

Please cite this paper as:

OECD (2008), "Eco-Innovation Policies in Mexico", Environment Directorate, OECD.



Country profiles on policies to support environment-friendly innovation

Eco-Innovation Policies in Mexico

Xavier Leflaive



Environment Directorate

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).

Copyright OECD, 2008.

All requests for permission to reproduce or translate all or part of this material should be submitted to rights@oecd.org. OECD Publishing, 2, rue André Pascal, 75775 Paris Cedex 16, France.

TABLE OF CONTENTS

FOREWORD	2
INTRODUCTION.....	4
Background.....	4
Policy instruments to support eco-innovation	4
COUNTRY PROFILE OF MEXICO.....	6
Introduction and country definitions of eco-innovation	6
Policies, Initiatives and instruments – a national inventory	8
Country Synthesis.....	15
References.....	18

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 Mexico 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 MEXICO

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. The Mexican government is committed to increase the country's competitiveness through innovation and technology efforts, and this is reflected in several official documents. However, the concepts of 'environmental innovation', 'clean technology' and 'sustainable technology' are not easily identified in the agenda yet.

Institutions playing a major role on eco innovation

Mexico's innovation system incorporates a wide range of institutions and organisations whose purpose is to foster technology adoption and innovation within Mexican industry. The organisations focus on funding, training, specialised research, and basic science research.

The Information provided in this report is mainly based on initiatives taken by the governmental institutions within the Mexican Government, as even though Mexico is a federal country (with strong federal regions), it has centralised responsibility for innovation in a single agency: the *National Council of Science and Technology (CONACYT)*. CONACYT is indeed the most important public entity promoting and supporting science and technology activities, reporting directly to the President. In addition, the national government also coordinates departments at regional and national level.

National Council of Science and Technology

CONACYT's main objectives include:

- Setting up funds for scientific and technological research;
- Fostering innovation in the services sector, especially software-related research;
- Establishing links with international organisations, furthering collaboration between national and foreign institutions;
- Administering the postgraduate scholarship system;
- Coordinating the CONACYT System of Research Centres – a set of 27 research centres whose main function is to conduct scientific research and technological development; and
- Administering the National Researchers System (SNI) that seeks to strengthen and stimulate research efficiency and quality by providing support to researchers in higher learning institutions or public sector research centres, as well as to the scientists working for private institutions (OECD, 2004).

CONACYT has launched several initiatives directed to increase the level of technological development in Mexico. Several actions have been implemented in coordination with different Ministries of State, such as *SEMARNAT (the Ministry of Environment and natural Resources)* and the *Ministry of Economics*.

Ministry of Economics

The Ministry of Economics operates the national Committee on Productivity and Technological Innovation, which is designated to improve the competitive position of small and medium-sized enterprises by maximizing the use of their resources.

There is a special fund co-managed by SEMARNAT and CONACYT to promote technological projects in environmental issues. But estimations report that only three of the 120 projects supported in 2003 regarded environmental innovations applicable to industry (Lopez, 2004).

National Commission for Energy Conservation

Since its creation in 1989, *Mexico's National Commission for Energy Conservation (Comision Nacional para el Ahorro del Energía, CONAE)*, the energy conservation arm of the Energy Secretariat (SENER), has had a governmental mandate to provide technical assistance on energy efficiency to the public sector.

State Councils on Science and Technology

While still fairly centralised, the Mexican innovation system has recently increased State's autonomy. For instances, up to 2004, 23 out of the 32 States in Mexico established their State Councils on Science and Technology (e.g. the States of Coahuila, Durango, San Luis Potosí, Querétaro and Tabasco). These councils are a permanent forum to discuss and propose science and technology programmes and actions furthering state-level innovation capacity. The organisations also work to improve researcher and facility cooperation between institutions and researchers in different geographical areas on subjects of common interest (OECD, 2004 and European Commission, 2006).

