

North American Strategy for Catalyzing Cooperation on Dioxins and Furans, and Hexachlorobenzene

Commission for Environmental Cooperation



This strategy was prepared by the Sound Management of Chemicals Working Group for the Secretariat of the Commission for Environmental Cooperation. The information contained herein does not necessarily reflect the views of the CEC, or the governments of Canada, Mexico or the United States of America.

The material herein may be reproduced without seeking permission, provided that it is accurately reproduced, is not used for commercial purposes, and includes an acknowledgement of the Commission for Environmental Cooperation.

Except where otherwise noted, this work is protected under a Creative Commons Attribution-Noncommercial-No Derivative Works License.



Commission for Environmental Cooperation,
2011

Publication Details

Publication type: *Background paper*

Publication date: *October 2011*

Original language: *English*

Review and quality assurance
procedures:

Final Party review: July 2011

QA10.33

*Disponible en français – Disponible en
español*

For more information:

Commission for Environmental Cooperation

393, rue St-Jacques ouest

Bureau 200

Montreal (Quebec) Canada H2Y 1N9

t 514.350.4300 f 514.350.4372

info@cec.org / www.cec.org



Table of Contents

1	Preface	1
2	Introduction	2
2.1	Objective	2
2.2	Path Forward.....	2
2.3	Multilateral Commitments	3
2.4	Cooperation and Transparency	3
2.5	Rationale	3
2.5.1	Dioxin and Dioxin-like Compounds.....	3
2.5.2	Hexachlorobenzene (HCB).....	5
3	National Background	6
3.1	Canada	6
3.1.1	Dioxins and Furans	6
3.1.1.1	Canada-wide Standards.....	8
3.1.2	Hexachlorobenzene (HCB).....	9
3.1.3	Other Initiatives in Canada	9
3.1.4	Results.....	10
3.2	United States.....	10
3.2.1	Specific Program Actions	11
3.3	Mexico	12
4	Strategic Sub-Objectives.....	14
4.1	Monitoring and Assessment Sub-objective	14
4.1.1	Actions.....	15
4.1.1.1	Air Monitoring Networks in North America.....	15
4.1.1.2	Freshwater Sediment Cores.....	15
4.1.1.3	Human Biomonitoring	15
4.1.1.4	Food Pathways Analysis	15
4.1.1.5	Fate and Transport Modelling.....	15
4.2	Laboratory Testing Sub-objective.....	16
4.2.1	Actions.....	16
4.2.1.1	Needs Analysis.....	16
4.2.1.2	Sampling Techniques and Analytical Protocols.....	16
4.3	Inventories Sub-objective	16
4.3.1	Actions.....	16
4.3.1.1	Improvement in Inventories	16
4.3.1.2	Public Access to Inventory Data	17
4.4	Pollution Prevention Sub-objective	17
4.4.1	Actions.....	17
4.4.1.1	Industrial and Other Sources.....	17
4.4.1.2	Small-scale, Community-level and Household Waste Disposal	17

4.4.1.3	Production Processes.....	17
4.4.1.4	Micro-contamination in Pesticides.....	17
4.5	Pollution Control sub-objective	17
4.5.1	Actions.....	18
4.5.1.1	Controls on Small-scale Combustion Sources	18
4.5.1.2	Examination of Potential Co-benefits	18
4.6	Policy/Management Options sub-objective	18
4.6.1	Actions.....	18
4.6.1.1	Public Information Materials and Awareness Raising.....	18
4.6.1.2	Review and Analysis of Policy Options.....	18
4.6.1.3	Workshops on Management Options	18
4.6.1.4	Voluntary Release Reduction Trial Initiative.....	18
5	Implementation.....	19
5.1	Implementation Team	19
5.2	Additional Financial Resources for Strategy Implementation.....	19
5.3	Public Outreach and Transparency	19
6	Reporting.....	19
7	ANNEX TO THE NORTH AMERICAN STRATEGY FOR CATALYZING COOPERATION ON DIOXINS, FURANS AND HEXACHLOROBENZENE – REPORT ON TASK FORCE ACTIVITIES – January 30, 2010.....	20

1 Preface

This **North American Strategy for Catalyzing Cooperation on Dioxins and Furans, and Hexachlorobenzene** is a regional undertaking stemming from the North American Agreement on Environmental Cooperation (NAAEC), a parallel side agreement to the North American Free Trade Agreement (NAFTA). The NAAEC came into force for the governments of Canada, Mexico and the United States of America on 1 January 1994, as an overarching framework for environmental cooperation. The NAAEC established the Commission for Environmental Cooperation (CEC) to "facilitate cooperation on the conservation, protection and enhancement of the environment in their territories."

The CEC Council (of Ministers) in Resolution 95-05 on the Sound Management of Chemicals (SMOC) established a "working group composed of two senior officials selected by each Party whose duties pertain to the regulation or management of toxic substances and who shall work with the CEC to implement the decisions and commitments set out in this Resolution."

Resolution 95-05 also directed the SMOC Working Group (WG) to develop North American Regional Action Plans for certain persistent and toxic substances, and under Resolution 99-01, directed the SMOC WG to develop a **North American Regional Action Plan for Dioxins, Furans and Hexachlorobenzene**. Starting in 2004, the CEC began a process of re-evaluating and redefining the various components of its work program, including the SMOC project. The refocusing of the SMOC work resulted in Resolutions 06-09 and 08-06, which reaffirm the commitment to the sound management of chemicals in North America and directs the SMOC WG to promote the sustained sound management of chemicals in North America by implementing a renewed North American agenda for chemicals management. This involves, among other activities, development of a Strategy for dioxins and furans (dioxin-like compounds—DLCs) and hexachlorobenzene (HCB),¹ instead of the NARAP originally referenced by Resolution 99-01, bearing in mind the relevant national programs and international commitments.

In order to achieve sound management of DLCs and HCB, the Strategy incorporates, as appropriate, pollution prevention and precautionary approaches² in the development of activities in support of reducing risks presented by these toxic chemicals. The Strategy also reflects commitment by the Parties to work cooperatively, while recognizing the different responsibilities of each country, to enhance capacities for the sound management of these chemicals in the three countries and to bring a regional perspective to international initiatives that are in place or being negotiated to address toxic chemicals.

¹ The Task Force (Team) terms of reference stipulated that: "in addressing dioxins within the Strategy, (the Team) will take into account other subsets of chemicals that are 'dioxin-like' as regards chemical structure, physical-chemical properties and which invoke a common battery of toxic responses. This group of dioxin-like compounds includes the seven polychlorinated dibenzo-p-dioxins, 10 polychlorinated dibenzofurans, and 13 polychlorinated biphenyls, for which the World Health Organisation has established dioxin toxic equivalents."

² 1992 United Nations Conference on Environment and Development, Agenda 21: A Global Action Plan for the 21st Century, in particular, Chapter 19 on the sound management of chemicals and the 1992 Rio Declaration on Environment and Development, Principle 15;

2 Introduction

2.1 Objective³

This Strategy for addressing DLCs and HCB provides documentation describing how the three governments will cooperate in implementing their obligations and commitments established in CEC Council Resolutions 95-05, 99-01, 06-09 and 08-06. This Strategy catalyzes current activities by the Parties under their respective domestic programs, as well as commitments, as appropriate, under the Stockholm Convention on Persistent Organic Pollutants (POPs) and other international agreements

The objective of this Strategy, comprising joint and individual actions of the Parties, is to improve the capacities of the Parties to reduce the exposure to DLCs and HCB of North American ecosystems, fish and wildlife, and especially humans; to prevent or reduce anthropogenic releases of these pollutants to the environment; and to promote continuous reduction of releases where feasible.

2.2 Path Forward

In developing the DLC and HCB Strategy, the Parties are adopting an approach focused primarily on information gathering and dissemination, and capacity building in support of reducing risks posed by these substances. Canada and the United States, through regulatory and non-regulatory efforts, have worked for many years to control and eliminate environmental release of these compounds, and both countries have relatively mature programs for DLC and HCB management. These programs were developed based on each country's individual laws, on the nature and distribution of sources in each of the countries, and in response to each country's individual government structure. Mexico is still in the early stages of developing its programs for DLCs and HCB. Given these differences, the three Parties have agreed that the primary focus of this Strategy should be on strengthening information gathering and capacity building, with a particular focus on Mexico.

The three Parties believe that through promoting information gathering, the DLC and HCB Strategy can help Mexico better understand the nature of its sources, exposure pathways, and environmental risks. This information can help Mexico design and develop a more effective and efficient program. For Canada and the United States, the information-gathering elements of the Strategy will help them evaluate the effectiveness of their programs and should help in identifying any unresolved problems. Additionally, through the capacity building elements of this Strategy, Mexico will benefit from the scientific expertise and risk management experience of Canada and the United States. Active implementation of this Strategy is intended to facilitate DLC and HCB risk reduction efforts in the three countries.

