THE COMMISSION RECOMMENDS THAT:

Governments should immediately develop a comprehensive, binational program to address the full scope of the contaminated sediment problem over the long term, setting appropriate priorities and defining the resources required for completion. As part of this comprehensive program, governments should ensure that:

(i) programs and cost estimates are in place and made public for fully addressing contaminated sediments in Areas of Concern,

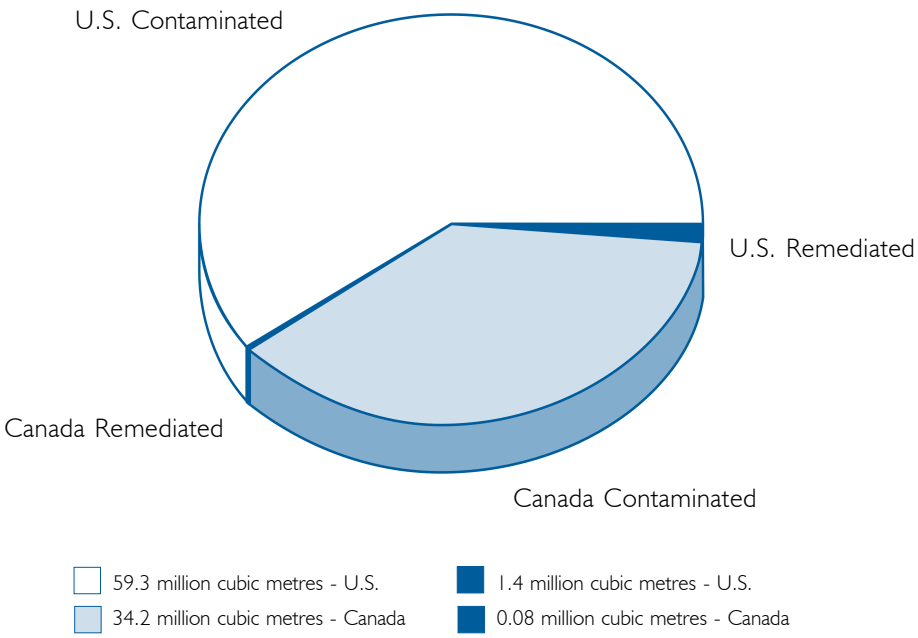
(ii) timetables for fully implementing those programs are established and made public,

(iii) resources are provided to fully implement the programs in accordance with the established timetables, and

(iv) progress reports are issued at least biennially.

Figure 2

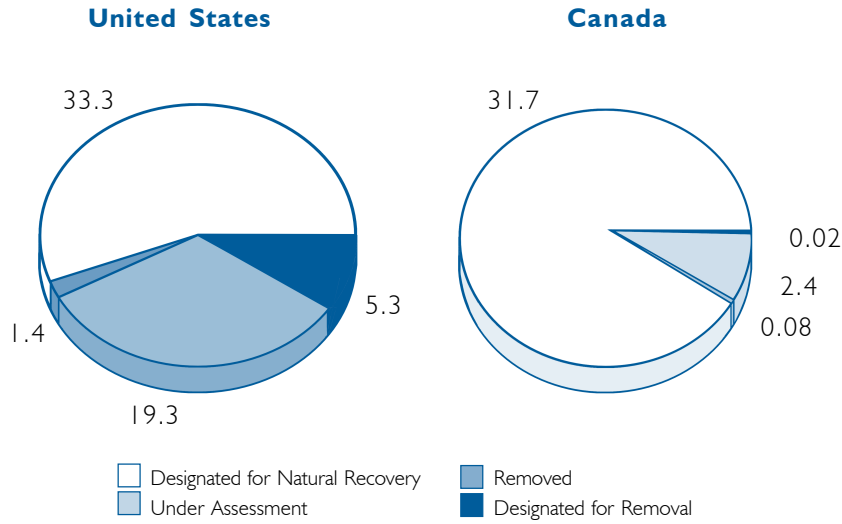
Contaminated Sediment in the Great Lakes Areas of Concern



Source: Compiled by Commission staff, based on the best available estimates.

Figure 3

Management Status of Contaminated Sediment in Areas of Concern



All quantities are in million cubic metres

Source: Compiled by Commission staff, based on the best available estimates.