Policy documents related to eco-innovation

The following Mexican legislative and policy programmes enacted in 2000 and 2001 provide a good framework for building a more innovative economy (see Lewis, 2006):

- In 2001, the Fox administration presented its *National Programme for Science and Technology 2001-2006*. The Programme set strategic priorities and guidelines for the development of science, technology and innovation in Mexico and identified broad objectives, such as creating a coherent policy framework for science and technology, increasing Mexico's science and technology capacity, and finding ways to use science and technology to increase innovation in the private sector. Clear goals have been set for each of these objectives and the timeline for achieving the same has been set for 2006. The Program is part of the Mexican National Development Plan which aims to drive responsible economic growth in the nation, elevate and extend the country's competitiveness, ensure inclusive development, promote balanced regional economic development, and create conditions for sustainable development (European Commission, 2006).
- On April 30, 2002, Mexico revised its legal framework for science and technology by approving the *Science and Technology Bill (Ley de Ciencia y Tecnología - LCYT)*, to

further strengthen and develop general scientific and technological research in the country. The Law created new mechanisms to support scientific research and technology. These included: (i) modifying the way CONACYT operates (e.g. making CONACYT a separate agency that report directly to the President); (ii) establishing several new coordinating bodies (e.g. National Board of Support to Scientific and Technological Activities, National Board of Support to Competitiveness, and National Council of Assessors on Science and Technology); (iii) establishing a separate budget function for CONACYT and creating new funding mechanisms for federal and mixed (combined federal, state, and local) funding; and (iv) creating tax incentives to subsidize private R&D for approved companies (a tax credit equal to 30 percent of the annual research spending), among others.

In recent years there have been larger programmes of reforms, and some relevant policy document in respect to eco innovation include:

- ‘Towards a national Climate Change Strategy’ in 2006 and ‘National Climate Change Strategy’; these strategic documents, released in 2007 by Mexico’s Interministerial Commission on Climate Change (ICCC), signal the government’s effort to increase the use of renewable energy. ICCC was active in introducing legislation and projects associated with renewable energy sources (Banda et al., 2007).
- During 2006, federal government attention was focused on the Renewable Energy Law, which specifies a range of transmission conditions to better capture the electricity generated from renewables. It also facilitates the connection of privately operated renewable energy sources to the national grid, and supports the development of emerging technologies based on renewable energy sources. Further, the bill proposes the implementation of a trust fund to assist research and development activities focused on those renewable energy technologies considered most promising. The Renewable Energy Law has been criticized because while it authorizes incentives to promote the use of renewables, the law is vague and ambiguous about the type of incentives that will be used.

Such decisions will be left largely to the Ministry of Energy, SENER. SENER will manage a trust for grant requests (*Fideicomiso para el aprovechamiento de fuentes renovables de energía*), although the total size of the trust is unclear. The Lower House indicated that funding would be drawn from a number of sources, including federal appropriations, unidentified duties, contributions from state governments and municipalities, voluntary contributions by individuals and companies, contributions by international organizations, and proceeds from the sale of renewable energy certificates to individuals or entities in Mexico and abroad. Final approval of Renewable Energy Law has been delayed (Banda et al, 2007).

- In May 2007 President Felipe Calderon proposed the 2007-2012 National Development Plan for Mexico, which emphasizes the country’s commitment to sustainable development.

Policies, Initiatives and instruments – a national inventory

Research and Development

The general goal of CONACYT is to bolster investment in R&D that will result in higher standards of living, to be achieved through stronger higher education programmes in science and technology, support for research initiatives, and the diffusion of innovation. Specifically, CONACYT supports graduate students in domestic and foreign programmes of demonstrated quality; supports firm-based innovation and the facilitation of industry-academia linkages; and bolsters the R&D

regional development and scientific network. CONACYT also operates 28 centres across the country that research technology, engineering, basic science, and social science (European Commission, 2006).

In order to facilitate technology transfer by universities and public laboratories, some of these institutions have been designated as Public Research Centres. These centres have been given the freedom to manage the technologies that they develop as well as resources that they generate. During the past ten years, major universities have forged links with private industry, resulting in a growing number of innovative programmes in education, training, research, and technology development. Much of the effort is channelled through Centres of International Competitiveness and Centres of Advanced Technology on different campuses throughout the country. Furthermore, initiatives currently under review at various universities, if passed, would give researchers who worked on innovations developed at these institutions a share of the economic rewards of the innovation. Furthermore, cooperation agreements allow public institutions and private enterprises to share intellectual property rights. Enterprises requesting the support of the higher learning institutions may even wholly own property rights in some cases (European Commission, 2006).

