Treading Water:

A Review of Government Progress Under The Great Lakes Water Quality Agreement

A Report to the International Joint Commission

Publication # 333
ISBN# 978-1-77189-394-7

Prepared by the
Canadian Environmental Law Association
Great Lakes United
National Wildlife Federation

October, 1997

TREADING WATER:

A Review of Government Progress Under The Great Lakes Water Quality Agreement

A Report to the International Joint Commission

Prepared by the
Canadian Environmental Law Association
Great Lakes United
National Wildlife Federation

October, 1997

ACKNOWLEDGEMENTS

Sections of the full report were written by Sally Billups, Fé de Leon, Tim Eder, Cora Hallsworth, John Jackson, Paul Muldoon, Paul McCulloch, and Michael Murray.

Copies are available from:

Canadian Environmental Law Association, 517 College St., Ste. 401, Toronto, ON M6G 4A2 (Tel.: 416-960-2284, Fax: 416-960-2284, e-mail: cela@web.net)

Great Lake United, State University College at Buffalo, Cassety Hall, 1300 Elmwood Ave., Buffalo, NY 14222 (Tel.: 716-886-0142, Fax: 716-886-0303, e-mail: glu@igc.apc.org)

National Wildlife Federation, 506 E. Liberty St., 2nd Floor, Ann Arbor, MI 48104-2210 (Tel.: 313-769-3351, Fax: 313-769-1449, e-mail: nwfgrlks@igc.apc.org)

Funding for this project was provided by the Joyce Foundation, the Canadian Environmental Law Association, Great Lakes United and National Wildlife Federation. However, the views and ideas expressed are those of the Canadian Environmental Law Association, Great Lakes United and National Wildlife Federation, and do not necessarily reflect the views and policies of the Joyce Foundation.

TABLE OF CONTENTS

PAGE

INTRODUCTION 5

CHAPTER 1: THE STATE OF THE LAKES 8
1.0 Introduction 8
1.1 Health Effects of Persistent Toxic Contaminants 10
1.1.1 Effects of Persistent Toxic Contaminants on Wildlife and Fish 10
1.1.2 Effects of Persistent Toxic Substances on Human Health . . . 14
1.1.3 Fish Consumption Advisories: Increasing Numbers in the Great Lakes Region 18
1.2 Loadings, Sources, and Concentration Trends of Contaminants in the Great Lakes 22
1.2.1 Loadings of Persistent Toxic Substances in the Great Lakes Region 22
1.2.2 Sources of Persistent Toxic Substances in the Great Lakes Region 25
1.2.3 Concentration Trends of Contaminants in the Great Lakes Region 26
1.3 Other Issues of Concern 32
1.4 Overall State of the Lakes 33
1.5 Conclusion and Recommendations 35

CHAPTER 2: VIRTUAL ELIMINATION OF PERSISTENT TOXIC SUBSTANCES 40
2.0 Introduction 40
2.1 Canadian Laws, Policies and Programs 41
2.1.1 Federal/Provincial Initatives 41
2.1.2 Federal Government 48
2.1.3 Ontario Government 63
2.2 U.S. Laws, Policies and Programs 66
2.2.1 Federal Laws, Policies and Programs 66
2.2.2 State Laws, Policies and Programs 76
2.2.3 Municipal Mercury Pollution Prevention Programs 77
2.3 Multilateral and Bilateral Initiatives 79
2.3.1 Multilateral Initiatives 79
2.3.2 Bilateral Initiatives 85

CHAPTER 3: REMEDIAL ACTION PLANS 90

CHAPTER 4: LAKEWIDE MANAGEMENT PLANS, LAKE SUPERIOR AND POINT SOURCE IMPACT ZONES 106
4.1 Lakewide Management Plans 106
4.2 Lake Superior 111
4.3 Point Source Impact Zones 116

CHAPTER 5: NON POINT SOURCES 118
5.1 Airborne Toxic Substances 118
5.2 Research, Surveillance, and Monitoring 119
5.3 Control Measures 121
5.4 Contaminated Sediments and Dredging 125
5.5 Land Use 132
5.6 Groundwater 135
5.7 Pesticides 136

CHAPTER 6: RADIOACTIVE SUBSTANCES 139

CHAPTER 7: PHOSPHORUS 143

CHAPTER 8: SURVEILLANCE AND MONITORING 147

CHAPTER 9: REPORTING TO IJC AND THE PUBLIC 149

CHAPTER 10: FUNDING FOR COMMITMENTS 153

CONCLUSIONS AND RECOMMENDATIONS TO THE REPORT 158

INTRODUCTION

The Great Lakes Water Quality Agreement (GLWQA) between Canada and the United States is an ambitious and necessary effort between the two countries to restore the waters of the Great Lakes basin to health, following decades of abuse and neglect. This Agreement has been a sentinel binational effort at improving water quality in the largest freshwater ecosystem in the world. This report by the Canadian Environmental Law Association (CELA), Great Lakes United (GLU) and the National 4Wildlife Federation (NWF) in an effort to independently gauge progress by the governments in implementing the Agreement's recommendations in the quarter century since its creation.

In 1972, the governments of Canada and the United States signed the GLWQA. This Agreement was renegotiated in 1978 and again in 1987. The general purpose of the agreement is summarized in its main thrust: "to restore and maintain the chemical, physical and biological integrity of the waters of the Great Lakes Basin Ecosystem."

The Agreement, as it continues to evolves, is one of the most remarkable environmental accords in history. It is fair to say that it has become a global model with respect to the management of a shared ecosystem. But the Agreement has done more than provide a legal framework for action. It has acted as a catalyst for the development of leading edge science pertaining to a whole range of topics and has furthered understanding of the proper management of complex lake ecosystems. It has provided the basis for the development of a host of policy innovations, such as the weight of evidence approach, the notion of "sunsetting" or phasing-out the most dangerous toxic substances, and the introduction of the "ecosystem approach" to the policy world. Most important, however, the Agreement has led to the development of a community, from all walks of life, interested in maintaining and furthering the sustainability of the Great Lakes ecosystem. This community, comprised of scientists, environmental groups, professionals, residents, and a list too long to name, provides an essential oversight mechanism to assist in reminding governments of their obligations under the GLWQA.

While one may give high praise for the GLWQA, the fundamental question remains as to whether the Agreement has been effective. The question is a difficult one and considerable work has been undertaken in an attempt to provide a comprehensive response.[1] In order to evaluate progress of governments in meeting the objectives of the Agreement, one must look at the environmental conditions of the lakes and the health of the people and wildlife that depend on them. It is also necessary to access

---

[1] For example, see Lee Botts and Paul Muldoon, *The Great Lakes Water Quality Agreement: Past Successes and Future Uncertainty*, Dartmouth College, 1997.

the extent to which the federal governments have implemented the actions they committed to do under the Agreement.

The requirement for periodic responses to these questions provides one of the key reasons why the Agreement has been such an innovative and effective mechanism - it incorporates evaluation and accountability mechanisms for the benefit of policy-makers and the public. By disclosing progress to the goals in a detailed fashion, governments either share the praise for suitable progress or endure the criticism for too slow a pace of action.

In recent years, however, this accountability mechanism has failed. Since the inception of the Agreement in 1972, the Water Quality Board (WQB), the primary advisor to the International Joint Commission (IJC), has provided an assessment of progress under the Agreement. Based on this assessment, the IJC then made reports to the governments on initially an annual basis and then on a biennial basis. The assessment by the WQB was a fundamentally important document. Because the board was composed of senior governmental representatives, the information was the most current and germane. Moreover, the assessment included both a review of the state of the lakes and an evaluation of government programs and policies in relation to the goals of the Agreement.

In 1991, the mandate of the WQB was changed. The WQB no longer evaluates progress under the Agreement but instead has become a policy advisor to the IJC. The implication of that change is that the IJC no longer has the same quality of information it needs to evaluate progress under the Agreement. In its place, the federal governments now prepare biennial "state of the lakes" reports which examine various environmental parameters, but studiously avoid evaluation of the signatories' performance in meeting their commitments under the Agreement.

The Great Lakes public deserve to know the degree of progress under the Agreement. For this reason, CELA, GLU and NWF have prepared this detailed assessment, from a citizens' perspective, of the progress made to date towards meeting the goals of the GLWQA. The governments' actions are judged against the commitments they made when they signed the Agreement and the subsequent recommendations the IJC has made in its reports on Great Lakes water quality.

Obviously, it is impossible for us to have access to all the information that government would otherwise have in drafting a report of this kind. Nevertheless, the report is based on our best efforts to obtain current and accurate information. The goal of this report is to inform all those interested in the Agreement of the extent to which governments are moving forward and living up to the commitments they made in the Agreement.

The first section provides a summary review of the state of the lakes. References are given for more detail and further study. The remaining sections examine key provisions of the GLWQA with respect to what the governments have done over the past decade or so. Again, further elaboration can be found in the sources cited in the report.

Throughout the report, a number of recommendations are made in the hope that governments can take positive action between now and the next assessment. It is our hope that this report will enlighten the Great Lakes public as to the performance of their governments under the Agreement and that the commitment to restore and protect the Great Lakes will be continually renewed.

The principle focus of the Agreement has been on the discharge of pollutants, in particular persistent toxic substances (PTSs), to the Great Lakes system and their effects on the health of all the residents of the Great Lakes Basin. Therefore, in this evaluation, only the provisions related to contamination issues have been addressed.

CHAPTER 1: THE STATE OF THE LAKES

1.0 Introduction

In order to assess progress in the implementation of the GLWQA, it is necessary to recall the original purpose of the Agreement:

> *The purpose of the Parties is to restore and maintain the chemical, physical, and biological integrity of the waters of the Great Lakes Basin Ecosystem. In order to achieve this purpose, the Parties agree to make a maximum effort to develop programs, practices and technology necessary for a better understanding of the Great Lakes Basin Ecosystem and to eliminate or reduce to the maximum extent practicable the discharge of pollutants into the Great Lakes System.*
>
> *Consistent with the provisions of this Agreement, it is the policy of the Parties that:*
> *(a) The discharge of toxic substances in toxic amounts be prohibited and the discharge of any or all persistent toxic substances be virtually eliminated.*
> *(b) Financial assistance to construct publicly owned waste treatment works be provided by a combination of local, state, provincial, and federal participation; and*
> *(c) Coordinated planning processes and best management practices be developed and implemented by the respective jurisdictions to ensure adequate control of* ***all sources of pollutants****.* (Emphasis added)[2]

A principal focus of the Agreement has properly been on the discharge of pollutants, in particular PTS, to the Great Lakes system, and concomitant effects on water quality. The unique value of the Agreement is at risk if it loses its focus on water quality in favor of a broader target of ecosystem quality.

Despite prodigious efforts on both sides, the governments have not succeeded in the goal of eliminating or reducing to the maximum extent practicable the discharge of pollutants into the Great Lakes System. Although direct discharges of pollutants from industries to surface waters are being reduced, evidence is building that diffuse sources of pollutants from air deposition, runoff, and contaminated sediments continue to contribute to unacceptably high levels of many chemicals in the water and

---

[2] International Joint Commission, *Great Lakes Water Quality Agreement*, Article II, 1989.

biota of the Great Lakes. Atmospheric deposition has been recognized as a major source of new loadings to the Great Lakes for many contaminants.[3] The inconsistent regulation of pollutants under several statutes may permit industries to release pollutants to a less regulated media (e.g., the atmosphere) rather than make maximum efforts at pollution prevention and control.[4] Governments must stop the toxic shell game and integrate air, water and land programs.