3.3 Annex 15 - Airborne Toxic Substances

Annex 15 recognizes that the atmosphere is a major pathway by which persistent toxic substances reach the Great Lakes. This annex includes provisions for research, monitoring, and modeling and establishes the components of the Integrated Atmospheric Deposition Network (IADN).

It is essential to place the atmospheric contribution to the pollution of the Great Lakes in the context of the total pollutant sources and the pathways that bring such pollutants to the lakes. Such determinations are needed to partially fulfill commitments by the Governments under Annex 15 of the Agreement. In addition, the Great Lakes Binational Toxics Strategy makes commitments to determine and manage the numerous sources of these contaminants. These determinations would support the further analysis of exposure and risk of pollutants, the development of regulatory controls, and the ultimate redesign of industrial processes to reduce and prevent discharges and emissions.

Airborne pollutants deposited in the lakes originate from both local and distant sources. The pollutants enter the atmosphere from direct emissions (smokestacks, combustion, automobiles) or through volatilization and evaporation from terrestrial or aquatic surfaces. The atmosphere transports the pollutants as particles, aerosols, or gases and the pollutants can be deposited directly onto solid or aquatic surfaces (dry deposition), or washed out of the atmosphere by rain and snowfall (wet deposition). A few pollutants remain suspended in the atmosphere for such a long period of time that they become part of a "regional or global background" level of pollution.

The relative importance of air as a pathway depends on the nature and number of the other pollutant sources in a given location. Lake Superior has relatively few point sources and the largest surface area. Because the deposition of material from the atmosphere is directly proportional to the surface area, Lake Superior receives a large percentage of selected persistent toxic substances via air deposition.

Integrated Atmospheric Deposition Network

To determine the significance of the atmosphere in the distribution and behavior of toxic contaminants in the Great Lakes, the Parties, principally the U.S. Environmental Protection Agency and the Atmospheric Environment Service (Canada), created the Integrated Atmospheric Deposition Network (IADN). This network combined "master" and "satellite" stations, as recommended in the Commission's 1988 Plan for Assessing Atmospheric Deposition to the Great Lakes.

The operation of IADN is an excellent example of a binational program that generates both comparable and compatible monitoring data on both sides of the international boundary. Locations were chosen for the master and satellite stations to allow quantification of the level of regional background for selected persistent toxic substances. One of those pollutants, mercury, in its elemental form volatilizes easily. Many of the organic compounds of mercury share this volatility characteristic. Thus, mercury and its compounds are contaminants requiring a "regional background" assessment as a vital piece of information for setting control strategies and regulatory approaches. However, IADN does not currently include mercury among the measured pollutants. This situation reflects the historical limitation on resources because, until recently, mercury analysis of air samples was very expensive.

Similar cost considerations were also cited in the exclusion of dioxin from the IADN roster. More recent analytical methods for mercury and dioxin appear less costly and, given the ongoing efforts to model the transport of these two contaminants to the lakes, enhancement of the network by inclusion of mercury and dioxin in the program should again be considered.

Although IADN is a significant achievement, success in the surveillance and research aspects of Annex 15 has been limited over the last decade because important components, such as emissions inventories and research, have not been pursued to the extent that they would enable the Parties to meet their obligations under this annex.

The operation of IADN is an excellent example of a binational program that generates both comparable and compatible monitoring data on both sides of the international boundary.

Linking Distant Sources to the Lakes

To assist the Parties in the development of source-receptor and air trajectory modeling, the International Air Quality Advisory Board (IAQAB) of the Commission supported application of the NOAA HYSPLIT (Hybrid Single Particle LaGrangian Integrated Trajectory) model to quantify dioxin contamination from sources internal and external to the Great Lakes basin.

HYSPLIT is capable of viewing atmospheric deposition from two perspectives. Starting with a source of emissions, such as a coal-fired plant in the U.S. midwest, the model estimates what fraction of those emissions will arrive (be deposited) at a specific site, such as Lake Michigan. Alternatively, starting with a site such as Lake Michigan, the model could determine likely airborne sources of a given pollutant and the relative significance of each source.

HYSPLIT depends upon the availability of several supporting elements, including a good-quality emissions inventory, adequate simulation of the behavior of the pollutant in the atmosphere, and the availability of ambient measurements for calibration and verification. Despite the limited data on emission inventories and ambient measurements, as described in the 1997-99 Priorities and Progress under the Great Lakes Water Quality Agreement Report (IJC 1999d; Cohen, M. and Commoner, B. 1995), the model outputs have been found to be reasonable and realistic for dioxin. If the supporting elements are improved, HYSPLIT or similar models could be a useful mechanism to establish the amount and relative significance of long-range atmospheric transport to the total burden of airborne persistent toxic pollutants in the Great Lakes.