Verification of technologies

The *Administración Pública Federal* (APF) initiative was developed by CONAE, the National Commission for Energy Conservation, in 1999, as an extension of the “100 Public Buildings” pilot program, which began in the early 1990s (see under ‘Awareness raising and training’). APF applies to all Mexican federal agencies and to date, APF has resulted in energy audits and retrofits (mainly for lighting) in almost one thousand Mexican government buildings.

Performance Targets

The National Commission for Energy Conservation (CONAE) has developed a number of energy efficiency standards and programmes. CONAE also promulgated official national mandatory regulations for energy efficiency (NOMS) of all new products and appliances (e.g. air conditioners). The ‘National Climate Change Strategy’ adopted in 2007 by Mexico’s Interministerial Commission on Climate Change (ICCC) reports the government’s intention to expand this strategy.

The ‘National Climate Change Strategy’ launched in 2007 by Mexico’s Interministerial Commission on Climate Change (ICCC) includes several initiatives that fall in this category, such as (i) increasing PEMEX’s energy efficiency target by 5%; (ii) increasing efficiency of flares on offshore platforms; (iii) increasing the efficiency of transmission and distribution lines by 2%; (iv) increasing thermal efficiency of fuel oil-fired thermoelectric plants by 2%; among others.

Mobilisation of Financing

In an effort to encourage private sector innovation, the Mexican government has been offering companies tax credits for R&D since 1998. Up to the year 2000, the incentive consisted of a 20 percent tax credit of the eligible expenditures and investments in research and development of technology (IDT) that the company would incur during a certain fiscal year. However, starting in 2001, the benefits were further increased. Companies now get a tax credit equal to 30 percent of their annual IDT expense, regardless of size or industrial sector (European Commission, 2006 and OECD, 2004).

CONACYT also supports technological modernization, linkage and the development of technology through low interest rate loans and “lost fund loans”, where payment of the loan is not required, provided certain previously established conditions are met.

The Mexican Government established “mixed funds” with the objective of establishing specific regional and local programmes, supporting further scientific and technological development and decentralization, and strengthening regional and local research and development capabilities. These funds are set up with joint contributions of the productive, academic and governmental sector, in a proportion which varies for each individual case. Traditionally, most of CONACYT’s resources have stayed in Mexico City. These funds have the additional advantage of promoting decentralisation of research. Mixed funds have been operating since 2001 and up to 2004 26 mixed funds and one municipal fund were set up (OECD, 2004 and European Commission, 2006).

The Mexican Government also established science and technology sectoral funds, which refer only to state Ministries of the Federal Government and to their research centres. Establishing these funds requires making technological diagnosis and forecasts by knowledge areas. In recent years (up to 2004), 14 sectoral funds began operating on several topics of applied research and technological development (OECD, 2004 and European Commission, 2006).

Electrical Energy Savings Trust (FIDE) developed a successful refrigerator and air conditioner substitution program allowing consumers finance credits for purchasing and using more energy efficient appliances in areas where electricity is provided by CFE, replacement of nearly 20% of all incandescent lamps in residential buildings with longer lasting compact fluorescent lamps, and financing industries which exchange inefficient equipment for more energy saving models. This was in addition to projects aimed at increasing the use of energy-efficient technologies and practices in government buildings and beginning in residential sectors as well (Banda et al, 2007).

Implementation of the Mexican Carbon Fund (FOMECAR), created as a result of the joined efforts of the Ministry of Environment and Natural Resources of Mexico, Centro Mario Molina, and the Mexican Bank for Foreign Trade (BANCOMEXT) in order to provide Mexican companies and public entities with technical and financial support to develop Clean Development Mechanism (CDM) projects. The fund became fully operational at the end of 2006 and is currently managed and run by the Mexican Bank of Foreign Trade. Since July 2006, 52 new projects were registered in Mexico under the CDM established by the Kyoto Protocol, in partnership with Switzerland, the Netherlands, the UK, Japan, and Spain (Banda, 2007).

‘AVANCE’ (a Spanish word for “advance”) is a programme that seeks to produce “High Value-Added Businesses linking Knowledge with Visionary Entrepreneurs”. The programme was developed by CONACYT to advance technological innovation in the private sector. It works as a kind of venture-capital effort and provides support for researchers, entrepreneurs, companies, and research institutions who wish to commercialise their research, by transforming scientific and technological developments into commercial activities (Lewis, 2006). The focus sectors include information technology, electronics and telecommunications, health, agricultural, fishing and food development, advanced materials, sustainable development and environment, energy, design and manufacturing, housing and construction, attention to poverty and social needs (OECD, 2004).