While evidence of harm to wildlife from environmental contaminants has existed since the early 1960s, a much more complete picture of the effects of these chemicals on wildlife, fish and people is emerging. Developmental, reproductive, and other effects are occurring in wildlife and fish of the Great Lakes Basin, including bald eagles, terns, otters, and salmon. In addition, continuing research has shown that children born to mothers who consumed fish contaminated with polychlorinated biphenyls (PCBs) and other organochlorines show decreased IQ scores and more behavioral problems than other children. These and other studies point to the need for governments to be addressing the third goal in the Agreement Purpose cited above: to ensure the control of all sources of pollutants to the Great Lakes System.

Contaminant levels in the biota, water, and air of the Great Lakes System have declined for many of the IJC critical pollutants; however, the levels for most toxic chemicals in fish and wildlife have been relatively stable in the past 10 - 15 years. While there is debate about whether this levelling off is due to food web changes or the increased importance of other sources (e.g., contaminated sediments or the atmosphere), it is evident that continued inputs of pollutants from both diffuse (e.g., the atmosphere) and point (e.g., landfills) sources will only prolong the complete recovery of the lakes. Concentrations of several contaminants in many fish species are still sufficiently high to warrant hundreds of fish consumption advisories in the Great Lakes states and provinces. The governments need to make stronger commitments to address other sources of contaminants that may be contributing to the loads leading to these advisories.

Other issues related to water quality in the Great Lakes include the introduction of exotic species, biodiversity, and wetlands. The inadvertent introduction of zebra mussels, round gobies, and other exotic species has had significant impacts on community structure in Great Lakes waters. The loss of wetlands in certain areas has led to destroyed habitat and threats to biodiversity, and can contribute to nutrient and pollutant loadings from runoff to the lakes. While all of these issues are related

---

[3] U.S. Environmental Protection Agency, *Deposition of Air Pollutants to the Great Waters: Second Report to Congress*, Office of Air Quality Planning and Standards, EPA-453/R-97-011, June 1997.

[4] Dernbach, J.C., 1997, *Harvard Environ. Law Rev.*, 21: 1-82.

in some ways to Great Lakes water quality, this report focuses on the impact of persistent toxic substances on water quality, and the health of the residents of the Great Lakes Ecosystem.

Several measures can be used to assess the state of the Great Lakes ecosystem, including the current health of fish, wildlife, and human populations living in the basin. While progress has been made in some areas, the governments need to aggressively work to reduce or eliminate the discharge of pollutants to all media to ensure that fisheries and wildlife populations can be restored, and people can eat fish without harming themselves or their children.

1.1 Health Effects of Persistent Toxic Contaminants

The focus of this section is on the persistent toxic substances recognized by the IJC and present in the Great Lakes Ecosystem.[5] While deleterious effects of these contaminants on wildlife have been recognized since the early 1960s, ongoing work has provided an extensive knowledge base of the potential and actual effects of toxic substances on wildlife, fish, and humans. Partly because levels of many of the priority pollutants have decreased since high levels in the 1960s or 1970s, and direct poisoning incidences are generally not occurring, much recent work has focused on more subtle, sublethal effects of contaminants. Public awareness of the issue of endocrine (or hormone) disrupting effects has been galvanized in part by the book *Our Stolen Future*;[6] however, work in this area has been ongoing in various ways for more than three decades. Recent reviews have summarized findings in fish and wildlife populations.[7] The following sections emphasize the developmental, behavioral, and other effects of contaminants on wildlife, fish, and human populations in the Great Lakes System.

1.1.1 Effects of Persistent Toxic Contaminants on Wildlife and Fish

Research into contaminant effects on wildlife and fish has utilized two approaches: field studies of wildlife and fish populations including contaminant measurements, and controlled laboratory studies of organisms themselves or surrogates (e.g., rats, mice, or monkeys). The earliest efforts at linking wildlife effects to toxic contamination

---

[5] IJC, 1989.

[6] Colburn, T., Dumanoski, D., and Myers, J. P., *Our Stolen Future*, Penguin, 1997.

[7] Colburn, T., vom Saal, F.S., and Soto, A.M., *Environ. Health Perspect.*, 101: 378-384, 1993; Fertility on the Brink, National Wildlife Federation, 1994; U.S. EPA *Special Report on Environmental Endocrine Disruption: An Effects Assessment and Analysis*, EPA/630/R-96/012, 1997.

involved fish-eating birds in the Great Lakes region.[8] Illnesses and problems including chick edema disease (involving gross deformities and incomplete development of chicks) and reproductive failure were found in a wide range of birds, including bald eagles, Forster's terns, Caspian terns and double-crested cormorants.[9]

A compilation of recent research resulting from the recent Health Conference '97 - Great Lakes/St. Lawrence in Montreal, and produced by researchers at the Agency for Toxic Substances and Disease Registry (ATSDR)[10] provided a synopsis of health effects of toxic contaminants observed in fish and wildlife, both historically and recently, in the Great Lakes Basin this is reproduced in the table on the following page. As summarized in Colburn et al.,[11] effects of established endocrine disrupting chemicals include abnormal thyroid function in birds and fish; decreased fertility in birds, fish, shellfish, and mammals; decreased hatching success in fish, birds, and reptiles; demasculinization of fish, birds, reptiles, and mammals; defeminization of fish and snails; and alteration of immune function in birds and mammals. Specific abnormalities related to contaminant loads noted recently in wildlife include:

- Egg mortality in double-crested cormorants at several sites in the Great Lakes was found to increase with dioxin-like compound contamination (including all contaminants, such as certain PCBs and furans, having dioxin-like properties).[12]

---

[8] Gilbertson, M., 1997, *Can. J. Fish. Aquat. Sci.*, 54: 483-495.

[9] *Ibid.*; The Terns of the Canadian Great Lakes, Great Lakes Fact Sheet, Environment Canada, 1997; The rise of the Double-crested Cormorant on the Great Lakes: Winning the War Against Contaminants, Great Lakes Fact Sheet, Environment Canada, 1995; Bringing the Bald Eagle Back to Lake Erie, A State of the Environment Fact Sheet, Environment Canada, 1993.

[10] Agency for Toxic Substances and Disease Registry, Public Health Implications of Persistent Toxic Substances in the Great Lakes and St. Lawrence Basins, by Johnson, B.L., Hicks, H.E., Jones, D.E., Cibulas, W., De Rosa, C.T., U.S. Department of Health and Human Services, Public Health Service, Atlanta, Georgia, 1997.

[11] Colburn et al., 1993, op. cited.

[12] Tillitt, D.E. et al. 1992, *Environ. Toxicol. Chem.*, 11: 1281-1288.

- Brain asymmetry in double-crested cormorant hatchlings was found to increase with level of dioxin-like compound contamination.[13]

- Embryo and chick deformities in double-crested cormorants and Caspian terns have been found to increase with degree of dioxin contamination at sites in the Great Lakes.[14] In a review article Giesy et al.[15] noted that "The weight of evidence, based on laboratory and field studies, indicates that the effects currently observed in CFEWB (colonial, fish-eating water birds) reproducing on the Great Lakes are caused by planar dioxin-like compounds."

Fish in the Great Lakes have exhibited diverse effects attributed to contaminants that have affected entire populations:

- Exposure to endocrine disrupting chemicals is suspected of affecting thyroid function and impacting fertility and embryo survival and development in Great Lakes salmon. Thyroid abnormalities were reported in 100% of the salmon stocks in all the Great Lakes for two decades, which was described as convincing evidence of the presence of a biologically active environmental factor affecting fish endocrine systems.[16]

---

[13] Henshel, D.S., Martin, J.W., Norstrom, R.J., Elliott, J., Cheng, K.M., DeWitt, J.C., 1997, *J. Great Lakes. Res.*, 23(1): 11-26.

[14] Giesy, J.P., Ludwig, J.P., and Tillitt, D.E., 1994, *Environ. Sci. Technol.*, 28(3): 128A-135A.

[15] *Ibid.*

[16] Leatherland, J., In Chemically Induced Alterations in Sexual and Functional Development: The Wildlife/Human Connection, Colburn, T., Clement, C., Eds., Princeton Scientific Publishing Co., Inc., Princeton, NJ, 1992, pp. 129-145.

Table 1: Health Effects Observed in Fish and Wildlife in the Great Lakes Basin.[17]

Species	Reproductive Effects	Eggshell Thinning	Generational Effects	Deformities	Organ Damage	Behavioral Changes	Hormonal Changes	Metabolic Changes	Immune Suppression	Tumors
Bald eagle										
Beluga whale										
Black-crowned night heron										
Caspian tern										
Chinook-coho salmon										
Common tern										
Double-crested comorant										
Forster's tern										
Herring gull										
Lake trout										
Mink										
Osprey										

[17] Agency for Toxic Substances and Disease Registry, 1997, op. cited.

- Fifty percent of lake trout fry exposed to TCDD (2,3,7,8-tetrachlorodibenzo-p-dioxin, the most toxic dioxin compound) at levels as low as 60 parts per trillion (ppt) develop blue sac disease, ultimately leading to death. It is estimated that total dioxin equivalent concentrations (including dioxin-like PCBs and furans) in Great Lakes waters were sufficiently high from the 1940s to the late 1970s to prevent natural reproduction, and thus contributed to the collapse of the fishery.[18] This is a relatively recent hypothesis, which has been cited as evidence for the often long lag time between manifestation of an environmental problem and scientific awareness of the cause.[19]

- Tumor incidence among fish including brown bullhead has been correlated with levels of organochlorine contamination in associated sediment.[20]

1.1.2 Effects of Persistent Toxic Substances on Human Health

Laboratory and epidemiological research over the past 10 to 15 years has emphasized more subtle effects of persistent toxic chemicals on human health. Recent research on human health effects of environmental contaminants in the Great Lakes Basin was the subject of the Health Conference 97 - Great Lakes/St. Lawrence summarized in the ATSDR report.[21] The report summarized recent findings on exposure studies, many of which focused on fish consumption. The authors emphasized the strong evidence of harm to human health due to exposure to PTSs:

> *"The weight of evidence based on findings of wildlife biologists, toxicologists, and epidemiologists clearly indicates that populations continue to be exposed to PCBs and other chemical contaminants and that significant health consequences are associated with these exposures. While*

---

[18] Cook, P.M., Butterworth, B.C., Walker, M.K., Hornung, M.W., Zabel, W.W., and Peterson, R.E., 1994, *Soc. Environ. Toxicol. Chem. Abstr.*, 15:58.; Walker, M.K., and Peterson, R.E., In Dioxins and Health, (Ed. by A. Schecter), Plenum Press, New York, N.Y., pp. 309-346, 1994; Raloff, J., 1997, *Science News*, V. 151, pp. 306-307.

[19] Gilbertson, M., op. cited.

[20] Environment Canada/U.S. Environmental Protection Agency, *State of the Great Lakes 1997 - The Year of the Nearshore*, Great Lakes National Program Office, EPA 905-R-97-013, 1997.

[21] ATSDR, 1997, op. cited.