The Commission is confident that the tools exist or can be further developed to determine the contribution of local, regional, continental, and global sources to the atmospheric deposition of persistent toxic substances into the Great Lakes basin. Some of these tools include those identified earlier — HYSPLIT and IADN and their supporting elements, including emissions inventories, physical and chemical determinations, and other ambient measurements.

THE COMMISSION RECOMMENDS THAT

The Parties should take the following measures to deal with airborne pollutants:

(i) identify both in-basin and out-of-basin sources of atmospheric deposition of persistent toxic substances to the Great Lakes, quantify their contribution to the total burden of these substances to the lakes, and use this information to formulate and implement appropriate prevention and control measures; and

(ii) adopt a source-receptor computer model, improve emissions inventory information, and add dioxin and mercury to the Integrated Atmospheric Deposition Network to improve the data bases for these two substances.

3.4 The Great Lakes Binational Toxics Strategy

The Great Lakes Binational Toxics Strategy ("the Strategy"), signed on April 7, 1997, established a collaborative process between the Parties and stakeholders to address the goal of virtual elimination of targeted persistent toxic substances in the Great Lakes basin. The strategy uses three processes to facilitate consultation: substance-specific workgroups, stakeholder forums, and an integration workgroup. An underlying tenet of the Strategy is that the Governments cannot achieve the goal of virtual elimination by their actions alone. Thus, it "challenges all sectors of society

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The Substance Specific Workgroups undertake a four step analytical process:

Step 1 - Information gathering

Step 2 - Analyze current regulations, initiatives, and programs

Step 3 - Identify cost effective options to achieve further reductions

Step 4 - Implement actions to work toward the goal of virtual elimination of the targeted substances.

to participate and cooperate to ensure success" (U.S. Environmental Protection Agency and Environment Canada 1997).

The work of the substance-specific workgroups comprises the core activity under the Strategy. Meetings with stakeholders are held twice a year to encourage an open participatory process of consultation on Strategy implementation. The Integration Workgroup functions to provide oversight and coordination and to discuss other issues that may fall outside the scope of the substance-specific workgroups.

The Mercury Workgroup

The Mercury Workgroup, one of the seven substance-specific workgroups, has effectively mobilized the activities of a broad spectrum of stakeholders. The group aims to reduce and eliminate mercury use and disposal in the environment. This includes eliminating mercury from such diverse sources and sectors as sewage treatment plants, electric utilities, schools, the metals industry, health care, mining, and industrial production processes. It also involves removal of mercury from a variety of commercial products and household uses, such as medical thermometers, thermostats, lamps, appliances, automobiles, and switches. The group accomplishes this work through initiatives involving joint activities with, for example, the Commission for Environmental Cooperation, the Chlorine Institute, and the steel industry. Community outreach and education activities are also undertaken by promoting better disposal methods that emphasize life-cycle analysis of mercury-containing products.

The control of mercury, one of the persistent toxic pollutants, represents one of the success stories of the Strategy. Significant reductions have been reported. The workgroup has established a mercury Internet web site, which provides information on sources and regulations by topic and sector. In addition to the impact of its direct initiatives, the workgroup has helped in expanding knowledge about the chemical, environmental, and human health effects of this material, and about its sources and environmental behavior. The workgroup has also benefitted from the work of a well-networked group of researchers from Labrador to Florida on the Atlantic coast and from Alaska to southern California on the Pacific coast. In addition, the electric power industry has an established network of researchers; fossil fuel, mainly in coal-fired power plants, is one of the major sources of mercury emissions to the environment.

Progress in environmental control of mercury has occurred despite the fact that IADN does not include mercury in its program. If IADN included mercury, the workgroup could estimate loadings of mercury to the Great Lakes, thereby assessing the ecosystem effects of its reduction efforts.

Other Workgroup Progress

Workgroups created by the Strategy are also addressing the other eleven designated persistent toxic substances. After three years, however, no workgroup has entirely completed the four-step process. For example, the PCB Workgroup is currently focusing on steps 3 and 4, but has only documented actions for the reduction of PCB inventories currently in use or in storage. This initiative does not address PCBs in sediments or the deposition of PCBs from long-range sources via the atmosphere. Although PCBs in use and in storage may constitute a potential long-term threat, PCBs circulating in biota cause the greatest immediate harm to Great Lakes fish, wildlife and humans.