³ This objective, in its focus on both source management and exposure reduction, is broader in scope than that of control or elimination and, therefore, provides a broader opportunity for addressing the public health risks posed by these chemicals than a focus solely on control of releases. This broader focus is important because much of contemporary exposure to DLCs and HCB comes from reservoir sources (past releases of these chemicals that have been temporarily stored in soil, sediment, products or biota and later re-released into circulating environmental media).

2.3 Multilateral Commitments⁴

This Strategy supports:

- *Agenda 21: A Global Action Plan for the 21st Century*, adopted at the 1992 United Nations Conference on Environment and Development, in particular, Chapter 19 on the sound management of chemicals and the 1992 *Rio Declaration on Environment and Development*, noting, in particular, the precautionary approach as stated in Principle 15;
- *The Great Lakes Binational Toxics Strategy: Canada-United States Strategy for the Virtual Elimination of Substances in the Great Lakes*;
- *The North American Agreement on Environmental Cooperation (NAAEC)*;
- *CEC Council Resolution 95-05 for the Sound Management of Chemicals*;

2.4 Cooperation and Transparency

This Strategy supports:

- ongoing and cooperative activities to achieve the goals of Canada, Mexico and the United States;
- public participation as appropriate in Strategy review and implementation;
- a regional perspective that encourages sharing experience with other countries in the Caribbean and Latin America under other international mechanisms, such as the Strategic Approach for International Chemicals Management (SAICM).

2.5 Rationale

DLCs and HCB are of concern because they are toxic compounds that can be present in the environment in amounts sufficient to result in adverse effects. These compounds are found in most human tissues as a result of a complex interaction between sources, the processes of fate and transport and their physical, chemical, and biological properties. Understanding these properties and processes and the quantitative linking of sources to exposure is central to the successful management of the risks these compounds pose.

2.5.1 Dioxin and Dioxin-like Compounds

The term “dioxin,” or “dioxins,” refers to a group of 30 chemical compounds that share certain similar chemical structures and a common biological mode-of-action. They are members of three closely related families: the polychlorinated dibenzo-*p*-dioxins (PCDDs), polychlorinated dibenzofurans (PCDFs), and certain dioxin-like polychlorinated biphenyls (PCBs). All three families of the chemicals are semi-volatile and extremely persistent in the environment. They bioaccumulate in the food chain as a consequence of their hydrophobic and lipophilic properties. PCDDs and PCDFs are produced both in nature and, inadvertently, by a number of human activities, including most forms of combustion, certain types of chemical manufacturing and processing, and other high-temperature industrial processes in which chlorine is present in some

⁴ This Strategy unambiguously reconfirms the support of Canada, Mexico and the United States to the rights and obligations of each of these international agreements. However, it is not the intent of the Strategy either to interpret or to selectively emphasize portions of these international agreements. Selecting portions of these agreements out of context runs the risk of misrepresenting the obligations contained in them. The responsibility of interpreting these agreements remains solely with the Parties to the agreements, rather than with the CEC. Similarly, it is not intended that the Strategy serve as the implementation plan for any of these agreements. That also remains the individual responsibility of each of the States that are Parties to these agreements. Rather, the Strategy serves as a vehicle through which the three states can coordinate their planning activities, mutually strengthen their institutional capacities and combine their risk management efforts to see that, collectively, they address DLC and HCB problems on a continental basis.

form. Anthropogenic sources dominate the levels of emissions to the environment, with waste combustion being, historically, the major source.

Unlike PCDDs and PCDFs, with their sources being predominantly unintentionally produced, an estimated 0.75 million to 1.5 million tons of PCBs were commercially produced worldwide, about five percent of which were dioxin-like PCBs. Although PCBs are no longer manufactured in North America, significant quantities were released into the environment and therefore continue to be redistributed and incorporated into the human food chain. Also, like dioxins, PCBs can be produced as unwanted byproducts of many of the same human activities that lead to the formation of dioxins.

In industrialized North America, DLC levels in the environment increased significantly from the 1920s and continued into the late 60s or early 70s, but have since declined. This decline is thought to be associated with the general application of pollution control measures for combustion sources, along with specific actions such as the discontinued use of 2,4,5-T (2,4,5-trichlorophenoxyacetic acid), hexachlorophene, lead in gasoline, and restriction on the use of pentachlorophenol. More recently, reductions in environmental levels are due to DLC-specific control measures applied to municipal and medical waste incinerators.

Levels of dietary intake and human tissue levels of DLCs also appear to be declining in Canada and the United States. These same declines have been observed in Europe; however, it has not yet been determined if Mexico has experienced a similar pattern.

There remain a number of sources of DLCs for which the magnitude of environmental release has not yet been quantified because of insufficient data. These sources include, for example, landfill fires, agricultural burning, forest fires, structural fires, ferrous and nonferrous metal foundries, ceramic manufacturing, coke ovens, wood stoves, open burning of household and municipal waste, burning of waste oil, water treatment effluent, and animal manures. Another source category, which may be of particular importance but for which adequate data do not exist, is terrestrial and aquatic reservoir sources. These are the result of past releases that, once in the environment, the DLCs are temporarily stored, and can then be re-emitted to the environment at a later time. Soil, for example, can serve as a reservoir source through the resuspension of soil particles in the air or through direct volatilization. DLCs stored in sediment serve as a reservoir source for surface water, as they are often the primary determinant of water column concentration. As current formation sources are reduced through environmental controls, the relative contribution of reservoir sources increases.

Most dioxin exposure to the general population occurs through diet. In the US and Canada, over 95 percent of DLC intake for a typical person is estimated to come through dietary consumption of animal fats. In Mexico, exposure pathways have yet to be quantified. This dietary exposure pathway results in widespread, low-level exposure of the general population. In addition to diet, small amounts of exposure occur from breathing air that has been contaminated with trace amounts of dioxin, from inadvertent ingestion of soil containing dioxin, and from absorption through the skin.

Dioxins are incorporated into the food supply by two principal exposure pathways: air deposition onto plants eaten by domestic meat production and dairy animals, and uptake from water by fish, particularly freshwater fish and other aquatic organisms. The roots of plants do not generally take up dioxins; however, the cuticle surface of plant leaves effectively collects and retains DLCs deposited from the air. This can be either from vapor deposition or the deposition of particles. When these leaves are eaten by domestic animals, through grazing or more commonly, as an

ingredient in animal feed, the dioxins are retained and bioconcentrate in the animal's fat cells. Humans consume these fats in the form of meat and dairy products. Fish can accumulate dioxins directly from water contact through the gills, from contact with DLC-contaminated sediments, or by bioaccumulation through the aquatic food chain. DLCs can enter the aquatic environment through industrial discharge into receiving waters, direct air deposition, or through soil erosion and urban storm water runoff. Soil contamination, as well as DLCs found in urban runoff, most often result from air deposition. Consequently, DLC levels in both the terrestrial and the aquatic food chains are closely linked to air transport and deposition.

In addition to the general population being exposed to trace levels in the general food supply, some individuals may be exposed to higher levels because of unique physical circumstances. It may sometimes be unclear if these elevated exposures result only from isolated incidents or are indicative of a more routine occurrence. Past examples of elevated exposures include those due to occupational settings, industrial accidents, discrete food contamination incidents, or because of living in proximity to elevated environmental levels.

DLCs are potent animal toxicants with the potential to produce a broad spectrum of adverse effects in humans. They can alter the fundamental growth and development of cells and cause adverse reproductive and developmental effects, endocrine disruption, suppression of the immune system, chloracne (a severe acne-like condition that sometimes persists for many years), and cancer. The International Agency for Research on Cancer (IARC) characterizes 2,3,7,8-tetrachlorodibenzo-*para*-dioxin (TCDD) as carcinogenic to humans, based on the weight of evidence of animal and human studies. The World Health Organization (WHO) and the Joint Expert Committee on Food Additives (JECFA) have also recognized DLCs as carcinogens but have placed greater emphasis on their non-cancer effects. Based on human studies, elevated prenatal exposure may affect the gender ratio among newborns, and studies in both humans and animals have indicated that elevated prenatal exposure may affect the developing fetus.

2.5.2 Hexachlorobenzene (HCB)

HCB was used from the 1940s until the late 1970s as a fungicide on grain seeds such as wheat, and was produced in the United States until 1984, when the last registered use as a pesticide was voluntarily cancelled. HCB has been used in the past as an intermediate and/or additive in various manufacturing processes, including the production of synthetic rubber, pyrotechnics, ammunition, dyes, and pentachlorophenol. A small amount of HCB may be formed as a byproduct of some solvent production. In addition, HCB is formed as an inadvertent byproduct at trace levels in a variety of combustion and incineration processes, in the production of magnesium, and several currently used pesticides. Stack tests have shown that HCB is usually detected with elevated dioxin/furans concentrations in combustion and incineration processes. Reservoirs or temporary storage in the environment resulting from past use is likely a significant source of HCB.