PCBs and other PTSs are declining in the environment, health concerns are still warranted.[22]

Based on the public health implications, the authors identified "the need for public health interventions."[23] Specific findings presented at the conference relating fish consumption and body burdens of contaminants included:

- Sport fisheaters consumed 2-3 times more fish than the general population, and fish consumption appears to be the major pathway of exposure for most PTSs. However, some research has shown that other foods, including meats, dairy products, and grains and cereals, may also contribute significant amounts of PTSs to human body burdens.[24]

- A significant trend of increasing body burden of PTSs is associated with increased fish consumption; individuals who consumed Great Lakes sport fish for more than 15 years have 2-4 times more pollutants in their blood serum than nonfisheaters.[25]

- In a study comparing blood serum levels of people in the five Great Lakes, frequent sport fish consumers were found to have mean PCB levels nearly eight times those of infrequent sport fish consumers. Consumers of Lake Michigan fish had significantly higher PCB levels than consumers of fish from Lakes Huron or Erie. In addition, PCB body burden was associated most strongly with the total number of years of eating Great Lakes sport fish.[26]

The report also summarized recent findings on health effects which have been related to exposure to PTSs; neurobehavioral and neurodevelopmental effects have

---

[22] ATSDR, 1997, op. cited.

[23] ATSDR, 1997, op. cited.

[24] Haines, D.A., Jordan, S.A., "Human Exposure to Priority Contaminants in the Great Lakes Basin," Presented at Health Conference 97 - Great Lakes/St. Lawrence, Montreal, Canada, 1997.

[25] Schantz, S.L., Sweeney, A.M., Gardiner, J.C., Humphrey, H.E.B., McCaffrey, R.J., Gasior, D.M., Srikanth, K.R., Budd, M.L., 1996, *Toxicol. Ind. Health*, 12: 403-417.

[26] Hanrahan, L.P., Falk, C., Anderson, H.A., Draheim, L., Steenport, D., Olson, J., Flore, B., Kanarek, M., "Serum PCB levels and Great Lakes Sport Fish Consumption," Presented at Health Conference 97 -Great Lakes/St. Lawrence, Montreal, Canada, 1997.

been particularly noted among those exposed to elevated levels of PTSs, in particular through consumption of contaminated fish:

- The *Michigan Maternal/Infant Cohort Study* had found developmental disorders and cognitive deficits in the offspring of mothers who were exposed to PTSs via fish consumption for at least six months before and during pregnancy. In their recent re-examination of 212 children from the cohort, Jacobson and Jacobson[27] found that neurodevelopmental deficits seen at infancy persisted at age 11. These deficits included a three times greater likelihood of low average IQ scores, poorer short- and long-term memory, and difficulty in paying attention.

- When compared to newborns of low- or no-fish-consuming mothers, newborn children of mothers consuming higher amounts of Lake Ontario fish were found to exhibit several behavioral deficits, including:
    - greater number of abnormal reflexes;
    - less mature autonomic responses; and
    - less attention to visual and auditory stimuli.[28]

These findings are consistent with and reinforce the findings of the Jacobsons' studies.

- The same study group investigated effects of timing of maternal fish consumption on coping behavior and temperament of the children at 24 months of age. After controlling for other variables, significant effects from timing of the mothers' fish consumption (i.e., more recent consumption having greater effects) were observed in children for several categories evaluated, including smiling, laughter and fear, duration of orienting, and distress to limitations.[29]

- Fisheaters in the St. Lawrence River region were found to exhibit several nervous system effects, including significantly greater motor slowing and poorer results on

---

[27] Jacobson, J.L., Jacobson, S.W., 1996, *N. Eng. J. Med.*, 335(11): 783-789.

[28] Lonky, E., Reihman, J., Darvill, T., Mather, J., and Daly, H., 1996, *J. Great Lakes Res.*, 22(2): 198-212.

[29] Darville, T., Lonky, E., Reihman, J., Stewart, P., "Effect of Recency of Maternal Consumption of Lake Ontario Sport Fish on Neonatal Coping Behavior and Infant Temperament," Presented at Health Conference 97 - Great Lakes/St. Lawrence, Montreal, Canada, 1997.

tests of memory and attention; these difficulties were directly related to the frequency of fish consumption.[30]

- In preliminary work investigating conception failure among Michigan anglers, Courval et al.[31] found a modest increase of risk of conception failure with increased fish consumption by men.

- Infants exposed to elevated levels of methylmercury often show greater signs of intoxication than the mother, with effects including cerebral palsy, mental retardation, and delayed walking and speech.[32]

- Increased mercury contamination of the environment continues to be cause for concern: as many as 85,000 U.S. women of childbearing age have been exposed to elevated mercury levels sufficient to affect the brain development of their babies.[33]

- The International Agency for Research on Cancer (IARC) recently revised its classification of 2,3,7,8-TCDD from "probable" to "known" human carcinogen. This revision was based on combined evidence from animal, human epidemiological, and mechanistic studies.[34]

These and other studies are showing that an understanding of the effects of human exposure to PTSs is continuing to build after years of research efforts. Some of these more subtle effects on the nervous system and development are only now being investigated in detail, twenty or more years after many PTSs (e.g. PCBs, DDT)

---

[30] Mergler, D., Belanger, S., Larrible, F., Panisset, M., Bowler, R., Lebel, J., Hudnell, K., "Early Nervous System Dysfunction in adults associated with eating fish from the St. Lawrence River System," Presented at Health Conference 97- Great Lakes/St. Lawrence, Montreal, Canada, 1997.

[31] Courval, J.M., De Hoog, J.V., Stein, A.D., Tay, E.M., He, J.P., Paneth, N., Humphrey, E.B., "Sport-Caught Fish Consumption and Conception Failure in Michigan Anglers," Presented at Health Conference 97 - Great Lakes/St. Lawrence, Montreal, Canada, 1997.

[32] Reviewed in Rice, D.C., 1995, *Environ. Health Perspect.*, V. 103 (Suppl. 9): 71-87.

[33] Commission for Environmental Cooperation, *Continental Pollutant Pathways: An Agenda for Cooperation to Address Long-Range Transport of Air Pollution in North America*, Montreal, Canada, Sept. 1997.

[34] Forum, *Environ. Health Perspect.*, 105(6) 576-577.

were banned. A recent report noted that basic toxicity testing data is not available in the public record for 75% of the top-volume chemicals in the U.S.[35] This is a large gap in knowledge that should not be tolerated by governments interested in protecting the health of their citizens. Collectively, the above review indicates the need to continue efforts aimed at lowering human exposure to PTSs, and for governments to act preemptively in restricting releases of banned, current use, and projected PTSs to the environment.

1.1.3 Fish Consumption Advisories: Increasing Numbers in the Great Lakes Region

One measure of the state of the lakes is the number of advisories in place urging citizens to limit or avoid eating fish contaminated with toxic chemicals. Primary responsibility for protecting people from the health risks of eating contaminated noncommercial fish and wildlife is with states and Native American tribal agencies in the U.S., and with provinces and First Nations in Canada. The U.S. Environmental Protection Agency (EPA) database, *Listing of Fish and Wildlife Advisories* (LFWA), is the central repository for fish consumption advisory information, it recently added information on Canadian advisories.[36] The following are among the salient facts on the most recent advisory listings in the U.S.:

- In 1996, 2,193 advisories were in place in the U.S., representing a 26% increase over 1995. These recommendations include no consumption and restricted consumption advisories for the general population and sensitive subpopulations (e.g., nursing mothers, infants, the elderly), as well as commercial fishing bans, the only category to show a decrease in number from 1995 to 1996.

- The number of advisories in the U.S. has increased 72% since 1993, in part due to increases in the number of assessments of contaminant levels in fish and wildlife tissues, as well as increased awareness of the health risks associated with consumption of chemically contaminated fish and wildlife.

- While advisories in the U.S. have been issued for 45 chemical contaminants, most have involved five contaminants: mercury, PCBs, chlordane, dioxins, and DDT and its breakdown products. These five chemicals (or classes of chemicals) were responsible for nearly 95% of all fish consumption advisories in effect in 1996.

---

[35] Environmental Defense Fund, *Toxic Ignorance: The Continuing Absence of Basic Health Testing for Top-Selling Chemicals in the United States*, 1997.

[36] U.S. EPA, Listing of Fish and Wildlife Advisories, Office of Water, EPA-823-97-007, June 1997.

- Mercury advisories in the U.S. have increased by 86% since 1993, and statewide advisories for all waters are now in effect in Ohio, Indiana, and Michigan, as well as seven other states outside the Great Lakes Basin. The majority of new 1996 mercury advisories nationwide were issued in the Great Lakes states of Wisconsin, Indiana, and Minnesota.

- Although banned long ago, PCBs are still of concern for human health: the 616 advisories in effect in 1996 represent a 41% increase from 1995. The majority of the 178 new advisories in 1996 were issued by Indiana, Wisconsin, and Minnesota.

The following are the main characteristics of Canadian advisories in the Great Lakes region:

- The great majority of the 2,617 advisories in place in Canada were issued by Ontario and Québec, and the majority of all advisories were issued for mercury, PCBs, mirex, toxaphene and dioxins. The breakdown by lake is given in the table below.

Table 2: Distribution of Canadian Fish Consumption Advisories in the Great Lakes and Lake St. Clair.[37]

Lake	Percent of Advisories Due to Contaminant				
	Mercury	PCBs	Mirex	Toxaphene	Dioxins
Superior	21	3	-	69	7
Huron	39	52	-	5	4
St. Clair*	47	53	-	-	-
Erie	24	76	-	-	-
Ontario**	22	50	27	-	1

*: Includes St. Clair and Detroit Rivers.
**: Includes Niagara and St. Lawrence Rivers.

- The data show that PCBs and mercury are consistent causes of Canadian advisories throughout the four lakes bordering Canada as well as Lake St. Clair. In addition, for reasons still unknown to researchers, high levels of toxaphene are persisting in Lake Superior, and are responsible for the majority of Ontario advisories for that lake. (Michigan has advisories for lake trout and ciscowet in Lake Superior tributaries; other states may not have toxaphene advisories due to higher action levels, not because toxaphene is not present in the U.S. waters).

---

[37] Based on *Guide to Eating Ontario Sport Fish*, 1997-1998, Ontario Ministry of Environment and Energy.

Due to historic point source discharges from the U.S. side, the pesticide mirex is still responsible for one-fourth of the provincial advisories for Lake Ontario.

- In Lake Superior, consumption restrictions on lake trout, whitefish and chinook salmon are generally due to toxaphene, while restrictions on walleye and northern pike are due to mercury. In contrast, in Lake Huron, restrictions on trout, salmon, carp and channel catfish are generally due to PCBs. Lake Erie has the lowest proportion of sport fish with consumption restrictions (19%), and these restrictions are generally for PCBs. (Michigan and Ohio have consumption advisories for Lake Erie perch and walleye, two of the most popular species).

- While levels for many contaminants have declined over the last 20 years, concentrations are still sufficiently high in some species to warrant advisories. For example, although lake trout PCB levels have declined to 25% from 1976 levels in southern Lake Huron, current levels are still above the unrestricted consumption guideline.[38]

- Athough mercury levels declined in areas of Lake St. Clair due to controls on discharge from a chlor-alkali plant on the St. Clair River, levels have not dropped appreciably since the early 1980s,[39] which may reflect continued inputs to the watershed from the atmosphere. Similarly, mirex levels in Lake Ontario rainbow trout have shown very little decline since the early 1980s,[40] which may indicate both cycling of historically deposited mirex in river and lake sediments, as well as inputs from the atmosphere.

Despite the breadth of fish consumption advisories in the Great Lakes region, there is evidence that many fish consumers are not aware of or not following guidelines. Dr. Henry Anderson of the Wisconsin Department of Public Health conducted a study on Great Lakes sport fish consumption from April 1993 to February 1994. Among the 4.7 million residents (8.4% of the Basin population) who ate sport fish during the preceding year, the following results stand out:[41]

---

[38] *Ibid.*

[39] *Ibid.*

[40] *Ibid.*

[41] Something's Fishy, Sierra Club Great Lakes Program, 1997; Anderson, H., personal communication.