Procurement

Initiatives related to green procurement include the following ones.

In 2000, PEPS and CONAE, the National Commission for Energy Conservation, began a programme to promote energy-efficient purchasing by national government agencies in Mexico (see under ‘Acting Globally’). The idea was to take advantage of the momentum of the APF program (see under ‘Verification of Technologies’), which was demonstrating considerable success in generating audits and lighting retrofits in large government buildings. PEPS aimed to get APF-participating agencies and facilities to institute procurement policies that, as a complement to the retrofit projects, would commit them to buy energy-efficient products in their day-to-day purchasing. However, the effort to launch a full-blown initiative at the federal level was not successful.

Subsequently, it was decided to shift to a more decentralized, bottom-up strategy targeting municipal government purchasing, through a collaboration established in 2003 with ICLEI. The pilot phase of the municipal program focused on cities’ purchases of a limited set of energy-efficient products (lighting and office equipment) that qualified for either the Sello FIDE (Mexican) endorsement label or the US-based ENERGY STAR label. During 2004, PEPS developed procurement specifications for the pilot-phase products and provided eight pilot municipalities with training and technical assistance on buying energy-efficient products. In 2005, PEPS continued to work through ICLEI and a Mexican municipal association, AMMAC (Asociación de Municipios de México AC), to provide individualized technical assistance to the pilot municipalities. The specific objectives were to ensure that each municipality adopted procurement policies that included the energy-efficient specifications, and to assist in their initial purchases of energy-efficient products. By September of 2005, \$1 million in estimated PEPS-related purchases had been made by four municipalities. The estimated annual savings from these purchases exceeded 5,000 MWh. By early 2006, seven of the eight PEPS pilot cities had begun buying energy-efficient products according to the PEPS recommendations. Furthermore, two of the cities had adopted new purchasing policies and policies were nearing completion in five other cities. PEPS expects to expand the programme and further collaborate with CONAE to transform the energy-efficient procurement program into a mandatory policy for all federal agencies (Van Wie McGrory et al., 2006 and Lawrence Berkeley National Laboratory, 2007).

The Ministry of Environment and Natural Resources has taken an initiative to incorporate forest certification in the criteria of public procurement at federal and state level (ITTO, 2005).

The Commission for Environmental Cooperation involves the governments of the US, Canada and Mexico and aims to build North American markets for renewable energy and other green products, and to facilitate green trade through ecolabeling and green purchasing. The Commission serves as the Secretariat for the North American Green Purchasing Initiative, a clearinghouse of information for manufacturers, purchasers, and suppliers. The initiative has highlighted the business case for green procurement. In a report dated 2005 it indicated that Governments and companies are buying green because it results in benefits such as reducing overall costs, the opportunity to use materials more effectively, improving employee health and stimulating markets for innovative new products and services (Australian National Audit Office, 2005).

Awareness raising and training

The Mexico GHG Programme

This programme is coordinated by SEMARNAT, with a technical support from the World Resource Institute and the World Business Council for Sustainable Development. The GHG Programme is advised by a committee of experts from local NGOs (e.g. the Centre of Public Policy for Sustainable Development and the Private Sector Commission for Sustainable Development), local business and industry associations (e.g. the National Confederation of Industrial Chambers of

Mexico), and government environmental agencies (e.g. the National Institute of Ecology and the Registry for the Emission and Transference of Pollutants). Initially launched on 25 August 2004, the GHG Pilot Programme aimed at developing a two years voluntary reporting platform on greenhouse gases emissions for Mexican businesses. Currently, the GHG Programme partners organize training workshops and provide information, calculation tools, and technical assistance to participants (i.e. private and public-sector organizations operating in Mexico) for preparing corporate GHG inventories, identifying GHG reduction opportunities, and participating in GHG markets (Banda et al., 2007).