HCB is a highly persistent environmental toxic chemical that degrades slowly in air and, consequently, undergoes long-range atmospheric transport. It bioaccumulates in fish, marine animals, birds, lichens, and animals that feed on these fish or lichens. In these species, HCB accumulates in fatty tissues, including fat deposits, and in the liver. HCB can also accumulate in wheat, grasses, vegetables and other plants.

In the United States, environmental levels peaked in the 1970s and have generally declined since that time. For example, HCB levels in Great Lakes sediments were reported to have peaked at about 460 ppb in the years 1971–1976 and declined to 270 ppb in 1976–1980, the most recent period for which comparative data are available. The decline in environmental concentrations is

primarily due to the cancellation of HCB as a registered pesticide based on a concern for human risk. HCB is considered a probable human carcinogen and is toxic by all routes of exposure.

Short-term high exposures at levels significantly above general population exposure can lead to kidney and liver damage, central nervous system excitation and seizures, circulatory collapse, and respiratory depression. Based on studies conducted on animals, long-term, low-level exposures may damage a developing fetus, cause cancer, lead to kidney and liver damage, and cause fatigue and skin irritation.

Human exposure pathways for HCB are via inhalation, ingestion of contaminated food, and skin contact with contaminated soil. Exposure of the general population occurs through ingestion of contaminated food, particularly meat, dairy products, poultry, and fish. Subpopulations that may be exposed to higher levels of HCB than the general population include workers with occupational exposure to HCB, individuals living near facilities where HCB is a byproduct of an industrial process, and individuals living near current or former hazardous waste sites where HCB is present.

3 National Background

3.1 Canada

In Canada, protection of the environment is a responsibility shared by the federal, provincial, territorial and aboriginal governments, and some designated municipalities. The *Canadian Environmental Protection Act, 1999* (CEPA 1999) provides instruments for the management of toxic substances. The development of management tools at the national level is usually carried out through multi-stakeholder consultations and these tools include non-regulatory voluntary measures.

Internationally, Canada was the first country to sign and ratify the United Nations Environment Programme (UNEP) Convention on Persistent Organic Pollutants (POPs)—the “Stockholm Convention.” In accordance with the Convention, in May 2006 Canada submitted to the Stockholm Convention Secretariat, a National Implementation Plan (NIP) which included a National Action Plan (NAP) for Unintentionally Produced Persistent Organic Pollutants (UPOPs). The Convention specifies UPOPs as dioxins and furans (D/F), hexachlorobenzene (HCB), and polychlorinated biphenyls (PCBS) from combustion, thermal and chemical sources. Canada’s National Plans under the Convention are available at:

<<http://www.ec.gc.ca/lcpe-cepa/default.asp?lang=En&n=3EEAC8B8-1> > and
<<http://www.pops.int/documents/implementation/nips/submissions/default.htm>>.

In 1998, Canada ratified the United Nations Economic Commission for Europe (UNECE), Convention on Long-range Transboundary Air Pollution POPs Protocol. The Convention specifies UPOPs as dioxins and furans, hexachlorobenzene and polycyclic aromatic hydrocarbons and includes Emission Limit Values and Best Available Techniques for specific sources to be met by the Parties

3.1.1 Dioxins and Furans

In 1990, the Assessment Report on Polychlorinated *para*-Dibenzodioxins and Polychlorinated Dibenzofurans (D/F) declared them to be toxic substances under the *Canadian Environmental Protection Act* <http://www.ec.gc.ca/substances/ese/eng/psap/PSL1_dioxins.cfm>. This triggered the development of regulations for these substances in liquid effluent discharged from pulp and paper mills.

In 1992, the *Pulp and Paper Mill Effluent Chlorinated Dioxins and Furans Regulations* were adopted, prohibiting the release of these substances in measurable amounts <<http://www.ec.gc.ca/lcpe-cepa/eng/regulations/detailReg.cfm?intReg=21>>. In addition, controls were placed on precursor compounds through the *Pulp and Paper Mill Defoamer and Wood Chip Regulations* <<http://www.ec.gc.ca/lcpe-cepa/eng/regulations/detailReg.cfm?intReg=20>>. As a result of implementing the Pulp and Paper Regulations and complementary provincial regulatory initiatives, dioxin and furan releases to the aquatic environment were reduced by more than 99 percent by 1997, thereby achieving the goal of virtual elimination (V.E.)⁵ from this sector. This achievement was attributed to the strict standards required for dioxins and furans, and to the additional controls imposed on the precursor compounds, which encouraged the industry to switch to an elemental chlorine-free bleaching technology and to substitute products that contained the precursor compounds.

In 1995, the federal government adopted the *Toxic Substances Management Policy* (TSMP), a key element of which outlines the requirement of *Virtual Elimination* for those toxic substances that meet specific criteria for persistence, bio-accumulation and that result primarily from a human activity. As described by the TSMP, "...*The ultimate objective of eliminating a Track 1 substance from the environment is set irrespective of socio-economic factors. Nevertheless, management plans such as targets and schedules to achieve that long-term objective will be based on analyses of environmental and human health risks as well as social, economic and technical considerations...*" <<http://www.ec.gc.ca/toxiques-toxics/default.asp?lang=En&n=2A55771E-1>>.

In 1998, the Canadian Council of Ministers of the Environment (CCME) adopted a complementary *Policy for the Management of Toxic Substances* that establishes an integrated, cooperative and concerted approach for the management of toxic substances. This policy also prescribes virtual elimination for Track 1 substances such as dioxins and furans and hexachlorobenzene). <http://www.ccme.ca/initiatives/environment.html?category_id=27>.

In 1999, Environment Canada published its first national *Release Inventory* report for dioxins and furans prepared by a federal, provincial and territorial task force with participation and input from stakeholders. This inventory report was updated in February 2001. Identified source categories are now required to report releases of dioxins, furans and hexachlorobenzene to the National Pollutant Releases inventory (NPRI). Since 1990, atmospheric releases were reduced by approximately 80 percent, as a result of the implementation of CCME standards for some sources and voluntary actions and business decisions on the part of other sectors.

There are a number of potential sources of releases of dioxins and furans, and hexachlorobenzene to the Canadian environment that remain to be better evaluated and incorporated into national inventories. Of particular relevance in this context are releases associated with the open combustion of municipal waste in isolated communities across the central and northern regions of Canada. Efforts are underway to evaluate strategies for improved quantification of these and other diffusive releases to the Canadian environment.

⁵ In Canada's legislation, "virtual elimination" means, in respect of a toxic substance released into the environment as a result of human activity, the ultimate reduction of the quantity or concentration of the substance in the release below the level of quantification. Level of Quantification (LOQ) is the lowest concentration that can be accurately measured using sensitive but routine sampling and analytical methods. Canada has determined three LOQs for dioxins and furans (a measurement for air emissions, a measurement for releases to soil, and a measurement in pulp mill effluent). For hexachlorobenzene, an LOQ for air emissions and an LOQ for releases to soil have been determined.

3.1.1.1 Canada-wide Standards

In January 1998, the Canadian Council of Ministers of the Environment, with the exception of Québec, signed A *Canada-wide Accord on Environmental Harmonization* (the Harmonization Accord) <http://www.ccme.ca/ourwork/environment.html?category_id=25> and its *Canada-wide Environmental Standards Sub-Agreement* <http://www.ccme.ca/assets/pdf/cws_envstandards_subagreement.pdf> (The government of Québec has indicated that it intends to take action equivalent to the Canada-wide Standards on sources under its jurisdiction).⁶ Included in the first six priority substances identified by Ministers for action were dioxins and furans. Based on the Environment Canada *Release Inventory*, a CCME Development Committee for Canada-wide Standards (CWS) for Dioxins and Furans identified a suite of priority sectors that accounted for about 80 percent of the estimated 1999 total releases to the atmosphere.

In June 2001, the CCME Council of Ministers endorsed Canada-wide Standards for two of these priority sectors for dioxins and furans: boilers burning salt-laden wood and waste incineration. The Coastal Pulp and Paper Mill Boiler CWS applies only to pulp and paper mills located on Canada's sea coasts which burn wood fuel contaminated with salt as a result of transport in seawater <http://www.ccme.ca/ourwork/air.html?category_id=97>. The Waste Incineration CWS applies to municipal solid waste, hazardous waste, medical waste and sewage sludge incineration facilities <http://www.ccme.ca/assets/pdf/df_incin_rvw_rpt_e.pdf>.