- Forty-two percent of men, and 61% of women did not know about fish consumption advisories.

- Only about one-half the men aware of advisories followed the recommendations concerning frequency of meals, and only 43% used advisory guidelines to restrict where they fished.

- Only 22% of minority anglers were aware of the advisories.

Other research on fish consumption patterns was presented at the Health Conference 97 - Great Lakes/St. Lawrence. Significant findings presented included:

- In a study of women from households with fishing licences in Wisconsin, socioeconomic status was the principal determinant of their awareness of the dangers of consumption of sport fish; in addition, news media were more effective than interpersonal sources in informing people, and saliency (that is, whether the women were pregnant, hoping to become pregnant, or had children) was the least effective predictor of the respondent's knowledge of the advisories.[42]

- In an analysis of data in the Ojibwa Health Study, 92.1% of respondents reported eating some fish on a regular basis, most respondents were either unaware of or had not read state fish consumption advisories, and only 26.7% of respondents reported decreasing fish consumption over the previous five years.[43]

- In a study of 139 Mohawk men living near a Superfund site in New York, 97% were aware of advisories, and 66% had changed local consumption patterns as a result. But while the average number of local fish meals per year declined from 89 to 21 in the two plus years before the interview, 70% of the men still ate local fish in the preceding year.[44]

---

[42] Godfrey, R., Dunwoody, S., Bro, K., Kanarek, M., "The Saliency of a Risk Message and the Motivation to Respond: Closing the Knowledge Gap," Presented at Health Conference 97- Great Lakes/St. Lawrence, Montreal, Canada, 1997.

[43] Hansen, L.K., Hegmann, K.T., Dellinger, J.A., and Kmiecik, N., "Environmental Risk Management Strategies for Ojibwa Communities," Presented at Health Conference 97- Great Lakes/St. Lawrence, Montreal, Canada, 1997.

[44] Fitzgerald, E.F., Hwang, S.A., Tarbell, A., Jacobs, A., "Dietary and Occupational Exposure to PCBs Among Mohawk Men at Akwesasne," Presented at Health Conference 97 - Great Lakes/St. Lawrence, Montreal, Canada, 1997.

In summary, numerous fish consumption advisories are in place in all the Great Lakes and thousands of inland waters in the Great Lakes Region.[45] Because the advisories are based on single chemicals or chemical groups, fish consumers throughout the Great Lakes should be even more cautious about consuming fish potentially containing many toxic chemicals. In addition, state and provincial agencies need to do a better job of informing citizens about the potential hazards of Great Lakes sport fish consumption, coordinating the development of consistent advisories, and encouraging that greater precautions are taken, especially for more sensitive populations.[46] Additionally, the increase in fish consumption advisories in the Great Lakes Basin indicates the continuing presence of PTSs in fish at levels that may threaten human health. In contrast, the recent State of the Lakes report described fish consumption advisories as "mixed/improving."[47] The fact that concentrations of many PTSs in biota have remained relatively constant for the past 10-15 years (see next section), and that subtle human health effects are increasingly being documented indicate that fish consumption advisories will likely be in place for a number of years, until further actions are taken to reduce the level of toxic substances in the environment.

1.2 Loadings, Sources, and Concentration Trends of Contaminants in the Great Lakes

1.2.1 Loadings of Persistent Toxic Substances in the Great Lakes Region

Following the imposition of controls on direct discharges of PTSs to surface waters in the 1970s, pollutant loadings from the atmosphere became increasingly important for the Great Lakes. In a study of Canadian *National Pollutant Release Inventory* (NPRI) and U.S. *Toxic Release Inventory* (TRI) data for 1993 and 1992, respectively, it was found that 73.2% of releases in the Great Lakes Basin were to the air.[48] An analysis of more recent U.S. TRI data found that industries in the eight Great Lakes

---

[45] Additional information on state-by-state advisories is available at the Great Lakes Information Network Web site: http://www.great-lakes.net/envt/wildlife/fishadvis.html.

[46] Michigan has been the lone Great Lake state to resist the recommendations in the Great Lakes Sport Fish Advisory Protocol (see, for example, letter from U.S. EPA to Governor John Engler on salmon advisories: http://www.greatlakes.nwf.org/toxics/eng-fis.htm).

[47] *State of the Great Lakes*, 1997, p. 7.

[48] Environment Canada, *Industrial Releases Within the Great Lakes Basin: An Evaluation of NPRI and TRI Data*, November 1995.

states reported releasing over 17 million pounds of endocrine disrupting compounds to the air in 1995, which was 90% of total reported releases.[49] In addition, over 62 million pounds of OSHA carcinogens and 113 million pounds of reproductive toxins were released to the air in the Great Lakes states, amounting to 90.8 and 99.8% of total releases, respectively. Thus, for a large number of these chemicals, the atmosphere will be the main source of new loadings to the Great Lakes. Earlier data showed that atmospheric contributions to the total loadings for the upper Great Lakes was 95% for lead, 58-89% for PCBs, and 80-96% for polycyclic organic matter (chemicals such as benzo(a)pyrene, and anthracene).[50] More recent data for several critical pollutants is given below.

Mercury

Mercury contamination is increasingly of concern in the Great Lakes and around the world; recent estimates indicate that human activity has tripled the concentrations of mercury in the atmosphere and surface waters, compared to pre-industrial levels.[51] In a modelling study, Shannon and Voldner[52] found that current anthropogenic emissions account for 83% of the loadings to the Great Lakes. Hoff et al.[53] recently estimated that 91% of the mercury inputs to Lake Superior were via atmospheric deposition. In addition, the amount of mercury volatilizing (evaporating) from the lake was approximately 21% of the total coming in from the atmosphere.

---

[49] Environmental Information Center, Great Lakes Report on Hormone Disrupting Chemicals, June 1997.

[50] U.S. EPA, First Great Waters Report, op. cited.

[51] Mason, R.P., Fitzgerald, W.F., and Morel, F.M.M., 1994, *Geochim. Cosmochim. Acta,* 58(15): 3191-3198.

[52] Shannon, J.D., Voldner, E.C., 1995, *Atmos. Environ.*, 29(14): 1649-1661.

[53] Hoff, R.M., Strachan, W.M.J., Sweet, C.W., Chan, C.H., Shackleton, M., Bidleman, T.F., Brice, K.A., Burniston, D.A., Cussion, S., Gatz, D.F., Harlin, K., and Schroeder, W.H., 1996, *Atmos. Environ.*, 30(20): 3505-3527.

1.2.3 Concentration Trends of Contaminants in the Great Lakes Region

The concentrations of persistent toxic substances in the Great Lakes decreased significantly from high levels in the 1960s and 1970s, but generally stopped declining in the 1980s. Currently, the U.S. government has only a limited number of monitoring programs aimed at gathering data to investigate the trends of persistent toxic chemicals, which is essential in knowing the efficacy of control programs. The National Oceanic and Atmospheric Administration (NOAA) *National Status and Trends Program* monitors more than 70 chemical contaminants in bottom-feeding fish, shellfish, and sediments at approximately 300 coastal and estuarine locations throughout the United States. This program includes the *Mussel Watch Project*, which began in 1986. Although a good approach to assessing contaminant trends, this project does not include the Great Lakes Basin in its purview. The U.S. EPA *Environmental Monitoring and Assessment Program* (EMAP) include sites in the Great Lakes, but only a limited number of contaminants are monitored. The *National Biomonitoring Specimen Bank* (NBSB) was developed out of the *Environmental Specimen Bank Program* initiated by U.S. EPA in 1979. Again, the focus of this program is coastal and estuarine waters.

Other U.S. programs include *Aerometric Information Retrieval System* (AIRS), a computer-based information repository administered by the U.S. EPA, Office of Air Quality Planning and Standards (OAQPS). While the program involves hundreds of sites monitoring states' progress in attaining federal standards for air pollutants, the system only covers the six criteria pollutants (carbon monoxide, ozone, sulphur dioxide, nitrogen dioxide, lead and particulate matter). The *Mercury Deposition Network* (MDN), created in 1994, shows promise in providing trend information, but data has only recently become available.

The Canadian government has several programs that have monitored contaminant levels in the Great Lakes, largely in biota. The Canadian Department of Fisheries and Oceans (DFO) runs the *Great Lakes Contaminants Surveillance Program* (GLCSP). The *Great Lakes Fisheries Specimen Bank* (GLFSB) is a complementary program which, since 1977, has monitored levels of metals and organochlorine compounds in aquatic biota throughout the Canadian Great Lakes. The program has proved reliable in obtaining data on archived samples, consistent with analyses done at the time of sampling, over a 16 year period.[60] The *Environmental Effects Monitoring Program* was developed to assess the overall adequacy of national effluent regulations for protecting fish, fish habitat, and the use of the fisheries

---

[60] Kiriluk, R.M., Whittle, D.M., Keir, M.J., Carswell, A.A., and Huestis, S.Y., 1997, *Chemosphere,* 34(9/10): 1921-1932.

resource.[61] (As of October, 1997, there is minimal recent data presented at the Web site.)

The following brief analysis presents summaries of contaminant trend data from biota, sediment, precipitation, air, and surface water in the Great Lakes region that has appeared in the recent scientific literature.

Concentration Trends of PTSs in Fish and Wildlife in the Great Lakes Region

Analysis of fish and wildlife has provided the most extensive database of contamination trends in the Great Lakes region. These databases have been compiled by both the U.S. EPA, Environment Canada, and individual researcher highlights of recent trends, mostly from the scientific literature, are given below:

- A joint program involving several U.S. government agencies, including the Fish and Wildlife Service and the Great Lakes National Program Office of the EPA has been monitoring levels of PTSs in Great Lakes trout and walleye since the 1970s. A recent paper by De Vault et al.[62] reported the following results:
    - Mean PCB concentrations in Lake Michigan Lake trout declined from 23 pg/g (ppm) to 2.6 ug/g, but showed no significant decline from 1986 to 1992.
    - Mean total DDT concentrations followed a similar trend, decreasing from 19.2 pg/g to 1.1 ug/g from 1970 to 1986, but remaining at 1.2 ug/g in 1992. Similar trends were observed for PCBs and DDT in lake trout from Lakes Superior, Huron and Ontario.
    - Concentrations of both PCBs and total DDT in Lake Erie walleye declined from 1977 to 1982, but remained relatively constant through 1990.
    - Concentrations of the pesticide toxaphene (termed "apparent toxaphene" by the researchers, due to difficulties in identifying this complex mixture) were observed to show no systematic trends with time over the period 1986 to 1992. In addition, concentrations in Lakes Superior and Michigan were higher than the other two lakes, differing from the trends for most other contaminants.

---

[61] Environmental Effects Monitoring Program of Environment Canada Web site: http://www.doe.ca/eem/english/default.htm.

[62] De Vault, D.S., Hesselberg, R., Rodgers, P.W., and Feist, T.J., 1996, *J. Great Lakes Res.*, 22(4): 884-895.

- Earlier data showed no significant decrease in mercury concentrations in whole fish from a number of sites in the Great Lakes between 1976 and 1984.[63] Information on more recent trends has not been published.