The Centre on Sustainable Consumption and Production

The Centre on Sustainable Consumption and Production (CSCP) and Ö-Quadrat (Freiburg) developed a pilot project at the National Autonomous University of Mexico (UNAM) to refit inefficient T 12-lamps installed in two of the university's buildings with new lighting equipment. The project aimed at demonstrating the potential for energy savings, and how improved illumination could improve learning conditions and reduce maintenance costs. The project included communication measures to inform students and faculty members about efficient illumination. Based on this pilot project, CSCP will develop a best practice handbook for application in the Mexican context, and will organise workshops and seminars. Furthermore, a publication with best practice cases developed at international level, including the Mexican one, will be developed and presented in international forums (UNEP/Wuppertal Institute Collaborating Centre on Sustainable Consumption and Production, at <http://www.scp-centre.org/HOME.786.0.html>).

100 Public Buildings and the programme of Energy Savings in Federal Buildings

Based on a programme launched in the early 1990s of energy studies and audits in different sectors, CONAE, the National Commission for Energy Conservation, developed a voluntary pilot programme entitled '100 Public Buildings', aiming to increase energy efficiency in federal buildings. As part of the programme, CONAE provided training and technical assistance to building operators, whose personnel eventually acquired the theoretical and practical knowledge to conduct their own assessments under the supervision of CONAE staff. The operators also were trained in follow-up measures, including permanent monitoring of energy use, and operation and maintenance of the newly installed equipment.

By 1998, after assessing 90 buildings (800 thousand square meters and 135 thousand lights), CONAE concluded that if all the recommended measures were implemented, a total demand reduction of 21% could be achieved – equivalent to 19 GWh per year, or 3.5 MW of avoided generating capacity. The estimated investment of US\$1.5 million would be recovered in 17 months. The programme showed the value of targeting two types of energy saving measures: technological, to upgrade or replace obsolete equipment, and operational, to improve the use of existing equipment with little or no capital cost (McGregory, 2002).

The "100 Public Buildings" programme was a precursor to the larger-scale Programme of Energy Savings in Federal Buildings (APF), which was applied to entire federal government.

Regional Liaison Units for Energy Efficiency

In 1993, CONAE started providing technical assistance through regional delegations called 'Liaison Units for Energy Efficiency' (U3Es). In an early stage, the U3Es promoted energy efficiency by visiting a limited number of industrial and commercial facilities to perform energy audits, sometimes followed by more comprehensive studies to identify specific energy saving measures.

In 1997, CONAE set out a new strategy based on the use of internet to widen the reach and scope of technical assistance activities, named “Virtual CONAE”. This initiative aimed to: a) link U3Es and their customers to other research centres, energy efficiency offices, and financing institutions, in Mexico and worldwide; and b) provide on-line technical assistance in the form of updated economic and technical information as well as software tools for evaluating energy efficiency projects. CONAE developed an executable program (SIAPPF) to facilitate the process of evaluating lighting systems and identifying energy-saving measures.

As part of the ‘Virtual CONAE’ strategy, ‘Ports of Attention’ (PACs) were developed to assist potential users (i) who did not have access to the Internet (many small firms and some offices of municipal governments), and (ii) who found it difficult to use the on-line tools. The PACs are typically located in educational institutions, industrial and commercial chambers, or government agencies. They are very low-cost technical assistance units, which require only a computer connected to the Internet and a trained operator. Their basic function is to assist energy users in identifying energy savings potential and evaluating the economic feasibility of specific measures. A number of PACs now concentrate on industrial sector energy efficiency; others deal more with state and municipal energy issues; and some address relationships between energy and the environment (McGregory et al., 2002).

The National Committee on Productivity and Technological Innovation programme and the Technological Services Information System programme

The Ministry of Economics, together with the CONACYT, operates the National Committee on Productivity and Technological Innovation (COMPITE) programme and the Technological Services Information System (SISTEC) programme. The COMPITE Programme is designed to improve the competitive position of SMEs (micro-, small- and medium-sized enterprises), maximizing the use of their resources. It is a methodology for fast intervention, mixing theory and practice to solve production problems, and applicable in all branches of industrial manufacturing.

The objective of SISTEC is to build the technological awareness of SMEs and to provide them with information from Applied Research and Technological Development Centres and Institutes. This helps build links between technological research and private enterprise, contributing to modernisation and improved competitiveness. The SISTEC is an open access information system that only provides information on technological centres and consultants throughout the country. The cost for the services provided by the centres or individual consultants varies depending on the policies of each one of them (OECD, 2004 and European Commission, 2006).

Acting Globally

Mexico and the United States celebrated a Science and Technology Agreement back in 1972. This agreement, which has been rather underused so far, can provide a framework for an expanded cooperation among the two countries.