In March 2003, the CCME Ministers endorsed the CWSs for emissions of dioxins and furans from iron sintering plants <http://www.ccme.ca/ourwork/air.html?category_id=94> and steel manufacturing electric arc furnaces (EAFs) <http://www.ccme.ca/ourwork/air.html?category_id=95>. At that time, an existing iron sintering plant in Ontario was the largest single point source for atmospheric emissions of dioxins and furans in Canada, accounting for four percent of national releases to the atmosphere. This last iron sinter plant in Canada was shutdown in 2008.

Steel manufacturing electric arc furnaces (EAFs) accounted for seven percent of the estimated 1999 national releases to the atmosphere. The EAF standard is expected to achieve an emission reduction from these facilities of at least 60 percent by 2010.

A CWS for *Conical Waste Combustion of Municipal Wastes* was endorsed by the CCME Council of Ministers in November 2003. The Conical Waste Combustion CWS commits Newfoundland and Labrador to phase out the operation of existing units in the province by 2008 and prohibits the operation of new conical waste combustors in Canada <http://www.ccme.ca/ourwork/air.html?category_id=92>. A 2006 status report indicates that Newfoundland and Labrador had exceeded its interim 2005 goal of a 40 percent reduction, through the closure of 27 conical waste combustors, resulting in a reduction of 57 percent in atmospheric emissions of dioxins and furans. See <http://www.ccme.ca/assets/pdf/df_cwc_cws_2006_rvw_rpt_e.pdf>. In 2008, the province experienced challenges in closing the remaining conical waste combustors but continues to work towards the phasing out of these units.

⁶ Québec did not sign the 1998 Canada-wide Accord on Environmental Harmonization or any subsequent standards. The province has indicated that it intends to act within its area of jurisdiction in a manner consistent with the other CCME member jurisdictions regarding the standards and the deadlines for attaining them. The Regulation respecting air pollution control (Q-2, r. 4.1), passed on 18 May 2011, enacts emission limits for dioxins and furans

The CCME has also published two status reports related to dioxins and furans activities in Canada, an interim report on jurisdictions' progress on achieving the CWSs; and a 2006 review of the CWS. These are available at the following website:

<http://www.ccme.ca/ourwork/air.html?category_id=91>. A 2008 Progress Report will be prepared by the CCME.

3.1.2 Hexachlorobenzene (HCB)

In 1993, an assessment of hexachlorobenzene conducted under CEPA concluded that it is toxic under the Act. In March 2000, hexachlorobenzene was added to the List of Toxic Substances under CEPA 1999. Based on the criteria set in the *Toxic Substances Management Policy*, it is to be managed as a Track 1 substance with a management goal of virtual elimination of hexachlorobenzene from releases to the environment.

Hexachlorobenzene is no longer in commerce in Canada. Now the principal sources of hexachlorobenzene are from the application of hexachlorobenzene-contaminated chlorinated pesticides and the incineration of wastes. Historical use of hexachlorobenzene as a fungicide is also suspected to be a source of hexachlorobenzene release. In addition, hexachlorobenzene can be released from the volatilization/leaching from in-service utility poles (treated wood), and from other minor sources, such as cement kilns, chemical production, the use of ferric/ferrous chloride and some chlorinated solvents (as a trace contaminant).

A Strategy has been developed to manage hexachlorobenzene as a commercial chemical and as a contaminant in products. In 2003, Canada banned the manufacture, use, sale or import of hexachlorobenzene and products containing hexachlorobenzene above 20 parts per billion. Since the formation of hexachlorobenzene is associated with dioxins and furans in combustion sources, releases of hexachlorobenzene may be addressed through actions to be carried out for dioxins and furans. The Canadian Pest Management Regulatory Agency (PMRA) reviews the hexachlorobenzene levels in pesticides during evaluations conducted under the authority of the Pest Control Products Act.

3.1.3 Other Initiatives in Canada

Other initiatives underway to address dioxins and furans and hexachlorobenzene in Canada include mandatory reporting of dioxins, furans and hexachlorobenzene in the CEPA 1999 National Pollutant Release Inventory (NPRI) since the reporting year 2000. Also there has been emissions characterization from various sources, including steel manufacturing, base metal smelters, kraft pulp mill black liquor boilers, and waste incinerators. A more comprehensive national "Air Pollutant Emissions Inventory" (APEI) for dioxins and furans and HCB is maintained and updated annually. The inventories are available on the website: <<http://www.ec.gc.ca/inrp-npri/default.asp?lang=En&n=B85A1846-1>>.

Under the Canada-United States Great Lakes Binational Toxics Strategy, targets are set to reduce releases of dioxins, furans, and hexachlorobenzene from anthropogenic sources and to remediate contaminated sediments. As releases of dioxins and furans from point sources decline due to standards, regulations and voluntary actions, burn barrels and other open burning, are emerging as a top source of dioxins and furans in Canada. A workgroup has been formed to develop and implement a Strategy to reduce backyard trash barrel burning in the Great Lakes Basin.

In 2005, Canada adopted on an interim basis the JECFA (Joint Expert Committee on Food Additives of the World Health Organization) and FAO (Food and Agricultural Organization of the United Nations) tolerable monthly intake value for human intake of dioxins and furans. This

intake is 70 pg/kg body weight/month, which represents an intake of about 2.3 pg/kg body weight/day, and is highlighted in Health Canada's 2005 publication "It's Your Health—Dioxins and Furans" <http://hc-sc.gc.ca/iyh-vsv/envIRON/dioxin_e.html>. Health Canada periodically conducts total diet studies in various locations across Canada to determine Canadians' dioxin intake through foods. Currently in Canada it is illegal to sell any food item if it contains any portion of chlorinated dibenzo-*p*-dioxins. However, there is an exemption for fish products and fish feeds which may contain up to 20 parts per trillion of 2,3,7,8-tetrachloro-dibenzo-*p*-dioxin. In addition, the Canadian Food Inspection Agency (CFIA) conducts regular monitoring of dioxins in foods of animal origin, animal and fish feeds, and feed ingredients. It has also established a dioxin traceback program, whereby elevated levels of dioxins found in livestock fat trigger analyses of feed batches consumed by the livestock.

Health Canada has developed a Canada-wide project, Maternal Infant Research on Environmental Chemicals (MIREC), to assess pre- and post-natal bio-monitoring of pregnant women and infants for dioxins and other environmental chemicals plus a number of important maternal and infant child health endpoints. This multi-partner funded study began in 2007 and is expected to extend for five years. In addition, Health Canada is undertaking an analysis of dioxins in pooled samples of blood from across Canada that were collected under the Canadian Health Measures Survey, to determine levels that are representative of adult Canadians. Concentrations of dioxins and furans were also measured for Health Canada in composite samples from mothers in five Canadian cities (2006–2007) as part of a small trinational feasibility study done under the Commission for Environmental Cooperation.

3.1.4 Results

Canada's efforts to control environmental releases of dioxins and furans are working. The Pulp and Paper regulations have virtually eliminated dioxins and furans in effluent releases and the CWS's are being implemented by jurisdictions. For example, actions by the province of Ontario to implement the Canada-wide Standards for Waste Incineration have led to the closure of a municipal waste incinerator that was at one point the largest point source of emissions of dioxins known in Canada, as well as all of the small biomedical waste incinerators located on-site at hospitals. A national inventory of sources indicates that dioxin and furan releases to the atmosphere have declined by more than 80 percent since 1990. Also, levels of dioxin-like compounds measured in Canadian serum and breast milk surveys declined by about one-half from the 1980s to the 1990s. Based on total diet studies undertaken by Health Canada, current estimates of Canadian intake generally do not exceed 1 pg/kg bw/day, well below the guideline level noted above. In addition, a 2002 survey of Canadian fish products indicated that dioxin levels in all products were below the federal concentration limit. Regarding levels in the environment, a declining trend for dioxins and furans and hexachlorobenzene is also shown in the ambient air through the National Air Pollution Surveillance (NAPS) Network <http://www.etc-cte.ec.gc.ca/publications/naps/pah_report2_e.html> and in other media such as wildlife. However, dioxins and furans continue to contribute to Fish Advisories and elevated levels of dioxins and furans are measured in lake sediment cores in the Great Lakes Basin <http://www.on.ec.gc.ca/wildlife/factsheets/fs_herring_gulls-e.html>.

3.2 United States

The US Environmental Protection Agency (EPA) has pursued the control and management of dioxins through each of its major program areas; collectively, these actions place strict regulatory

controls on all of the major well-defined industrial sources of dioxins. Dioxins have also been a focus of the United States in food safety programs of the US Department of Agriculture and the Food and Drug Administration of the US Department of Health and Human Services. Recent activities have included the expansion of efforts to monitor dioxins in the food supply and animal feeds, and specific action to eliminate the use of naturally-occurring, dioxin-contaminated ball clay as an animal feed additive.