- Analysis of Lake Ontario lake trout for PCBs, PCDDs (dioxins), and PCDFs (furans) from 1977 to 1993 found substantial declines in overall toxicity (as measured by toxic equivalency factors) during this period, however, most contaminants appeared to have reached a steady state, or to be declining very slowly, by the 1980s.[64]

- In contract, De Vault et al.[65] found that concentrations of the most toxic dioxin compound (2,3,7,8-TCDD) increased slightly overall from 1977 to 1993 in archived Lake Ontario lake trout samples.

- Concentrations of the pesticide toxaphene measured in Great Lakes lake trout and smelt in 1982 and 1992 were found to have declined for all lakes except for Lake Superior. Reasons for the lack of decline in Lake Superior, despite the 1982 registration cancellation of the pesticide, have not been identified, but may indicate a lake-specific source. In spite of the declines for the other lakes, toxaphene concentrations in lake trout from Lakes Michigan and Huron were still relatively high (1.5 and 2.4 ppm, respectively).[66] These levels are in the range of food tolerance restrictions established under the U.S. Federal *Insecticide, Fungicide and Rodenticide Act*,[67] indicating the need for caution among fish consumers.

- Concentrations in total PCBs (measured in terms of two Aroclor mixtures) declined in herring gull eggs in Lakes Erie and Ontario (by 31 and 68%, respectively) between 1981 and 1992. However, total PCB declines were more moderate for

---

[63] Schmitt, C.J., Brumbaugh, W.G., 1990, *Arch. Environ. Contam. Toxicol.*, 19: 731.

[64] Huestis, S.Y., Servos, M.R., Whittle, D.M., van den Heuvel, M., Dixon, D.G., 1997 *Environ. Toxicol. Chem.*, 16(2): 154-164.

[65] De Vault, D., Bertram, P., Whittle, D.M., and Rang, S., 1995, Toxic Contamination in the Great Lakes, Background Paper, 1994 State of the Lakes Ecosystem Conference.

[66] Glassmeyer, S.T., De Vault, D.S., Myers, T.R., and Hites, R.A., 1997, *Environ. Sci. Technol.*, 31: 84-88.

[67] ATSDR (Agency for Toxic Substances and Disease Registry), Toxicological Profile for Toxaphene, U.S. Department of Health and Human Services, Public Health Service, August 1996.

double-crested cormorant eggs in Lake Erie (28%) and declines were not statistically significant for cormorant eggs in Lake Ontario. In addition, when considering the most toxic PCB congeners, there was little change in overall toxicity in double-crested cormorant eggs for both lakes.[68]

- Dioxin levels in herring gull eggs in several colonies in the Great Lakes region declined from 1981 to 1984, but showed no obvious temporal trends from 1984 to 1991. In addition, mean TCDD levels in eggs from Saginaw Bay and two Lake Ontario sites significantly greater than those from ten other sites scattered around the other lakes.[69]

- Limited data on total PCB levels in osprey eggs from various parts of the Great Lakes Basin have not changed markedly since the 1970s. In addition, limited data also indicates no change, or even increases in mercury concentrations in osprey eggs over the same period.[70]

In conclusion, there is a large body of data documenting the trends in contaminant levels in the Great Lakes biota for nearly three decades. The significant decreases in contamination levels in biota in the 1970s had in nearly all cases stopped by the 1980s, so that levels for the past 15 years have shown very little, if any, decrease in most cases.

Concentration Trends of PTSs in Sediments of the Great Lakes

Because sediments accumulate chemicals in documentable ways, they can be used to track the loadings of PTSs to lake waters through time. Several recent studies have reported distributions of PTSs in lake sediments, and have shown that although levels peaked in the 1970s in the Great Lakes, concentrations are still well above pre-industrial background levels.

- Analyses of samples for dioxin in Lakes Superior, Michigan, and Ontario indicate that accumulation began in the 1930s, concentrations peaked in the early-to-mid 1970s, and recent inputs amount to about 50 of the levels of the 1970s for Lakes

---

[68] Haffner, G.D., Straughan, C.A., Weseloh, D.V., and Lazur, R., 1997, *J. Great Lakes Res.*, 23(1): 52-60.

[69] Hebert, C.E., Norstrom, R.J., Simon, M., Braune, B.M., Weseloh, D.V., and Macdonald, C.R., 1994, *Environ. Sci. Technol.*, 28: 1268-1277.

[70] "The Fall and Rise of Osprey Populations in the Great Lakes Basin," Great Lakes Fact Sheet, Environment Canada, 1994.

Michigan and Ontario. In addition, the data in Lake Ontario suggested that significant non-atmospheric sources contributed dioxin to the lake.[71]

- In a just-released paper on accumulation of dioxins and furans in Great Lakes sediments, Pearson et al.[72] reported that significant accumulation began about 1940, peaked about 1970, and declined to present rates, which are still 30 to 70% of the highest levels.

- A recent paper on dioxins, furans, and PCBs in the Baltic Sea indicated that the highest 2,3,7,8-TCDD levels were in the top two centimetres of sediments (corresponding on average to the period from 1985 to the present).[73] Though this was not a Great Lakes study, contamination of waters by dioxin and other chemicals is a global problem, and this study indicates that contamination is continuing despite some efforts at controls.

Concentration Trends of Mercury in Precipitation of the Great Lakes Region

Ongoing research on precipitation in Minnesota has shown mercury levels increased by 5.7% per year from 1990 to 1995 at six sites across the state, which the researchers have related to soft coal consumption in the region.[74]

Concentration Trends of PTSs in Air of the Great Lakes Region

There have been few systematic long-term monitoring studies of PTSs in the atmosphere of the Great Lakes region. Persistent toxic substances such as PCBs, DDT, and mercury can occur in the gas phase and attached to particles in the air. Recent data indicate that while concentrations of some chemicals in some cases are continuing to fall, urban air continues to carry high burdens of some of these chemicals.

---

[71] Pearson, R.F., Swackhamer, D.L., 1995, *Organolhalogen Compd.,* 24: 267-271.

[72] Pearson, R.F. Swackhamer, D.L., Eisenreich, S.J., and Long, D.T., 1997, *Environ. Sci Technol.*, 31: 2903-2909.

[73] Kjeller, L.0., Rappe, C., 1995, *Environ. Sci. Technol.,* 29: 346-355.

[74] Glass, Gary, personal communication.

- In an intensive study of PCBs in the gas phase in the Great Lakes region, Hillery et al.[75] found that concentrations near Lake Superior remained relatively unchanged in the period 1991 - 1995, while concentrations near Lakes Michigan and Erie declined only slightly. The latter results indicated that the half-life of PCBs (the time for one-half the amount to be depleted) in the air over these lakes was approximately six years. Together, the data indicate that as with other environmental compartments, levels of PCBs are declining only gradually in the Great Lakes environment.

- A recent paper reported on particulate metal concentrations in the air of metropolitan Detroit. Although mercury levels showed a general decrease during the 1970s, concentrations increased by about 11% per year 1982 to 1992. The authors suggested that the increase for mercury, as well as cadmium and zinc, may have been due to both the start up of two major incinerators and the continuing operation of over 1600 other incinerator units during that period.[76] Pirrone et al.[77] noted that his significant increase and strong relationship to incinerator capacity may not be as discernible on a continental scale. In addition, the ecological effects of even small increases in anthropogenic mercury can be significant, especially closer to local and regional sources.

Concentration Trends of PTSs in Great Lakes Water Samples

There is limited data on long-term trends in water concentrations in the Great Lakes. Jeremiason et al.[78] evaluated data collected from their laboratory over the past two decades for PCBs in Lake Superior, and found a systematic decrease of approximately 20% each year in concentrations from 1980 to 1992. They estimated that most of the losses were due to volatilization, indicating that chemicals discharged historically to water and sediments in one location can later volatize to the air, causing increased contamination at other locations.

---

[75] Hillery, B.R., Basu, J., Sweet, C.W., and Hites, R.A., 1997, *Environ. Sci. Technol.*

[76] Pirrone, N., Keeler, G.J., Nriagu, J.O., and Warner, P.O., 1996, *Water Air soil Pollut.,* 88: 145-165.

[77] Pirrone, N., Keeler, G.J., Nriagu, J.O., 1996, *Atmos. Environ.*, 30(17): 2981-2987.

[78] Jeremiason, J.D., Hornbuckle, K.C., and Eisenreich, S.J., 1994, *Environ. Sci. Technol.*, 28: 903-914.

Typical open water concentrations for PCBs and dieldrin in the Great Lakes exceed Great Lakes Water Quality Criteria by factors ranging from 46 to 310 for PCBs, and 40 to 58 for dieldrin.[79]

Conclusions on Concentration Trends

The review above shows that for most of the PTSs of concern in the environment, the levels in biota, water, air, and sediments which showed more rapid declines in the 1970s and early 1980s have since levelled off. Regarding contaminant concentrations in fish, researchers have generally attributed the relatively steady concentrations to either other contaminant pools (e.g., contaminated sediments) or food chain modifications. In either case, there is an obvious need to address poorly controlled sources (such as the atmosphere, contaminated sediments, and possibly landfills and other point sources) which are at least in part allowing for high contaminant concentrations to be present in Great Lakes biota. In order to better ascertain the trends for all PTSs and implement effective control and remediation strategies, the governments need to initiate and expand more extensive monitoring programs for more chemicals in diverse areas of the Great Lakes Basin.

1.3 Other Issues of Concern

Exotic Species such as zebra mussel, round gobi, and other animals and plants in the Great Lakes have drawn much attention by researchers and policy makers in recent years. Because exotic species can sometimes influence water quality and trophic dynamics in the Great Lakes, they can also potentially influence the fate of toxic chemicals in the waters. For example, DePinto and Narayanan[80] found in a computer model that high densities of zebra mussels in Lake Erie's western basin could reduce total suspended solids in the water by 66%, particulate PCB concentrations by 42%, and increase PCB concentrations in the sediments by 42%. In addition, by removing particulate from the water column, the zebra mussel invasion is allowing for an increase in the bioavailable fraction of upper layers of water, potentially allowing for increased bioaccumulation in the food web. Other researchers also reported similar effects of zebra mussels in experiments using heavy metals, with increased accumulation of metals in the lake sediments.[81]

---

[79] U.S. EPA, *Second Great Waters Report*, 1997, op. cited.

[80] DePinto, J.V., Narayanan. R., *Great Lakes Res.*, 3(1): 1-8.

[81] Klerks, P.L., Fraleigh P.C., Lawniczak, J.E., 1997, *Can. J. Fish. Aquat. Sci.*, 54: 1630-1638.

1.4 Overall State of the Lakes

Fish and Wildlife

Although levels of most contaminants in the Great Lakes had declined significantly by the early 1980s, levels for many have not declined appreciably since then. This is in contrast to the assessment in the State of the Great Lakes 1997 report, which gives a uniform "improving" rating in its indicators section for concentrations of persistent toxic substances in water, sediments, fish and wildlife.[82] In addition, healthy population levels are still not seen in all bird species; for example, the Caspian tern population is still recognized as vulnerable in Canada, and common terns are declining in the Canadian Great Lakes, a situation which may be partly attributable to toxic chemical contamination.[83] Although bald eagle populations have rebounded in much of the Great Lakes, eagles are still not breeding on the shores of Lake Ontario, and reproduction on the shores of the upper lakes is largely due to recruitment of inland populations. There still are fewer eagle pairs in the eastern portion of Michigan's Upper Peninsula than in the 1960s (20 as compared with 38).[84] Populations of the uncommon birds black terns, Forster's tern, and the little gull are all decreasing in the Great Lakes.[85]

Some improvements have been noted in dioxin levels in fish taken from sited affected by pulp and paper industry effluents. Data from 39 sites in 14 states in the four major U.S. paper-making regions showed decreases in levels of the most toxic dioxin compound (2,3,7,8-TCDD) at 84% of the sites.[86] However, data from specific locations, including in the Great Lakes region, were not presented.