Furthermore, the North American Free Trade Agreement (NAFTA), which came into effect in 1994, brought a set of negotiations related to environmental issues under the North American Agreement of Environmental Cooperation (NAAEC) (Lopez, 2004).

Since the adoption of the North American Free Trade Agreement (NAFTA), there have been strong integrative forces between Mexico, United States and Canada. Initiatives include:

- Commission for Environmental Cooperation (CEC): this 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 to 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;

- The United States, Canada, and Mexico have joined forces to create a high-tech business alliance among the Canadian Advanced Technology Alliance (CATA), the United States' Software and Information Industries Association (SIIA), and Mexican high-tech association Canietti. There is a high level of trade between the countries' technology industries. For instances, in 2004, Canada and Mexico were the United States' largest export markets for information and communications technologies. The alliance intends to launch many joint programmes including a joint facility in China (European Commission, 2006).
- In 2007, Canada, Mexico and United States signed a Trilateral Agreement for Cooperation in Energy Science and Technology to fuel joint developments to seek cleaner and more efficient ways to use energy¹.
- Two major projects have already been launched with funding assistance from the World Bank. The World Bank's Board of Directors approved a US\$25 million grant from the Global Environment Facility (GEF) for Mexico, in order to remove barriers to the development of renewable energy technologies and markets. The World Bank's Large-Scale Renewable Energy Development Project will assist Mexico in developing initial experience in commercially-based, grid-connected renewable energy applications. It will do so by supporting the construction of an approximately 101 MW independent power producer wind farm, designated as La Venta III, which will build on the Federal Electric Commission's 2 MW demonstration plant (La Venta I) and the 85 MW La Venta II. In October 2006, the World Bank also announced funding for a \$50 million Hybrid Solar Thermal Power Plant Project: The Solar Thermal Project Agua Prieta II seeks to demonstrate the benefits of integrating a solar field with a large conventional thermal facility, contribute to reducing the long-term costs of the technology, and reduce global GHG emissions. The total emissions reduction over the 25-year operation of the plant is estimated at 391,270 tons of CO₂ (Banda et al., 2007).
- Science and Technology Working Group in the US-Mexico Binational Commission. Bilateral relations have been reenergized in the last few years, and a large number of groups have been created under the umbrella of the commission focusing on a number of subjects, including pollution (Lewis, 2006).
- Sandia National Laboratories (SNL), supported by United States Department of Energy (USDOE) Office of Solar Technologies and the Mexico mission office of the United States Agency for International Development (USAID) have developed a Renewable Energy Programme to promote the use of renewable energy technologies in Mexico, in order to: (1) increase the quality and to reduce the costs of renewable energy technologies (components, systems, and services) by expanding markets for, and providing feedback to, the U.S. and Mexican renewable energy industry; (2) reduce greenhouse gas emissions and pollution; and (3) increase the economic, social, and health standards in rural, off-grid households and communities by utilizing renewable energy systems for productive applications. The Mexico

¹ See http://www.nrcan.gc.ca/media/newsreleases/2007/200766a_e.htm

Renewable Energy Program focuses on photovoltaics and small wind electric systems, for rural, off-grid productive applications (www.re.sandia.gov/index.html).

- Mexico is a member of the international Carbon Sequestration Leadership Forum, although it is not currently pursuing any projects to implement carbon sequestration (Banda et al., 2007).
- PEPS ('Promoting an Energy-Efficient Public Sector') is an initiative from Lawrence Berkeley National Laboratory (LBNL) established in 2000 in collaboration with Alliance to Save Energy, ICLEI – Local Governments for Sustainability, and the International Institute for Energy Conservation (IIEC). With funding support from the U.S. Agency for International Development (USAID), U.S. Department of Energy (U.S. DOE), U.S. Environmental Protection Agency (USEPA), and the Energy Foundation, the PEPS partners develop and disseminate global outreach tools (e.g., a website, guidebook, and energy savings estimation spreadsheet) and work with partner countries to implement government sector energy-efficiency programs at the municipal, state, and national levels. PEPS is currently working to compile a comprehensive inventory of public sector energy management programmes that are being carried out around the world (see: www.pepsonline.org). Initiatives implemented in Mexico include: CONAE's APF building retrofit programme (see under 'Awareness raising and training') and EE Product Purchasing (see under 'Procurement').
- Canada is looking into collaboration with Mexico on emissions trading.