3.2.1 Specific Program Actions

Releases to Air: Incineration of municipal and medical wastes have, historically, been the two largest industrial categories of dioxin releases to the United States environment. Over the past decade, emissions from these sources have been significantly reduced as a result of federal and state attention. Additional emission reductions are taking place as a result of stringent regulatory requirements promulgated by the EPA under authority of the Clean Air Act (CAA) and its amendments. The CAA requires the EPA to set emission limits for dioxins and other hazardous air pollutants based on “maximum achievable control technology” (MACT). EPA regulations promulgated in 1995 for municipal waste combustors, and 1997 for medical waste incinerators, should result in a greater than 95 percent reduction in dioxin emissions from these two source categories. Under the combined authorities of the CAA and the Resource Conservation and Recovery Act (RCRA), the EPA has regulated dioxin emissions from facilities that burn hazardous waste. These include commercial hazardous waste incinerators, cement kilns burning hazardous waste, and some lightweight aggregate kilns. With the completion of these rules, the major categories of commercial and municipal waste combustion are under direct regulation for their dioxin emissions.

Releases to Water: Dioxin releases to water are managed through a combination of risk-based and technology-based tools established under the Clean Water Act (CWA). Using the authority of the CWA, EPA published in 1984 ambient water quality criteria for 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD). Ambient water quality criteria serve as EPA guidance for states in establishing and adopting their own ambient water quality standards. These state standards set a limit on the maximum pollutant concentration allowed for surface waters anywhere within that state and are implemented through discharge limitations contained in National Pollutant Discharge Elimination System (NPDES) permits.

In 1993 EPA proposed integrated rules for the pulp and paper industry, which included an effluent guideline for dioxins. Effluent guidelines establish limits on facility effluent concentrations based upon application of best available control technology as defined by the CWA. Pulp and paper effluent guidelines were promulgated in 1998 and will reduce this industry’s dioxin discharges at least 96 percent. Pulp and paper facilities that used elemental chlorine bleaching processes were the largest known industrial dischargers of dioxins into water. The technology-based effluent guidelines are implemented under the NPDES program, along with health-based, state ambient water quality standards. Under the NPDES, each facility must meet the more stringent of these separate performance requirements placed upon it.

To maintain the quality of public drinking water, in 1992, EPA promulgated a maximum contaminant level goal (MCLG, a non-enforceable, voluntary health goal) of zero, and a maximum contaminant level (MCL) of 3×10^{-8} mg/l for TCDD under the Safe Drinking Water Act (SDWA).

In addition to these direct regulatory actions under the CWA and SDWA, EPA is working with the states and the Army Corps of Engineers to manage the dredging and disposal of dioxin-contaminated sediment.

Contamination of Land: Clean up of dioxin-contaminated lands is an important part of the EPA Superfund and RCRA Corrective Action programs. There are dozens of Superfund sites around the country in which dioxin is one of the chemicals of concern. Times Beach, Missouri, and Love Canal, New York, are the best-known examples, both of which have now been cleaned up. To prevent future problems like these, EPA has developed, under RCRA authority, Hazardous Waste Identification and Disposal Rules. These rules identify and strictly limit the disposal options for wastes formally designated as dioxin-containing. Dioxins can also be found in low concentrations in wastes applied to the land as fertilizers or soil amendments. EPA has taken actions to limit dioxin levels for some soil amendment practices.

Contaminated Products: Dioxins can exist as trace contaminants in certain industrial chemical products. Legal authorities under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), and under the Toxic Substances Control Act (TSCA), are used to control or eliminate the use of such chemicals. The registration of the herbicide 2,4,5-T was cancelled because of concern about dioxins. Similarly, most of the uses of the wood preservative pentachlorophenol have been eliminated, in part because of concern for dioxin. The toxic substance program, through voluntary industry agreements, has restricted the levels of dioxins found in the industrial chemical chloranil (tetrachloro-1,4-benzoquinone), which is used in the manufacture of certain pigments and tires. Additionally, the TSCA New Chemicals Program, in cooperation with industry, has effectively prevented the manufacture of any new chemicals that are significantly contaminated with dioxins.

3.3 Mexico

Dioxins and furans, and HCB comprise new issues for Mexico's environmental agenda. Under CEC Council Resolution 99-01, adopted 28 June 1999, Mexico agreed to initiate cooperative activities with Canada and United States to develop this DLCs and HCB Strategy. On 31 May 2001, Mexico signed the Stockholm Convention and later ratified it on 10 February 2003. In November 2006, Mexico began to prepare its National Implementation Plan (NIP)⁷ in order to address the issue resulting from POPs through this international agreement responding to the consensus of the Mexican Society after a comprehensive public consultation. This included federal authorities, industrial associations, members of the civil societies and representatives of the private and academic sectors. Mexico's NIP has been structured to include eight action plans supported by appropriate diagnostic studies. These studies were developed during the formulation process including: those relative to strengthening the legal frame work as well as the monitoring and assessment of POPs, the elimination of POPs, and the reduction of unintentional POPs, the development of information, the communications Strategy and citizen participation, including the inventories of; PCBs, expired pesticides and unintentional POPs. The NIP was signed in November 2007 and submitted to the Stockholm Convention Secretariat in early 2008.

The National Institute of Ecology's (INE) National Environmental Research and Training Center (CENICA) has developed two preliminary Mexican inventories on dioxins and furans using US EPA emission factors and the UNEP dioxins and furans inventory toolkit. As part of Mexico's NIP, a formal emission inventory based on 2004 data using the UNEP toolkit was completed in 2007 and will continue over the next several years. Special emphasis will be given to identifying

⁷ <http://siscop.ine.gob.mx/index.html>

areas of opportunity to reduce the uncertainty of both activity rates and emission factors. Mexico is collaborating on a project coordinated by the Chemicals Programme of UNEP to determine experimentally the emission factors for open burning of municipal waste. Other collaborative initiatives under the Stockholm Convention are in progress to determine emission factors from other sources including wood burning cooking stoves and artisanal brick productions.

Mexico is in the process of developing its capacity for the analysis of DLCs and HCB. A high-resolution mass spectrometry analyzer has been installed at the National Center of Metrology to develop reference materials. Preliminary analyses of dioxin and furan levels in sediments and fish tissue have been done using this equipment. In addition new equipment is being installed to undertake analysis of DLCs and HCBs in foods by the Ministry of Agriculture, Livestock, Rural Development, Fisheries and Food (SAGARPA). As part of Mexico's NIP, a feasibility evaluation of the laboratory implementation for analyses of DLCs has been performed.

As the result of early implementation of the Strategy and in cooperative collaboration with Canada and the United States, Mexico is operating a Mexican Dioxin Ambient Air Monitoring Network (MDAAMN). This network, consisting of nine sites distributed throughout the Mexican territory, began operation in the first trimester of 2008.

Over the last three years, Mexico has continued working on the definition and first stage implementation of its National Monitoring and Evaluation Program. This program will include monitoring and evaluation activities in different matrices and environments for POPs, including dioxins and furans.

Mexico has developed legislation relating to air emissions for dioxins and furans. Limits for dioxin and furan emissions from cement kilns, including those that burn hazardous wastes, as described in NOM-040-Semarnat-2002, are 0.2 ng TEQ/m³@7% O₂. In addition, an emission factor (in ng TEQ/kg of clinker produced) will be defined based on actual DLC measurements from cement kilns. DLC levels from medical and industrial hazardous waste incinerators are also being monitored. NOM-098-Semarnat-2002, establishes a DLC emission limit of 0.2 ng TEQ/m³ for new incinerators, and for operating incinerators, of 0.5 ng TEQ/m³. In addition to these limits, this standard establishes several operational requirements for incinerators that should help to reduce emissions of DLCs.

Also as part of Mexico's NIP, best available technologies and best environmental practices were and will continue to be identified for POPs, including DLCs.

Mexico has started the development of a guideline for hazardous wastes incinerators, in order to promote good operational practices with these kinds of incinerators. This guideline will also include some reference for the inspections of trial burns and a review of these results.

Mexico has also developed the legal provisions and instruments needed to establish the pollutant release and transfer register (*Registro de Emisiones y Transferencia de Contaminantes*—RETC). This register is integrated with the information of the industrial facilities required to report their pollutant releases and transfers to air, water, soil and subsoil; hazardous materials and residues; as well as other substances that are listed in the corresponding section.

Among the related legal instruments are the following:

- In 2001, the General Act on Ecological Balance and Environmental Protection (*Ley General del Equilibrio Ecológico y la Protección al Ambiente*—LGEEPA) was modified to establish that the government of the Federal District, the states and municipalities

should integrate a National Registry having its own force of law. The pollutant sources are to be obliged to submit their information for integration into this registry. The information is to be made public and widely announced.