As noted above, water concentrations of PCBs and dieldrin in all the Great Lakes continue to exceed Great Lakes Initiative (GLI) criteria designed to protect the most

---

[82] Environment Canada/U.S. EPA, 1997, op. cited, Table 4.

[83] The Terns of the Canadian Great Lakes, Great Lakes Fact Sheet, Environment Canada, 1997.

[84] Bowerman, W., "Examining the Effects of Persistent Toxic Substances on the Bald Eagle," Presented at the Lakewide Management Plan Workshop: Human Health and Aquatic Life Considerations - Examining the Effects of Persistent Toxic Substances, Sept. 19, 1997, Cleveland, OH.

[85] Environment Canada/U.S. EPA, 1997, op. cited.

[86] Abbott, J.D. and Hinton, S.W., 1996, *Environ. Toxicol. Chem.*, 15(7): 1163-1165.

sensitive wildlife species by factors ranging from 40 to 310.[87] Because use of these chemicals in the U.S. and Canada has been restricted for decades, this indicates the very long recovery times that can be required for past pollution mistakes. In addition, because other PTSs such as hexachlorobenzene and octachlorostyrene have received less attention in effects research, it is possible that more subtle effects on fish and wildlife due to these and other chemicals are occurring, but have not yet been evaluated in laboratory or field settings to the extent necessary to observe them.

Human Health

Evidence is increasingly mounting that PTSs can cause harm to human health at levels well below those that cause acute toxicity. The recent ATSDR report[88] on wildlife and human health effects of Great Lakes pollutants noted that background human body burdens of dioxin toxic equivalents were well within an order of magnitude of levels found to have effects on eight measures in laboratory and human health studies. The ATSDR report noted that the studies presented indicate that:

(1) reproductive function may be disrupted by exposure to PCBs and other PTSs;
(2) neurobehavioral and developmental deficits occur in newborns and continue through school aged children from in utero exposure to PCBs and other PTSs;
(3) other systemic effects, e.g., self-reported liver diseases and diabetes, may be associated with elevated serum levels of PCBs; and
(4) increased cancer risks are associated with PCB exposures.[89]

As noted previously, 1996 saw a record number of fish consumption advisories in the U.S., many of which were in the Great Lakes states. This is in contrast to the assessment of a "mixed" but "improving" trend for fish advisories offered in the recent State of the Great Lakes 1997 report, which based its conclusions on Ontario's assessment.[90]

The persistence of many of these bioaccumulative chemicals means that once released into the environment, they can do damage both over long time periods and far from their original source, and any remediation efforts on a large scale are

---

[87] U.S. EPA, *Second Great Waters Report*, op. cited.

[88] ATSDR, 1997, op. cited.

[89] *Ibid.*

[90] E.C./U.S. EPA, 1997, op. cited, Table 9.

impossible. Therefore, pollution prevention strategies remain the key to reducing new toxic chemical releases, and consequently burdens in humans, fish, wildlife, and the ecosystem in general. However, remediation of toxic hotspots such as landfills and contaminated sediment sites in harbors and connecting channels, is still a necessary means of reducing exposure levels for those pollutants already released.

1.5 Conclusion and Recommendations

In conclusion, the evidence from hundreds of studies over the past three decades indicates that injury to fish, wildlife and humans has occurred and continues to occur in parts of the Great Lakes Basin due to contamination from PTSs. This contamination is continuing via inputs from sources including contaminated sediments, landfills, and industrial stacks via the atmosphere, in contradiction to the goals of the GLWQA.[91] The impairment of beneficial uses includes restrictions an fish and wildlife consumption, degradation of fish and wildlife populations, and animal deformities and reproductive problems, all items which are supposed to be addressed by Remedial Action Plans (RAPs) and Lakewide Management Plans (LaMPs).[92] The injury to fish, wildlife and humans and other impairment of beneficial uses is in contradiction to the GLWQA. Therefore, the governments need to take additional actions to address the continuing sources of toxic contaminants to the Great Lakes (atmospheric deposition, contaminated sediments, and landfills) that are impairing the health of wildlife, fish, and people in the Great Lakes region.

RECOMMENDATION: **Therefore, the governments need to take additional actions to address the continuing sources of toxic contaminants to the Great Lakes, and continue and fully fund on-going monitoring networks and specimen banking projects.**

Source, Loading and Concentration Trend Assessments

Improved assessment of the uses, sources, deposition pathways, and concentration trends is needed for all critical pollutants in the Great Lakes Basin. Source identification and deposition monitors trends of the six criteria air pollutants; however,

---

[91] IJC, 1989, op. cited.

[92] *Ibid.*, Annex 2.

lead is again the only PTS considered in this program.[93] The U.S. EPA *Regional Air Pollutants Inventory Development System* (RAPIDS) database is potentially a more useful program in assessing the magnitudes of toxic chemical sources in the Great Lakes Basin.[94] The U.S.TRI and Canadian NPRI are both limited by their relatively high thresholds, limited chemical coverage, lack of accounting for area and mobile sources, and lack of accounting of differing toxicities of chemicals released. The ongoing *National Toxics Inventory* (NTI) has the potential to better describe emissions of hazardous air pollutants due to the inclusion of data and sources not included in the TRI database[95] In addition to improving in the above areas, a concerted effort by the U.S., Canada and Mexico to develop integrated emissions inventories will be necessary to accurately assess pollutant emissions (as recommended by the Commission for Environmental Cooperation),[96] and give a better basis for priorities in pollution prevention efforts. Other programs involving air toxics are discussed in the Airborne Toxic Substances section (Chapter 5) of this report.

The creation of the Mercury Deposition Network (MDN) in 1994 will increase the EPA's ability to monitor mercury in precipitation, but a program is also required to systematically measure mercury levels in water and fish of the Great Lakes biota, and possibly water. Because programs such as MDN have just begun to gather data, other means of assessing longterm trends (including analyses from specimen banks as noted earlier and coordinated efforts examining soil and sediment deposition records from diverse areas) will be needed to accurately gauge progress in emissions controls and subsequent decreased loadings in the environment. In light of these needs, actions such as the 1992 decision to discontinue specimen collection for the National Status and Trends specimen bank are clearly in the wrong direction.[97]

---

[93] U.S. EPA, *National Air Pollutant Emission Trends Report*, 1990-1995, Office of Air Quality Planning and Standards, Web site: http://www.epaa.gov/oar/emtrnd/execsumm.htm.

[94] See Great Lakes Commission Web Site: http://www.epa.gov/airprogm/aor/oaqps/efig/ei/faq12.html#toxics.

[95] See U.S. EPA Web site for link to NTI information: http://www.epa.gov/airprogm/oar/oaqps/efig/ei/faql2.html#toxics.

[96] Commission on Environmental Cooperation, op. cited, 1997.

[97] Becker, P.R., Wise, S.A., Thorsteinson, L., Koster, B.J., Rowles, T., 1997, *Chemosphere*, 34(9/10): 1889-1906.

Whie the governments need to do more in the areas of source assessment and trend monitoring, there is also the need for greater understanding in the research community in the areas of transfer of pollutants between environmental compartments and load reduction models. In a recent survey by the Council of Great Lakes Research Managers, 85% of research respondents working in these areas reported they would see a decrease in funding for those activities.[98] These reductions would potentially affect the research needs of RAPs and LaMPs, which as described later in this report, are in dire need of an infusion of energy and commitment.

RECOMMENDATION: **The governments need to create new programs and expand existing programs assessing the sources of PTSs to the environment, make greater efforts to investigate the importance of different loading pathways of a larger number of toxics to the Great Lakes, and continue and fully fund ongoing monitoring networks and specimen banking projects.**

Health Effects Research

Positive developments in research programs include the *Great Lakes Human Health Effect Research Program* established by U.S. Agency for Toxic Substances and Disease Registry.[99] This program is a step in the right direction of assessing actual and potential human health harm caused by PTSs in the Basin. Other programs such as the *New York Angler Cohort Study*, the *Effects on Aboriginals from the Great Lakes Environment* and Health Canada's *Great Lakes Health Effects Program* are examples of studies that can potentially elucidate the far-ranging effects that must be considered and respect to PTSs.

Numerous studies in the area of endocrine disruptors research have shown the possible subtle and transgenerational effects of anthropogenic chemicals on fish, wildlife and human health. The creation by the U.S. EPA of the Endocrine Disruptor Screening and Testing Advisory Committee (EDSTAC) is potentially a very valuable tool in determining protocols and assessing the endocrine disrupting hazards of

---

[98] Council of Great Lakes Research Managers, "Improving the Effectiveness of Great Lakes Research," prepared for the plenary session at the 40th Conference of Great Lakes Research, Buffalo, NY, June 4, 1997.

[99] Agency for Toxic Substances and Disease Registry, Great Lakes Human Health Effects Research Program, U.S. Department of Health and Human Services, Public Health Service, undated.

current use and possible future use of chemicals.[100] Because concerted efforts at understanding the subtle effects of the thousands of chemicals to which fish, wildlife, and humans are potentially exposed have only recently begun, the governments should be cautious regarding the use and release of both new and existing toxic substances. For example, a Canadian group recently reported some of the first measurements of the breakdown products of nonylphenol polythoxylate surfactants in the Great Lakes.[101] Although levels were below acute toxicity thresholds, levels were reported to be high enough to warrant concern regarding longterm effects on reproductive health of fish. Researchers have found that low levels of nonylphenol can cause an estrogen-like response in rainbow trout liver cells.[102] Other Canadian researchers recently noted discovering a flourine-containing dioxin compound present in a lamprey-killing chemical used in the Great Lakes.[103] This is a further reminder of the need for Great Lakes managers to be forward-thinking in preventing possible adverse effects of management decisions, and for governments to reduce reliance on toxic chemicals that may be released intentionally or unintentionally to the Great Lakes Ecosystem.

Increased health research must be directed at the problem of multiple chemical exposures that Great Lakes citizens face. The toxic equivalency (TEQ) approach is one means of assessing multiple chemical exposure levels. Much more extensive laboratory and field studies must be conducted to assess the potential effects of multiple chemicals. Because humans, fish and wildlife are exposed to potentially thousands of synthetic chemicals, much more research is needed on the possible combined effects of the most hazardous compounds, and multiple exposure should be considered when determining pollutants criteria, as more information becomes available.

RECOMMENDATION: **The governments need to fully support programs such as the U.S. *Great Lakes Human Health Effects Research*, Canada's *Great Lakes Health Effects Program* and the *Effects on Aboriginals from the Great Lakes Environment*, continue to**

---

[100] See U.S. EPA Endocrine Disruptor Web site: http://www.cpa.gov/opptintr/opptondo/index.html.

[101] Bennie, D.T., Sullivan, C.A., Lee, H.B., Pert, T.E., Maguire, R.J., 1997, *Sci. Total Environ.*, 193: 263-275.

[102] Jobling, S., Sumpter, J.P., 1993, *Aquat. Toxicol.*, 27: 361-372.

[103] Raloff, J., op. cited., 1997.

support investigations of ecological and human health effects of endocrine disrupting chemicals, and give greater priority to research on the effects of multiple chemical exposure on fish, wildlife, and human.