Other instruments for innovation

Metrorrey director Rolando Valle announced that the Monterrey subway system will become the first subway system in Latin America to run on biofuel. The subway system in Mexico's third-largest city serves 180,000 commuters a day. It will switch from electricity to biofuel for 82% of its energy needs (Banda et al., 2007).

Country Synthesis

Overview of policies and measures

Since 1990s, Mexico has sought to advance its science and technology base by launching a series of programmes and initiatives. Many are sponsored by the Mexico's National Science and Technology Council (CONACYT). Mexico has a small but well-qualified core of researchers upon which to build an expanded national innovation effort, and has also created a structure for scientific cooperation that can be expanded to meet the needs of a high-tech, innovation-driven economy. CONACYT has created an effective structure that makes it possible for Mexico to cooperate on science programmes with international bodies, other governments, and other countries' research institutions (Lewis, 2006).

However, Mexico lags behind other economies in research and development. Mexico invests 0.39 percent of GDP in R&D (compare to 2.2 percent as OECD average). The government provides the bulk of the R&D funding: about two-thirds of the national R&D investment comes from public funds. Mexican R&D funds are concentrated in higher education and public-sector research institutions. This means that Mexican companies are not developing new products and services at the same rate as other OECD economies. This is due to a number of factors, but one of the most important seems to be companies' concern over intellectual property (Lewis, 2006).

Some recent reforms are likely to increase investment in eco-innovation. However, there is the need to include in the agenda the coordination of different policy tools to emphasize environmental innovations and clean technology as a national priority.

A summary of the initiatives described in this report is provided in the table below:

Actions	Initiatives
Research and Development	'National Net of Research Groups and Centres' 'National Registry of Science and Technology Institutions and Companies' (RENIECYT) Additional CONACYT's initiatives Centres of International Competitiveness and Centres of Advanced Technology Public Research Centres Programme aiming to promote the sale of solar powered water heaters developed by CONAE
Verification of Technology	The Administración Pública Federal (APF) initiative developed by CONAE
Performance Targets	Energy efficiency standards and programmes developed by CONAE National mandatory regulations for energy efficiency (NOMS) of all new products and appliances promulgated by CONAE Initiatives launched in 2007 under the 'National Climate Change Strategy' by the Mexico's Interministerial Commission on Climate Change (ICCC)
Mobilisation of Financing	Mexican Government offers companies 30% tax credit of the eligible incremental expenditures and investments in research and development of technology (IDT) that the company would incur during a certain fiscal year Low interest rate loans and "lost fund loans" provided by CONACYT Mexican Government established "mixed funds" (promoting decentralisation of research), and also science and technology sectoral funds Electrical Energy Savings Trust (FIDE) programme Mexican Carbon Fund (FOMECAR) 'AVANCE' (High Value-Added Businesses linking Knowledge with Visionary Entrepreneurs)
Procurement	PEPS ('Promoting an Energy-Efficient Public Sector') and CONAE partnership to promote energy-efficient purchasing Forest certification incorporated in the criteria of public procurement at federal and state level Mexico is a member of the Commission for Environmental Cooperation, which serves as the Secretariat for the North American Green Purchasing Initiative
Awareness Rising and Training	'Mexico GHG Programme' coordinated by SEMARNAT Pilot project developed by the Centre on Sustainable Consumption and Production (CSCP) and Ö-Quadrat (Freiburg) at the National Autonomous University of Mexico (UNAM) Pilot programme entitled '100 Public Buildings' developed by CONAE 'Ports of Attention' (PACs), developed by CONAE as part of the 'Virtual CONAE' strategy 'National Committee on Productivity and Technological Innovation' (COMPITE) programme and 'Technological Services Information System' (SISTEC) programme, developed by CONACYT and the Ministry of Economics 'Technological Information and Services' (INFOTEC) Centre, operated by CONACYT National Science and Technology Week "Science in your School" Programme "Atlas of Science" Programme