- In 2004, the rulemaking for the RETC (*Reglamento del Registro de Emisiones y Transferencia de Contaminantes*) establishes that the sources required to report are those subject to federal jurisdiction. These are industries such as the chemical, petroleum and petrochemical sectors; paint and ink facilities; automobile, pulp and paper, metallurgical, and glassmaking plants; electric power generation utilities; asbestos producers; cement and lime kilns; hazardous waste treatment plants and hazardous waste generators; and facilities that discharge into receiving water bodies under federal jurisdiction.
- In 2005, the format of the Certificate of Annual Operation (*Cédula de Operación Anual*) was published as the main instrument for reporting and gathering of information about emissions and transfer of pollutants to integrate into the National registry. The list of 104 substances subject to be reported was also published, and included dioxins and furans. The list also includes limits for reporting that are specific to each substance—for dioxins and furans it is required that any amount released or transferred to the air, soil, subsoil, or contained in hazardous materials and residues should be reported.
- The RETC lists information broken down by substance and by source in the national report, which is distributed both electronically and in print, and is only intended for informative and consultative purposes.
- The federal government has begun corresponding work with state and municipal governments to establish, through agreement, the general guidelines and technical specifications that will allow uniform and compatible information to be integrated into the RETC, and coordinate the annual updating of the information at the national level.

4 Strategic Sub-Objectives

The Parties will implement this Strategy through the following sub-objectives:

- monitoring and assessment,
- laboratory testing,
- inventories,
- pollution prevention,
- pollution control, and
- policy/management options.

Following below are a number of possible actions the Parties may consider, consistent with available resources and priority projects within the context of the annual operational plan process. They are not intended to reflect everything that will transpire, but outline an array of activities that may be carried out in furtherance of the sub-objectives expressed.

4.1 Monitoring and Assessment Sub-objective

To improve monitoring and assessment data on DLCs and HCB, to assist with target actions to reduce human exposure and environmental releases, with particular focus toward strengthening understanding in Mexico, including:

- the extent of environmental releases of DLCs and HCB, with particular emphasis on Mexico;
- trends in environmental contamination by DLCs and HCB spatially and over time for Mexico, and North America as a whole; and
- human exposure to and tissue levels of DLCs and HCB.

4.1.1 Actions

The following are possible actions the Parties may consider with respect to monitoring and assessment to facilitate implementation of this Strategy.

4.1.1.1 Air Monitoring Networks in North America

Canada and the US could provide support for the development of the Mexican ambient air monitoring network for DLCs to parallel the operational structure of the United States National Dioxin Air Monitoring Network,⁸ or NDAMN. This could involve the establishment of monitoring stations in Mexico and training for their operation, and subsequent integration of Mexican network data with those of the US NDAMN and Canadian National Air Pollution Surveillance Network (NAPS).⁹ This would permit production of a regionally comparable and compatible North American Air Monitoring Network Database on background ambient levels of DLCs and provide baseline information on background ambient levels which would contribute to the analysis of DLC levels in North America.

4.1.1.2 Freshwater Sediment Cores

Collection and assessment of freshwater sediment cores would permit determination of the technical feasibility for improving data on concentration trends of DLCs and HCB in Mexico's environment. This could include provision of assistance by the other Parties for sample analysis.

4.1.1.3 Human Biomonitoring

A study could be initiated for the three countries to determine levels of-DLCs in human tissues. These data would then be compiled to contribute to a preliminary North American databank on human exposure to DLCs.

4.1.1.4 Food Pathways Analysis

The Parties could undertake studies on food production, distribution and consumption patterns, possibly to include food studies with particular reference to Mexico and indigenous populations as a way to better understand potential pathways of exposure to DLCs and HCB.

4.1.1.5 Fate and Transport Modelling

Determine atmospheric transport characteristics and the contribution of various DLC emission sources in North America through atmospheric modelling. This could involve testing and evaluation of atmospheric transport models to fill information gaps in quantifying atmospheric transport of these chemicals, and subsequent integration of ambient air monitoring and model

⁸ The US National Dioxin Air Monitoring Network is a nationally based, ambient air-monitoring network, consisting of 32 stations, mostly in rural and non-impacted sites. It is used to estimate regional variability of the target analytes, which include vapor and particulate phases of dioxin-like compounds. While NDAP is no longer collecting air samples, available data will be comparable to the Mexican and Canadian data.

⁹ Canada's PCDD/PCDF ambient air monitoring program has been carried out under the National Air Pollution Surveillance Network (NAPS) since 1989. Currently in the NAPS there are 5 rural and 13 urban monitoring sites in operation across Canada. Two rural stations are co-located at the Great Lakes Integrated Atmospheric Deposition Networks (IADN) stations on Lake Ontario and Lake Huron. Combined particulate and vapor-phase PCDD/PCDF are collected using a modified high-volume sampler and analyses are conducted using high-resolution gas chromatography and high-resolution mass spectrometry. Samples are collected over 24-hours once every 12 or 24 days at the sites. Additionally, the NAPS network monitors hexachlorobenzene and dioxin-like PCBs-in the Great Lakes Basin.

development. Characterization of the transport and fate of DLCs on a regional scale would assist in determining sites of impact and provide potentially valuable information on reducing the risk posed by these substances.

4.2 Laboratory Testing sub-objective

To work collaboratively to improve access to analytical laboratory services that operate with internationally accepted methods for measurement of DLCs and HCB.

4.2.1 Actions

The following are possible actions the Parties may consider with respect to laboratory testing to facilitate implementation of this Strategy.

4.2.1.1 Needs Analysis

Canada and the US could provide support to Mexico as it undertakes an analysis of:

- Mexico's needs for laboratory services (i.e., with internationally accepted methods for measurement of DLCs and HCB); and
- alternatives to meet its needs for these laboratory analyses.

To complement this, the Parties could develop a plan to maintain a current inventory of laboratory and field sampling capacity within North America.

4.2.1.2 Sampling Techniques and Analytical Protocols

The Parties could consider providing technical assistance to Mexico to:

- identify sampling techniques and analytical protocols by surveying existing national protocols in OECD countries, including the potential of continuous dioxin monitoring systems;
- adopt comparable sampling techniques and analytical protocols by reference; and
- train government experts to monitor contractors for quality assurance/quality control, based on adopted protocols and techniques.

4.3 Inventories Sub-objective

To develop, refine, and maintain national inventories of DLCs and HCB to improve characterization and verification of releases from known and newly identified sources, and inform priority setting regarding risk-reduction activities, and to provide a comparable emissions inventory for the North American region to be used for atmospheric modelling.

4.3.1 Actions

The following are possible actions the Parties may consider with respect to ongoing domestic inventories to facilitate implementation of this Strategy.

4.3.1.1 Improvement in Inventories

The Parties could:

- conduct source testing and data evaluation to empirically verify emission factors used in the development of their national inventory;
- identify potential sources of DLCs and HCB from small and medium-size enterprises, with particular emphasis on Mexico;
- identify and investigate previously unidentified sources and include them in their national inventories;

- refine estimates of the size and flux of releases attributable to aquatic and terrestrial reservoir sources of DLCs and HCB;
- work toward improvement of methodologies for conducting inventories; and
- focus on improvement of the comparability of North American inventory data.

4.3.1.2 Public Access to Inventory Data

The Parties could:

- promote public access to data from national inventories and identify areas for improvements in public access consistent with national law; and
- explore with the CEC's Pollutant Release and Transfer Register (PRTR) Working Group, the possible relationships between PRTR activities and public access to information about releases of DLCs and HCB.

4.4 Pollution Prevention Sub-objective

To identify and promote best available techniques and best environmental practices to prevent formation of DLCs and HCB.

4.4.1 Actions

The following are possible actions Parties may consider with respect to pollution prevention to facilitate implementation of this Strategy.

4.4.1.1 Industrial and Other Sources

The Parties could examine and recommend best available techniques and best environmental practices for source categories identified in applicable agreements (see section 2.3), including as appropriate, Annex C of the Stockholm Convention.

4.4.1.2 Small-scale, Community-level and Household Waste Disposal

The Parties could study and identify practices and techniques to prevent the formation of DLCs and HCB applicable to small-scale, community-level and household waste disposal, and assess their potential feasibility for remote communities and others with similar needs, taking into account social and cultural considerations.

4.4.1.3 Production Processes

The Parties could review and identify production processes that typically release DLCs and HCB to the environment, and suggest alternatives to these processes and their potential feasibility.

4.4.1.4 Micro-contamination in Pesticides

The Parties could examine measures toward the reduction/elimination of HCB and 2,3,7,8-substituted dioxins and furans as micro-contaminants in currently registered pesticides, and the status of the development of alternative products and/or pest control strategies to prevent or minimize releases, including the development of non-chemical alternatives.

4.5 Pollution Control Sub-objective

To identify and promote best available techniques and best environmental practices to control releases of DLCs and HCB.

4.5.1 Actions

The following are possible actions Parties may consider with respect to pollution control to facilitate implementation of this Strategy.

