and Communities Industrial Systems Optimisation Canadian CO2 Capture and Storage Technology Network Institute for Fuel Cell Innovation R&D Program Technology and Innovation Research and Development Industry Energy Research and Development Program
Verification of Technology	Environmental Technology Verification (ETV) Program. Community Energy Systems Program
Performance Targets	The Energy Efficiency Act The R2000 Standard The C-2000 Program for Advanced Commercial Buildings
Mobilisation of Financing	Emerging Technologies Program Western Economic Partnership Agreements Buildings Energy Technology Program Renewable Energy Technologies Program Hydrogen, Fuel Cells and Transportation Energy Program Canadian Transportation Fuel Cell Alliance ecoFREIGHT Program
Market-based Instruments and State Aid	Wind Power Production Incentive Pilot Emission Removals, Reductions and Learnings ecoAUTO Rebate Program Quebec royalty system Emissions trading Green budget and subsidy reform
Procurement	Policy on Green Procurement Alberta Ministry of Environment procurements
Awareness Rising and Training	Advanced Technology Vehicles Program ecoTECHNOLOGY for Vehicles ecoENERGY Efficiency Freight Efficiency & Technology Initiative Fuel Consumption Program Environmental Choice Program RETScreen EnerGuide Program Clean energy portal Events and Trade fairs
Acting Globally	Collaboration with Mexico on emissions trading. CDM and JI International projects on clean energy Canadian Initiative for International Technology Transfer: Commission for Environmental Cooperation North America Working Group on Environmental Enforcement and Compliance Cooperation Trilateral Agreement for Cooperation in Energy Science and Technology

Green technologies in Canada

According to Statistic Canada the Environmental industry consisted of almost 7,500 companies in 2005, employing more than 160,000 people[9]. According to the House of Commons Standing Committee on Industry 2000 report on the Canadian productivity, competitiveness and prosperity, Canada's environment sector employed about 220,000 people in 2000, and was the third largest employment sector in the country[10].

The supply of environmental goods and services (environmental revenues) was estimated to be worth about $ 14.4 billion in 2000, (about €10.5 billion) of which 6,2 (€4.6 billion) came from environmental goods, 6,3 (€4.6 billion) from services and 1,9 (€1.4 billion) from environment-related construction[11]. In 2002 revenues from sales of environmental goods and services were $15.8 billion (about €10.7 billion) and increased to $18.5 billion (about €11.5 billion) in 2004. In the same year export markets represented 8.1% of environmental revenues in 2004, i.e. $1.5 billion (about €930 million), with the USA being the largest export market for Canada's environmental industries followed by Europe and Asia[12]. The sectors contributing the most to the overall revenue are shown in the graphic below.

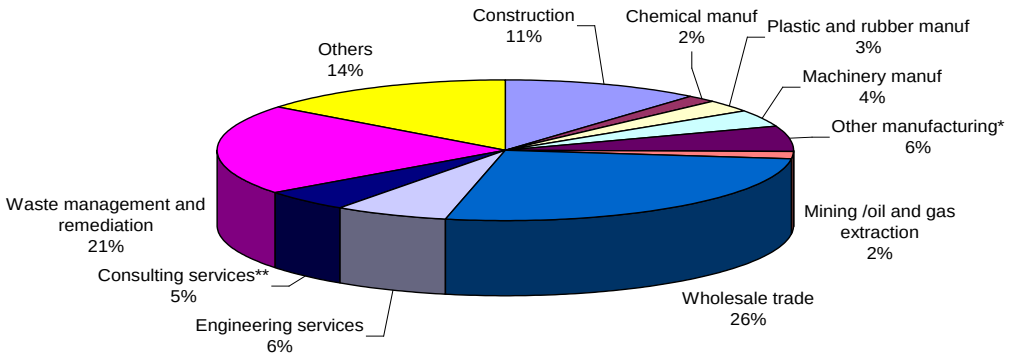
[9] http://www40.statcan.ca/l01/cst01/envi30a.htm

[10] Source: http://cmte.parl.gc.ca/Content/HOC/committee/362/indu/reports/rp1031680/indy20/18-ch10-e.html

[11] Source: http://www40.statcan.ca/l01/cst01/envi30a.htm

[12] Statistic Canada, 2007

Figure 1. Environmental revenues by sector[13]



* Other manufacturing including: non metallic mineral product, primary metal, fabricated metal product, computer and electronic products, electrical equipment, appliance and component, and other manufacturing
** Consulting including: environmental, management and other scientific and technical consulting services
Source : adapted from Statistic Canada, 2007

References

Government of Canada (2002): Canada Innovation Strategy - Achieving Excellence Investing in People , Knowledge and Opportunity http://www.innovationstrategy.gc.ca/gol/innovation/site.nsf/en/in04135.html

Statistic Canada, 2007: *Environment Industry: Business Sector - 2002 (revised) and 2004*

National Advisory Panel on Sustainable Energy Science and Technology (2006), *Powerful Connections. Priorities and Directions in Energy Science and technology in Canada (http://www.nrcan.gc.ca/eps/oerd-brde/report-rapport/toc_e.htm)*

Direct links related to each initiative and programmes are noted in the text.

[13] Note only the sectors above $ 200 m. Other sectors fall into the category 'Others'