Actions	Initiatives
Acting Globally	1972 Science and Technology Agreement between Mexico and US North American Free Trade Agreement (NAFTA) Commission for Environmental Cooperation (CEC) formed by Canada, Mexico and the US under the North American Agreement on Environmental Cooperation (NAAEC) North America Working Group on Environmental Enforcement and Compliance Cooperation (Enforcement Working Group) formed by Canada, the US and Mexico under the CEC High-tech business alliance among the Canadian Advanced Technology Alliance (CATA), the United States' Software and Information Industries Association (SIIA), and Mexican high-tech association Canietti Trilateral Agreement for Cooperation in Energy Science and Technology formed by Mexico, Canada and the US Mexico-United States Foundation for Science 'Innovation for Competitiveness Programme' funded by the World Bank 'Mexican Knowledge and Innovation Project' (KIP) supported by the World Bank World Bank's Large-Scale Renewable Energy Development Project World Bank's Hybrid Solar Thermal Power Plant Project U.C. MEXUS, a cooperative arrangement with the University of California which has been duplicated with other US universities Science and Technology Working Group in the US-Mexico Binational Commission Renewable Energy Programme developed by Sandia National Laboratories (SNL), supported by United States Department of Energy (USDOE) Office of Solar Technologies and the Mexico mission office of the United States Agency for International Development (USAID) Mexico is a member of the international Carbon Sequestration Leadership Forum PEPS ('Promoting an Energy-Efficient Public Sector') Science and technology cooperation agreement signed between Mexico and the EU Canada is looking into collaboration with Mexico on emissions trading

Highlights

Lessons

Since the adoption of the North American Free Trade Agreement (NAFTA), which came into effect in 1994, there have been strong integrative forces between Mexico, United States and Canada.

Regional cooperation on environmental issues between Mexico, United States and Canada is expected to create a regional market for eco-innovation. The Commission for Environmental Cooperation (CEC) has an important role in this regard: it identifies opportunities for trade in environmental goods and services, including renewable energy and energy efficiency.

In general, many initiatives in Mexico are focused on promoting energy efficiency, particularly relying on energy efficiency targets. The National Commission for Energy Conservation (CONAE) has put a significant amount of work on the development of these targets. In addition, the National Climate Change Strategy adopted in 2007 by Mexico's Interministerial Commission on Climate Change (ICCC) reports the government's intention to expand this strategy even further and includes several initiatives that fall in this category.

References

- Australian National Audit Office, 2005, 'Cross Portfolio Audit of Green Office Procurement', Audit Report No. 22 2005-06
- Banda, M. and Langille, J., 2007, 'Governing Global Climate Change: St. Petersburg Compliance Report for the 'G8 Plus Five' Countries', G8 Final Compliance Report 2007, Oxford: G8 Research Group Oxford, 1 June 2007.
- European Commission, 2006, 'Annual Innovation Policy Trends Report for United States, Canada, Mexico and Brazil', European Commission's Enterprise and Industry Directorate-General, Innovation Policy Development Unit, report drafted by Luger, M., Maynard, N., Miller, J., Facci, E. and Uppalapati, A.
- ITTO, 2005, 'Consecución del Objetivo 2000 y la Ordenación Forestal Sostenible en México', ITTC (XXXIX)/5
- Lawrence Berkeley National Laboratory, 2007, 'The Public Sector: A Catalyst for Energy Efficiency', PEPS at CSD-15 U.N. Headquarters – New York City May 3, 2007
- Lewis, J., 2006, 'National Policies for innovation and Growth in Mexico', CSIS Report
- Lopez, F.J.D., 2004, 'Environment, Technical Change and Innovation. A development approach in the Latin American Chemical Industry: a case study in Mexico', oikos PhD Summer Academy 2004
- McGregory, L.V.W., Harris, J., Lapeyre, M.B., Campbell, S., Constantine, S., della Cava, M., Martinez, J.G., Meyer, S. and Romo, A.M., 2002, 'Market Leadership by Example: Government Sector Energy Efficiency in Developing Countries'
- OECD, 2004, 'OECD Science, Technology and Industry Outlook 2004 – Country Response to Policy Questionnaire: Mexico', available at <http://www.oecd.org/dataoecd/30/57/34243063.pdf>
- Ten Kate A., 1993, 'Industrial development and environment in Mexico', Working Paper Series, no. 1125, World Bank, Washington D.C.
- Van Wie McGrory, L., Coleman, P., Fridley, D., Harris, J. Villaseñor Franco, E., 2006, 'Two Paths to Transforming Markets through Public Sector Energy Efficiency: Bottom Up versus Top Down'