4.5.1.1 Controls on Small-scale Combustion Sources

Practices and techniques could be identified for the control of releases of DLCs and HCB applicable to small-scale, community-level, and household waste disposal. Assessment of their potential feasibility for remote communities and others with similar needs, taking into account social and cultural considerations, also could be undertaken.

4.5.1.2 Examination of Potential Co-benefits

Assessment of current approaches for pollution controls on sources of DLCs could be carried out to determine whether these approaches result in corresponding reductions in HCB and other emissions.

4.6 Policy/Management Options Sub-objective

To: (1) educate the public regarding the issues associated with environmental releases of DLCs and HCB and the subsequent mandate of the Strategy and (2) collaboratively review the current state of public policy options for reducing exposure to these chemicals and preventing their formation .

4.6.1 Actions

The following are possible actions Parties may consider with respect to policy and management options to facilitate implementation of this Strategy.

4.6.1.1 Public Information Materials and Awareness Raising

The Parties may collect and prepare material for public release outlining the health and environmental concerns associated with these substances, identifying potential sources of exposure for the public and associated risks. The Parties could also consider recommending actions that could be undertaken by the public to minimize risks, and indicate management initiatives that are being, or have been put in place by governments.

4.6.1.2 Review and Analysis of Policy Options

The Parties could consider sharing information on options in law, policy, guidelines and regulations found in North America, other jurisdictions and UNEP, designed to address exposure to and formation of DLCs and HCB.

4.6.1.3 Workshops on Management Options

Recognizing Mexico's evolving legislative and regulatory regime in these areas, the Parties, working with the CEC, could choose to conduct workshops, as appropriate, in support of managing DLCs and HCB on a trilateral basis.

4.6.1.4 Voluntary Release Reduction Trial Initiative

Assisted by the CEC, Mexico could examine prospects for working with sectors of particular interest to develop a voluntary sectoral approach, toward continuous improvement in reduction of releases.

5 Implementation

5.1 Implementation Team

Upon completion and SMOC WG approval of this developmental phase of the Strategy, the SMOC WG will notify Council of the initiation of the Strategy. They will also identify the members of the Implementation Team, which should consist of at least one national government representative (with one alternate) from the three Parties. This Implementation Team should be composed of federal health and/or environment agency representative(s) who possess the appropriate scientific and technical expertise associated with source identification, environmental fate and transport exposure, health effects, risk assessment, pollution prevention and control, and environmental management. The Implementation Team will plan, coordinate and undertake the Strategy Implementation and report to the SMOC WG on progress related to implementing the Strategy actions and meeting the Strategy goals and objectives. The Implementation Team will, every two years, review the Strategy and recommend to SMOC WG adjustments, as appropriate.

The SMOC WG will keep stakeholders informed of the activities of the Implementation Team and, as appropriate, will invite stakeholders to undertake activities to support the Strategy.

5.2 Additional Financial Resources for Strategy Implementation

Mexico, with the support of Canada, the United States, and the CEC, may develop project proposals for leveraging third-party resources in the implementation of this Strategy, including funding from international financial institutions.

5.3 Public Outreach and Transparency

The Implementation Team for this Strategy will ensure that documentation of accomplishments under this Strategy will be made available to the public on the CEC web page and that workshops will be held, when appropriate, to share information and encourage dialogue with stakeholders in the three countries, and in coordination with the SMOC WG communications team.

6 Reporting

The Implementation Team, in reporting to the SMOC WG, will prepare, two months after the adoption of this Strategy, an annex summarizing accomplishments of the three Parties that supported the development and implementation of the Strategy. Additional periodic reports updating Strategy implementation will be issued as appropriate and no less than once every two years, including a final report.

Subsequently, the SMOC WG, in reporting to Council, will report one year after approval of the Strategy, and every two years thereafter, on the status of implementing the Strategy actions, as well as reporting on trends in levels in the environment and humans. Where progress needs to be accelerated, the Parties may make proposals for ameliorating/overcoming obstacles to action implementation.

It is anticipated that implementation of this Strategy will remain in effect through active participation of the Parties and the CEC, up to and including 2016. A summary report approved by the SMOC WG will be provided to Council for consideration at that time as well as recommendations concerning closure of the Strategy and a subsequent path forward.

7 ANNEX TO THE NORTH AMERICAN STRATEGY FOR CATALYZING COOPERATION ON DIOXINS, FURANS AND HEXACHLOROBENZENE

REPORT ON TASK FORCE ACTIVITIES – 30 January 2010

The North American Task Force on Dioxins and Furans, and Hexachlorobenzene was established in 2000, by the Sound Management of Chemicals (SMOC) Working Group of the North American Commission for Environmental Cooperation (CEC). The mandate of the Task Force was to develop and implement a North American Regional Action Plan (NARAP) for Dioxins, Furans and Hexachlorobenzene toward effective management of these chemicals in North America. Subsequent to this, in 2004, as a result of re-evaluating and redefining the components of the Task Force mandate, the CEC determined that a North American Strategy for Catalyzing Cooperation on Dioxins and Furans, and Hexachlorobenzene which highlights a range of activities which could be undertaken to fulfill this mandate, should be developed to replace the NARAP. However, since 2000, there have been significant accomplishments and ongoing activities of the Task Force toward its mandate. The following summarizes the achievements of the Task Force to date, which demonstrate accountability toward its objectives.

7.1 MONITORING AND ASSESSMENT

North American Monitoring Network

The Task Force undertook to establish a North American Air Monitoring Network. The US and Canada have had ambient air monitoring programs in place for some time. In 2004, Canada and the United States assessed the compatibility of their air monitoring networks and concluded that the data is comparable. The US National Dioxin Air Monitoring Network (NDAMN) is a nationally based, ambient air-monitoring network, consisting of 17 stations, mostly in rural and non-impacted sites. It is used to estimate regional variability of the target analytes, which include vapor and particulate phases of dioxin-like compounds. While this program is no longer collecting air samples, data available will be comparable to the Mexican and Canadian data.

Canada's dioxins and furans ambient air monitoring program has been carried out under the National Air Pollution Surveillance Network (NAPS) since 1991. Currently in this network there are 5 rural and 13 urban monitoring sites in operation across Canada. Two rural stations are co-located at the Great Lakes Integrated Atmospheric Deposition Network (IADN) stations on Lake Ontario and Lake Huron. Combined particulate and vapor-phase dioxin and furan samples are collected using a modified high-volume sampler and analyses are conducted using high-resolution gas chromatography and high-resolution mass spectrometry. Samples are collected over 24-hours once every 12 or 24 days at the sites. Additionally, hexachlorobenzene and dioxin-like PCBs are monitored at the network stations located in the Great Lakes Basin. Hexachlorobenzene is also measured in air and precipitation samples at five stations, one located at each of the Great Lakes, under the Integrated Atmospheric Deposition Network, which is jointly operated by Canada and the United States.

Accordingly, it was acknowledged that a similar program should be developed for Mexico. To that end, Canada provided dioxin samplers and technical training to Mexico, and the US, a commitment for analysis of samples through to the third year of collection. The Mexican air

monitoring program currently includes nine sampling sites. The first two years of data have been obtained and the third year of sampling is underway. Regional assessment and analysis of ambient air data is an ongoing priority for Mexico. Further to this, an assessment and tri-country comparison of air monitoring data is planned following collection of the third year of Mexican data.

Fresh Water Sediment Cores

The US and Canada have also collected significant data on sediment core analysis, including all lakes in the Great Lakes Basin, and the need for further sampling is being examined. Similarly as part of the Task Force activities, freshwater sediment cores have been collected from several Mexican lakes, and the US plans to undertake analysis of these cores.

Human Biomonitoring

Recognizing that human biomonitoring is an important determinant of exposure to these substances, each country undertakes measurement of dioxins in human tissues. A tri-country compilation and comparison of human exposure data including metals and POPs is currently in draft and under review. There is also a Canada-wide maternal and infant study underway for monitoring of exposure to dioxins and other chemicals. In addition, an analysis of pooled plasma samples collected under the Canadian Health Measures Survey, representative of Canadian adult exposures to organochlorines including dioxins and furans, is ongoing and expected to be complete by 2011. Periodic monitoring of dioxins in Canadian human milk is also undertaken. Compilation of US NHANES data on exposure to various chemicals including dioxins is currently being augmented. Mexico has collected blood data from Mexican women from various parts of the country and has identified one particular area where dioxin, furan and hexachlorobenzene levels are high relative to those from the rest of the country. It should be noted that sample analysis has occasionally been hindered by difficulties in cross-border transportation of samples to analytical laboratories.