RECOMMENDATION: **The governments need to take additional actions to address the continuing sources of toxic contaminants to the Great Lakes (atmosphere deposition, contaminated sediments, and landfills) that are impairing the health of wildlife, fish and people in the Great Lakes region.**

Finally, increased research must be directed at the health effects of PTSs on children. The combination of greater relative food intake, behaviour both indoors and outside, and unique physiology and state of development make children more susceptible to the exposure and effects of many household and environmental toxicants.[104]

---

[104] Goehl, T.J., *Environ. Health Perspect.*, 105(6): 564-565.

CHAPTER 2: VIRTUAL ELIMINATION OF PERSISTENT TOXIC SUBSTANCES

2.0 Introduction

Those provisions relating to persistent toxic substances are the cornerstone of the GLWQA. As has been shown in chapter 1 these substances, while recognized to be a concern for over twenty years, remain a major challenge for the Great Lakes.

The key provisions of the Agreement relating to persistent toxic substances are outlined in Article II, which defines the policy goals for the GLWQA, and Annex 12. Article II states that:

> *The discharge of toxic substances in toxic amounts be prohibited and the discharge of any or all persistent toxic substances be virtually eliminated.*

Annex 12 directs itself to persistent toxic substances. The annex discusses general principles, programs, monitoring, an "early warning system," human health, research and reporting. In terms of general principles, the annex states that, when a jurisdiction is designing a regulatory strategy, the strategy must be adopted in accordance with the "philosophy of zero discharge" and the "reduction in the generation of contaminants, particularly persistent toxic substances." This latter phrase is commonly interpreted to be a directive to jurisdictions to further pollution prevention, as opposed to pollution control, approaches when implementing regulatory strategies.

Annex 12 gives a number of indicators for evaluating progress in "regulatory strategies and programs." A number of IJC recommendations also have provided yardsticks in this regard. These indicators can be listed as follows:

> (I) Are regulatory strategies being designed in the "philosophy of zero discharge?" [Annex 12 (2)(a)(I)(ii)]
> (ii) What progress has been made in furthering pollution prevention? [IJC recommendations, First Biennial Report and Third Biennial Report]
> (iii) Have the governments adopted a "weight of evidence" approach [Sixth Biennial report] and "reverse onus" in their laws? [IJC Fifth Biennial Report]
> (iv) Have the governments adopted an expanded definition of persistent toxic substances? [Sixth Biennial Report]
> (v) Have the governments sunset PCBs, DDT, dieldrin, toxaphene, hexachlorobenzene? [IJC Sixth Biennial Report]

The purpose of this chapter is to assess the progress the jurisdictions have made in furthering Article II and Annex 12 of the GLWQA, i.e., to determine to what extent has

progress been made in implementing programmes to virtually eliminate persistent toxic substances.

2.1 Canadian Laws, Policies and Programs

Since the late 1980s, there have been significant changes to the environmental law and policy framework in Canada. This section looks at joint federal-provincial initiatives, namely, the Canada-Ontario Agreement (COA), federal initiatives and activities at the provincial level.

2.1.1 Federal/Provincial Initatives

CANADA-ONTARIO AGREEMENT (COA)

The COA is an agreement between the federal government and Ontario aimed at implementing the GLWQA. Since it was first signed in 1971, COA was a mechanism to provide fiscal transfers from the federal government to the province to assist Ontario in undertaking activities that would contribute to meeting the goals of the GLWQA, such as upgrading sewage treatment works. COA has been periodically renewed. In 1994, a COA was signed which remains the operative agreement today.

The 1994 COA differs from earlier COAs in several significant ways. First, it contains various targets and time lines for elimination and reduction of emissions and for clean-up activities. Second, this version of COA contains virtually no financial transfer arrangements which, apparently, was one of the most controversial issues during the negotiations. Third, COA, although called an "agreement," is in fact a non-binding, good faith agreement between the two levels of government. All of these issues resulted in a harsh criticism from the environmental community when the most recent COA was concluded.

COA is divided into three areas: the restoration of degraded areas, habitat protection and prevent and control pollution provisions. Only the latter area is discussed in this report..

Table 2 reviews some of the key provisions on the prevention and control of pollution. In this regard, COA commits to:

(a) Confirming that zero discharge has been achieved for five pesticides by January, 1996 (DDT, Mirex, Chlordane, Toxaphene, aldrin/dieldrin);

(b) Achieve 90% reduction of Tier I pollutants by the year 2000, including benzo(a)pyrene; mercury; alkyl-lead; octachlorostyrene; hexachlorobenzene; dioxins; furans; and

(c) Achieve PCBs decommissioning and destruction targets.

There is no doubt that the "prevent and control pollution" provisions of the 1994 COA were set in place to further the reduction of persistent toxic substances (PTS).

One of the cornerstone commitments for COA relates to the goal of seeking 90% reduction in the use, generation or release of seven of the Tier I substances mentioned above. Environment Canada and Ontario Ministry of Environment and Energy (MOEE) released their most recent progress report on the toxic substances components under COA in November 1996.

The *COA Stream 2 Annual Report* demonstrated that Tier 1 Reduction progress is underway and that target reductions are being met. However, the presentation of the data to show the reductions of Tier I substances can be critically questioned for a number of reasons. According to ther report, reduction of several key Tier 1 substances including dioxins and furans, has been demonstrated by participating members of the *Accelerated Reduction/Elimination of Toxics* (ARET) programme. The most fundamental concern with the ARET data is that ARET is voluntary and lacks accountability mechanisms. Due to the absence of a regulatory framework and thresholds for reporting, the companies reporting under ARET are not required to report on particular substances that are thought to be negligible or nil quantities. There are questions with respect to the definition of negligible quantity and what these quantities can cumulatively add up to.

Table 2: Key Provisions Under COA

COA Commitments	1996 Progress Report
For Tier I substances, Canada and Ontario agreed to:	
1.Confirm by 1996 that zero discharge has been achieved for 5 priority substances (aldrin/dieldrin, chlordane, DDT, toxaphene and mirex).	* Completed "weight of evidence points to the conclusion that there is effectively zero use and stock availability of ...[targeted substances]"
2. Seek to (by 2000): a) decommission 90% of high level PCBs in Ontario	42% of target
(b) destroy 50% of the high-level PCBs now in storage	7% of target
(c) accelerate the destruction of stored low-level PCB	>15% of target
3. Seek a 90% reduction in the use, generation or release of the remaining seven substances (benzo(a)pyrene, hexachlorobenzene, alkyl-lead, mercury, octachlorostyrene, dioxins and furans) by the year 2000.	Activities (a) updating profile inventory; (b) filling in the gaps; (c) carry out promotional activities to encourage reductions through ARET, P4, MOUs and SOPs.
For Tier II substances and other pollutants, Canada and Ontario agree to:	
* collaborate with, and provide support for, voluntary programs by industry and other to reduce the use, release or generation of Tier II substances, and establish specific time lines and targets for achieving their virtual elimination	* profiles for Tier II substances completed * unclear on programs and policies
* provide essential knowledge on the fate and effects of Tier II substances from industrial, municipal and other sources	* a number of studies undertaken
* a coordinated review and evaluation of registered and scheduled pesticides will be conducted	* "Business plan" being redrafted in light of June 6, 1996 workshop

For Tier I and Tier II substances: * Work with industry to attain commitments to achieve the targets stated herein through such formal arrangements as Memoranda of Understanding, and through informal arrangements as appropriate. * Implementation by 1998 of pollution prevention programs will be promoted and encouraged at targeted industrial facilities discharging to the Great Lakes, through a variety of instruments, including the Ontario Pollution Prevention Pledge Program, and the Accelerated Reduction/Elimination of Toxics initiative.	See: 1995 Report 22-23

Members of the ARET program are requested to choose a base year between 1988 to 1993. Since COA was implemented in 1994, this should be the base year for comparing emissions data. In addition, since the base year is not consistent for each reporter, it is impossible to make cumulative reduction estimates. For example, under ARET, members estimate that they have achieved a reduction in dioxins and furans by 99% and that by the year 2000 the reduction level from the base year which varies from 1988 to 1993, will be 98%. The data presented is questionable. Under the First Progress Report under COA,[105] a total of 0.473 kg of dioxins and furans were emitted from Ontario sources in the varying base year, while the *1996 COA Stream 2 Annual Report* indicates 0.142 kg/yr of emissions of dioxins and furans for the base year. Based on these values, the reduction of dioxins and furans in 1995 would be 99% reduction. Given the dissimilar data presented in the two reports, the importance of having an accountability mechanism in place becomes ever more apparent. More importantly, if the 1993 emission data were chosen as the base year which would be consistent with COA with total emissions of .0075 kg,[106] the percentage of reduction would dramatically decrease to 81%.

The importance of accountability is further demonstrated in the contrasting emission data for dioxins and furans presented in the *Environmental Leaders 1 and 2* reports.[107] If the discrepancies can be attributed to an increasing number of

---

[105] Environment Canada and Ministry of the Environment and Energy, *First Progress Report under the 1994 Canada-Ontario Agreement respecting the Great Lakes Basin Ecosystem*, 1995, p. 22.

[106] Environment Canada and MOEE, *First Progress Report under the 1994 Canada-Ontario Agreement respecting the Great Lakes Basin Ecosystem*, p. 22.

[107] Environment Canada, Environmental Leaders 1: Voluntary Commitments to Action on Toxics Through ARET (March 1995), pg. 23, Appendix 3

Emission data for dioxins and furans

base year = .0011 tonnes
1993 = .00022 tonnes
2000 = .0000102 tonnes

Environment Canada, Environmental Leaders 2: Voluntary Action on Toxic Substances (January 1997), pg. 53, Appendix 3.

Emission data for Dioxins and Furans

base year = .00123 tonnes
1993= .0000276 tonnes
1995 = .0000147 tonnes

reporting companies and hence increased emissions and reductions, these changes should be indicated to provide a clear reference point. Furthermore the data presented may be furthered skewed since it was also indicated that ten of the ARET participants who reported emissions in *Environmental Leaders 1* did not submit data for *Environmental Leaders 2* for one of three reasons:

- they missed the deadline for submitting their data for this report;
- they chose alternative reporting means; or
- their data for 1995 emissions was unavailable.[108]

Six out of the 10 companies that reported to the 1995 Leaders 1 that failed to submit reports for the *Environmental Leaders 2* report had operations in Ontario, indicating a serious gap in data in the Great Lakes regarding the emission of dioxins and furans.[109]

With reference to the reductions of dioxins and furans from other programs, it is impossible to determine the validity of the data presented in the *COA Stream 2 Annual Report* for several reasons. A Task Force on Dioxins and Furans was established recently by Environment Canada to develop an Inventory of Sources of Dioxins and Furans.[110] According to a preliminary inventory of sources for dioxins and furans compiled by the Task Force, an estimated 39.354 g/yr of dioxins and furans were emitted from the various sectors in Ontario.[111] However, the *COA*

2000 = .0000191 tonnes

[108] Environment Canada, *Environmental Leaders 2: Voluntary Action on Toxic Substances*, p. 28.

[109] Environment Canada, *Environmental Leaders 2: Voluntary Action on Toxic Substances*, p. 63, Appendix 5.

[110] Prepared by Environment Canada, Draft Summary of Workshop on the Development of a Canadian Inventory for Dioxins and Furans (March 26, 1997), p. 3.

The mandate [of the Task Force] is to prepare an inventory of Canadian sources of dioxins and furans resulting from human activities and to prepare an action plan consistent with the Toxic Substances Management Policy for the virtual elimination of PCDDs/PCDFs.