Similarly, the Dioxin/Furan Workgroup has been unable to quantify sources of these substances to the Great Lakes as a basis to determine priorities for action. Major source reductions of dioxin are estimated based on new national standards in the United States and Canada primarily related to incineration. Another major source reduction in Canada was recently achieved by process changes in the pulp and paper industry that avoid the use of elemental chlorine in bleaching. Without quantified estimates of the contributions of all sources to the Great Lakes, however, strategic and cost-effective reduction opportunities cannot be identified with certainty. As an illustration, pollution prevention initiatives to restrict open burning and replace older technology woodstoves may represent greater or fewer opportunities for reductions than programs targeting other sources. Given that the state of knowledge and available data for PCBs and dioxins are somewhat advanced, the Commission encourages the Governments to adopt a more strategic approach with these substances to ensure that adequate data, information, and research are made available to the workgroups to support them in moving forward decisively to steps 3 and 4 in the process.

Deficiencies of the Strategy

The Commission recognizes the significant yet disparate effort being sustained in the Strategy, and it is concerned that the effectiveness of the Parties' efforts are being compromised by inadequate data and information on sources. The Strategy places emphasis on the substance-specific workgroups to address reduction opportunities separately for each substance, which can limit the ability of the Integration

"Right now the Canadian and U.S. governments - the agencies - are very reluctant to actually set a real schedule for virtual elimination."

Andy Buchsbaum
Great Lakes Office
National Wildlife Federation

Workgroup to adopt an overall strategic approach. The Commission is sensitive to the fact that any and all reductions of persistent toxic substances are worth pursuing. However, setting priorities for the virtual elimination of the targeted substances may be the most effective manner to reduce significant or important sources of the pollutant. This issue can be addressed with improved data, information, and reporting with respect to steps 1 and 2 of the Strategy's four-step analytical process. Greater emphasis on sources and emissions could lead to a more strategic approach and would make major inroads into producing effective overall emission inventories. The effectiveness of steps 3 and 4 of the process for all the substances would also be improved with greater oversight of the Integration Workgroup, using the stakeholder forums to assist with policy implementation.

The Commission is sensitive to the fact that any and all reductions of persistent toxic substances are worth pursuing. However, setting priorities for the virtual elimination of the targeted substances may be the most effective manner to reduce significant or important sources of the pollutant.

In an attempt to advance the state of knowledge with respect to the sources and transport of persistent toxic substances to the Great Lakes, the Commission's IAQAB undertook an analysis of dioxin deposition in the Great Lakes. The Board recognized the need for a comprehensive, binational emissions inventory of in-basin and out-of-basin point sources and source regions of this contaminant. By bringing together experts from federal, provincial, and state governments, this inventory and associated binational digital maps were produced, which then allowed the modeling of dioxin deposition to the lakes, and the accompanying identification of significant sources and source regions.

The IAQAB also assembled a U.S. county emissions data base for several of the persistent toxic substances of concern as well as a preliminary compilation of related control programs and outcomes for both the United States and Canada. The IAQAB has demonstrated the feasibility of this type of analysis and the Commission recommends that the Governments utilize a similar technique to advance further their knowledge and understanding of the air pathway as it applies to the Strategy.

This work of the IAQAB has demonstrated that the resources and technology exist within the Governments to rigorously pursue the goal of virtual elimination under the Strategy in a truly binational manner. The Commission believes that a reliance on actions to reduce persistent toxic substances discharges through pollution prevention, while necessary, is not sufficient to enable the Parties to fulfill their obligations under the Agreement.

THE COMMISSION RECOMMENDS THAT:

The Parties should strengthen the Great Lakes Binational Toxics Strategy by fully addressing all sources of persistent toxic substances, such as atmospheric transport and deposition and *in situ* contaminants in sediments. In order to include the air pathway the Parties should:

i) **establish an inventory of baseline air emissions for toxics for all of the United States and Canada.**

ii) **undertake a complete analysis of emission reduction scenarios for key source regions and determine their effectiveness in reducing contamination of the Great Lakes from the air.**

The Parties should ensure that the Strategy is truly both strategic and binational by strengthening the integration and priority setting component and establishing a full-time binational secretariat.