Food Pathway Analysis

Food is a major source of exposure to these substances and therefore food pathway analysis is being conducted. Studies of food production, distribution and consumption patterns are a focus of the Task Force work. The ultimate goal is to identify opportunities to reduce dioxin exposure from foods. Sampling and analysis of eggs from Mexican brick kiln areas has been undertaken and the US and Canada have ongoing programs to analyze foods and determine food consumption patterns. As well, both the US and Canada undertake regular sampling of animal feeds and animal food products to determine dioxin contamination and conduct trace-backs to identify the origins of contamination. Corrective action is then undertaken to eliminate these sources.

Fate and Transport Modelling

With a focus on the development of regional ambient air modelling capacity in Mexico, a technical workshop on fate and transport modelling was held in Mexico with experts from the US and Canada, in August of 2009. It was concluded that Mexico required further training to improve its capability in this area, and additional workshops on short- and long-range atmospheric modeling are planned. The Task Force is currently developing the scope for a North American air modelling project for dioxins and furans.

Technical Training and Workshops

In order to share information on state-of-the-art sampling techniques, analytical protocols and source control, workshops have been held in various locations in Mexico that are attended by representatives from various Mexican industries, government departments, nongovernmental organizations and the academic community. Workshops in 2007 and 2008 featured US and Canadian approaches and expertise, and data presentation focusing on steel manufacturing, base metals smelting, cement manufacturing, brick manufacturing, and waste incineration.

The most recent workshop held in December of 2009, similarly included presenters from Canada, Mexico and the US, and provided a comprehensive overview of emissions inventory activities and ambient air monitoring activities. Canada had provided training to Mexico on air sampling and analysis in May 2004 at Environment Canada's air monitoring laboratory in Ottawa. Source characterization presentations focused on residential wood combustion, brick kilns, combustion of agricultural material, and residential burning of household waste. Human exposure studies were also featured, with Mexico providing a summary of its data on levels of dioxins and hexachlorobenzene in blood, and Canada and the US, providing overviews of dioxins in foods and feeds. Mexico made a quite significant announcement regarding the initiation of its national program for the monitoring and control of pollutants in food from animal sources. This indicated that the country had now acquired laboratory capacity to undertake its own analysis of dioxins in foods, an area of expertise for which Canada had provided training (also in May 2004) to Mexican trainees in Health Canada's foods laboratory in Vancouver. Additional presentations focused on the utility of various emissions models dealing with both long- and short-range transport of dioxins.

As well, a workshop focused specifically on brick kilns as a source of dioxins and furans and other pollutants, was held in Mexico in mid-January 2010.

In addition, as Mexico had identified a need for development of skills in human health and environmental risk assessment, a series of training sessions have been provided to Mexico by Health Canada and Environment Canada. The initial session which focused on general assessment techniques was held in March 2008 and the second, focusing on site-specific techniques, in January 2010. It is expected that future sessions will highlight various additional aspects of risk assessment.

7.2 LABORATORY TESTING

The Task Force has undertaken ongoing discussions regarding feasible options for meeting Mexico's analytical needs. A major issue has been Mexico's proposal to establish high-resolution dioxin analysis laboratory capacity. To that end, in November 2009, Mexico acquired high resolution mass spectrometer/gas chromatograph equipment which will permit analysis of dioxins in various media. Capacity-building in the areas of sampling and analytical protocols has been provided through workshops held in Mexico in 2007, 2008, and 2009, featuring US and Canadian approaches and expertise.

7.3 INVENTORIES

Improvement in Inventories

There is a need to improve the quality of release inventories. To that end, empirical verification of emission factors for Mexican industry is ongoing, facilitated by source testing in the US and Canada. Review and revision of each party's domestic emission inventories is being undertaken with the goal of improved comparability of North American inventory data. Both Canada and the US have developed mandatory reporting of dioxins, furans and hexachlorobenzene from point sources under the Canadian National Pollutant Release Inventory (NPRI), and the US Toxics Release Inventory (TRI). In addition, both countries maintain a comprehensive inventory of domestic dioxins and furans including point, area, mobile and natural sources. The US has indicated that it is in the process of revising its 2000 dioxin inventory. As well, the US continues to expand its emission factor database by testing new source categories, and collaborates in industry-sponsored test programs. Further discussion of the latter topic took place during the analysis and sources workshop held in December 2009. There has also been recognition that better characterization of reservoir sources of dioxins is required in this endeavor. The Implementation Team is considering the addition of hexachlorobenzene to these inventories.

Regarding its own initiatives, Mexico has developed a 2007 (base year 2004) emissions inventory for dioxins and furans; the inventory can be consulted at the following link: <http://siscop.ine.gob.mx/index.html>. Mandatory reporting of dioxins and furans was established in 2004 in the *Registro de Emisiones y Transferencia de Contaminantes* (RETC).

Based on the Canadian inventories for dioxins and furans, the releases of dioxins and furans in that country have been on a declining trend. Since 1990, the total atmospheric releases in Canada have been reduced by over 80% and releases in effluent from Canadian pulp and paper mills have been virtually eliminated. As a result, dioxin and furan levels in various indicators such as human tissues, ambient media and wildlife have significantly declined over the past several decades.

Public Access to Inventory Data

Both the US and Canadian release inventories are publicly available, with online data query capability for TRI and NPRI.

7.4 POLLUTION PREVENTION

Recognizing the importance of pollution prevention from industrial and other sources through implementation of best available techniques and best environmental practices (BAT/BEP), Canada developed their Stockholm Convention National Action Plan on POPs which includes Canada's approach to managing dioxins and furans and promotes the application of BAT/BEP. As well, the US applies MACT standards and effluent guidelines toward release control.

Regarding small-scale waste disposal, both Canada and the US have reviewed and inventoried the formation of dioxins from small-scale incineration and prepared educational material regarding residential burning practices, with a particular focus on burn barrel activities in rural areas. New York State has recently prohibited the latter activity. Much of this work has been undertaken through the Great Lakes Binational Toxics Strategy.

The analysis and sources workshops held in 2007, 2008, and 2009 have provided significant information for this undertaking. As well, Canada has contributed Canada-wide Standards information, and the US, similar information regarding their domestic standards, for reference.

Identification of feasible options for release reductions from production processes will be done in the near future.

With respect to releases from pesticides, regulatory efforts are ongoing in Canada and the US to minimize dioxins and hexachlorobenzene as micro-contaminants in pesticides.

7.5 POLLUTION CONTROL

Small-scale combustion sources are among the most significant contributors to dioxin releases into the environment. To further define this, a study has been completed by Canada on a small incinerator (Eco-waste) with no pollution control equipment, and the report on this study is available.

Regarding the potential co-benefits of pollution control efforts, Canada has initiated a comparison of available stack test results for dioxins, furans, and hexachlorobenzene, from various sources in the Great Lakes Basin, to determine the co-relation between these substances and whether pollution controls on sources result in effective reductions for all three.

In addition, a trial Mexican government program, in which traditional indoor open fires were replaced with stoves vented to the outside, resulted in significant improvement in respiratory health of Mexican women living in these households. While much of this is attributable to reduction in levels of carbon monoxide and particulate matter, co-benefits of reduction of indoor open fires would include a reduction in exposure to dioxins.

7.6 PUBLIC INFORMATION MATERIALS

In an effort to make the public aware of domestic efforts to reduce risk associated with exposure to dioxins, Canada and the US have developed a variety of public information material. Canada maintains a "Management of Toxic Substances" website <<http://www.ec.gc.ca/toxiques-toxics/>> containing information on toxic substances under the Canadian Environmental Protection Act, 1999, and other websites providing information on regulatory activities, policies and health issues related to dioxins, furans and hexachlorobenzene. The US publishes updates on its dioxin reassessment activities which provide comprehensive information on dioxin toxicology and environmental behaviour. Both countries collaborated in the preparation of educational material on backyard trash burning which has been distributed to municipalities in the Great Lakes Basin.

Canada has offered assistance to Mexico in the development of similar public education materials to raise public awareness in Mexico about these substances.

7.7 FINANCIAL RESOURCES FOR STRATEGY

The Task Force has discussed various options for leveraging third-party financing for its activities, particularly for those requiring significant funding. In an initial effort, Mexico is working through PRONAME, highlighting POPs priorities, emissions factor work, and potential brick kiln projects, to attract funding from potential partners such as the Stockholm Convention Secretariat and UNEP.

7.8 ACHIEVEMENTS WITH REGARD TO GOALS OF TASK FORCE

It has clearly been demonstrated that Mexico is acquiring significant technical capacity in dioxin management, particularly with respect to food and ambient monitoring. Capacity-building has been the focus of the Task Force in its technical training exercises over the past years as part of its Task Force activities and this substantiates success toward this goal. Continued work of the three countries under the Strategy activities can be expected to facilitate the betterment of their domestic risk management programs for dioxins. It has been noted that provision of further technical and scientific expertise to Mexico on various aspects of dioxin assessment and management would be very beneficial.