[111] Environment Canada, Draft Summary Workshop on the Development of a Canadian Inventory for Dioxins and Furans, March 26, 1997, p. 1.

At this time, the pulp and paper regulations along with CCME guidelines for municipal incinerators, hazardous waste incinerators; biomedical incinerators and cement kilns burning waste as fuel focus on dioxins and furans.

Stream 2 Annual Report indicate that 330 g were emitted.[112] The presentation of the data should come under some criticism since Environment Canada indicated that the "...Task Force had initially decided to develop the inventory from information available to the members. ...the Task Force realized that the information is incomplete and a reliable inventory could not be developed from current information available to the federal and or provincial agencies alone."[113]

In terms of PCBs, it is apparent that the target of destroying 50% of these substances in storage will not be met in the near future. In fact, only 7% of the PCBs in storage had been destroyed as of 1996. The recent reclosing of the U.S. border to shipments of PCB wastes from Canada and the current problems with PCB contamination from the Swan Hills incinerator in Alberta has made it even more difficult for Canada and Ontario to meet their targets for PCB destruction.

Recent decisions make other targets more difficult to meet. For example, the recent decision by Ontario Hydro to enhance the province's power supply through increased use of fossil fuels will make it much more difficult, if not impossible, to meet the 90% reduction target for mercury. It is estimated that this will increase Ontario Hydro's mercury emissions by 70%.[114]

RECOMMENDATION: **The parties to COA renew their efforts to achieve the 90% reduction targets for the designated substances with specific work plans, regulatory measures, and interim targets developed as soon as possible.**

---

[112] Environment Canada, March 24, 1997 - Draft for discussion only - preliminary inventory of dioxins and furans (biomedical incinerators, hazardous waste, large municipal incinerators, small municipal incinerators, sewage sludge incinerators, cement kilns, cement kilns Burning Waste, Fossil Fuel Electric Power Generations, Pulp Paper Sector, Sintering Plants - Steel Manufacturing using chlorinate substances).

[113] Environment Canada, Draft Summary Workshop on the Development of a Canadian Inventory for Dioxins and Furans, March 26, 1997, pg. 4.

[114] Jack Gibbons and Sara Bjorkquist, An Evaluation of Ontario Hydro's Preliminary Nuclear Recovery Strategy, October, 1997, p. 3.

2.1.2 Federal Government

CANADIAN ENVIRONMENTAL PROTECTION ACT

The most important federal environmental law relating to toxics, the *Canadian Environmental Protection Act* (CEPA), was enacted in 1988. Under CEPA, a list of all substances in commercial use is to be developed and updated. This list, the Domestic Substances List (DSL), now has over 21,000 substances on it. Substances on that list are to undergo an assessment to determine whether or not the substance is toxic. Since 1989, 44 substances have been assessed. Of those assessed, 25 were found to be toxic, 9 found not to be toxic, and a finding was not made for 11 of the substances since there was insufficient data to make a determination. Last year, 25 more substances were placed on the list to be assessed.

Some of the major problems that have been identified with CEPA include:

* too few substances have been assessed for toxicity and the assessment process has taken too long;
* the failure to complete assessments of the "toxicity" of 13 of the 44 substances placed on the Priority Substances List (PSL) in 1988 within the prescribed five-year time-frame;
* the finding that a number of substances known to have toxic properties and to be present in the Canadian environment, such as toluene and used crankcase oils, were not declared "toxic" under the Act;
* to date regulations have only been put in place regarding a few substances (including CFC's, chlorinated pulp effluent and PCB's) found to be "toxic" for the purposes of CEPA;
* slow progress in the Strategic Options Process; and
* an enforcement regime that has never been strong, and that now appears to be on the edge of collapse, with only a handful of prosecutions being undertaken under the Act in 1996.

RECOMMENDATION: **CEPA should be amended with the following provisions incorporated in it, including:**

(a) a commitment to virtual elimination and zero discharge as defined by the IJC;
(b) the recognition of the concept of "inherent toxicity," that is, the need to eliminate substances that have inherently problematic properties such as persistence, bioaccumulation or are know to disrupt endocrine systems; and
(c) assessment of more substances within strict time frames, including classes of substances.

A consultation process was put in place to negotiate the action to take on each of the 25 substances found to be toxic. The process called the Strategic Options Process (SOP), involved a multi-stakeholder forum for each substance or related substances. Each consultation is intended to produce a report, a Strategic Options Report (SOR), that makes recommendations to the federal Minister of the Environment for action.

Twelve SOPs have been initiated. Eight of them reported to the Minister. Of those submitted, the Minister responded with a commitment to act on those reports in February of 1997. To date, no actions have been taken by the Minister.

Only two of the SOR documents[115] call for regulatory action. The six other SOR documents recommend, despite the dissenting views of the non-governmental group representatives at the consultations, purely voluntary initiatives. In many cases, non-government groups also argued for more stringent targets or requirements to phase-out certain substances or technologies. Table 3 provides a summary of the SOP activities, including a summary of the recommendations for each SOR.

The problems associated with the process, the lack of regulatory action, and failure to rigorously promote pollution prevention supports a call for a significant revamping of the SOP process.

RECOMMENDATION: **The SOP process should be revamped with the aim of improving the consultation process, instilling the concept of pollution prevention and ensuring regulatory action follows to address toxic substances.**

The 1988 CEPA contained a provision requiring a review of the law after five years. That review commenced in 1994 by way of a legislative hearing by the federal Standing Committee on Environment and Sustainable Development. In June of 1995, the Standing Committee released its report, entitled, *Its About Our Health! Towards Pollution Prevention*, which called for a dramatic re-writing of CEPA with 141 recommendations.

---

[115] For a review of this initiative, see: S. Gingras, "The Strategic Option Process: An Evaluation" Great Lakes United.

TABLE 3: Status of Strategic Options Process[116]

ISSUE TABLE	STATUS	DATE SUBMISSION OF STRATEGIC OPTIONS REPORT	RESPONSE OF MINISTER	SIGNIFICANT RECOMMENDATIONS OF SOR	REGULATORY OR OTHER ACTIONS
Benzidine, 3,3 Dichlorobenzidine	completed Dec. 1995	report submitted 1995	released in Feb. 1997	- use should be restricted according to regulations under CEPA - Companies using DCB and DCB salt should develop a MOU with Environment Canada focus on life cycle controls and monitoring programme	• generally, to act on the recommendations • developing agreement between Ontario region and industry on reporting data • regulations to be developed
ethylhexyl phthalate	on-going				
Chlorinated Paraffin	on-going				
Dichloromethane	on-going				
Solvent Degreasing	completed Dec. 1995			• Develop CEPA regulation in 1996-97 to control quantities of TCE and PERC used in solvent degreasing • S. 15 of CEPA to gather information on consumption of PERC and TCE by degreasing operations to calculate the yearly allowance • monitor progress annually to 2002 to determine further action • ENGO recommends a reduction of 85% by 2001	• drafting group established on different issues to do follow-up on recommendations • identify baseline in order to begin to develop regulations on reducing TCE 65% by 2000
Metal Finishing	completed Dec. 1996	- report not completed, to be submitted to Provinces for review, not submitted to Minister		• MOU between industry, province of Ontario, Québec, BC, and Alberta on pollution prevention and reduction • emission standards for hexavalent chromium similar to MACT USEPA standards (0.03 mg/m3) • strategy to revise the federal, provincial and regional permitting system •ENGO recommends mandatory pollution prevention planning for metal platers under federal regulation • ban and restriction on specific cadmium plating operations as adopted by European Community	

[116] Raouf Morcos, Coordinator for Strategic Options Process, Environment Canada, personal communication September 1997.

Steel Manufacturing	Completed Jan. 1997	- report not completed, not submitted to Minister		• Federal-Provincial Harmonization - implement of toxic substances management initiative under COA • voluntary programs to reduce 1993 benzene emission and PAH emissions • develop Envir. Code of Practice by Dec. 1998 for benzene and PAH Metal - Air Emission and water effluent - Develop and Environmental Code of Practice by Dec. 1998 Dioxin and Furan - Research Program to characterize, quantify and prioritize actions Mercury - Mercury Release Assessment Program for non-integrated mills and sintering plants - report June 1997 - contaminated sites - pollution plans prevention - envir. audits - voluntary audits - ministerial review by March 1999	
Base Metal Smelting	Feb. 1997		- report not completed, not submitted to the Minister	• voluntary reduction of total releases 90% by 2008 (1988 base level) • CCME performance guidelines for discharge for 2000 • protocol for measurement of releases under CCME with independent verification • site specific environmental management plans • reporting of dioxins and furans for smelters that use plastics or organochlorines compounds in feedstock • research program on releases from sector and pollution prevention opportunities • Ministers review in 2001 of progress of the SOR recommendations • ENGOs disagree with voluntary program and CCME performance guidelines as to achieve reduction at facility level • switch to second. metal prod. and more recycling over the next 25 years	
Wood Preservatives	on-going				

Dry Cleaning	completed Jan. 1996	submitted in Jan. 1996	released in Feb. 1997	• ban first and second generation PERC machines by Jan. 1, 1998 through regulation • performance standard for new dry cleaning PERC machines of 10 kg of PERC used for 1000 kg of clothes cleaned • product stewardship program for solvent distributors to manage PERC waste from dry cleaning industry • levy on PERC sold to pay cost of training and certification for dry cleaners • training and certification program by Jan. 1, 1998 for handling PERC and operating PERC machines • monitoring program for progress towards 65% reduction of PERC by 2000 ENGO - reduction should be 85% by 2000 using wet cleaning technology • import quota • CFA did not support Stewardship program	• accepted in general the recommendations made in SOR • drycleaning sector in Ontario already has a training program • regulations will be developed with respect to the recommendations on phase-out of first and second generation equipment •regulations regarding training and certification will require further discussion
Electric Power Generation	completed Dec. 1996	report completed, expected to be submitted to the Minister in the next few months		•stakeholders submitted differing recommendations a) Utilities - proposed a covenant with federal government to reduce particulate matter emissions to the air • research to gather data on water and solid releases, dioxin and furans, mercury and fluorides. b) Environment Canada - revise CEPA guidelines on stationary sources to limit particulate emissions • MOU with existing facilitates to reduce particulate emissions to 0.1 pound per million BTU input by Dec. 1998 c) ENGO - all new and existing facilities to meet federal regulation of limit of .03 pound of particulate matter per million BTU input • mandatory pollution prevention planning under CEPA and NPRI reporting	
Refractory Ceramic Fiber	Completed	report expects to be submitted to the Minister within the next few months		• MOU between companies and Environment Canada to undertake a 5-6 year monitoring program for manufacturers and processors • stewardship program for labour and consumer groups to discuss end use activities of RCF	

The government response to the Committee's report was released in December of 1995. This report was described by the environmental community as a diluted and incomplete response. It was seen as weakening, rather than strengthening, important provisions in the statute. The poor government response was due to intense lobbying from both pro-industry departments, industry and itself.

A year later in December of 1996, a new CEPA was introduced into Parliament in the form of Bill C-74. However, the bill never got to second reading since a federal election was called in June of 1997, at which time the bill died. During the campaign the Liberal Party promised to put CEPA at the top of the legislative agenda. The next version of the bill is due out in late 1997 or early 1998.

It is beyond the scope of this review to provide an in-depth discussion of the proposed amendments; this analysis has been undertaken elsewhere.[117] The bill has a number of positive attributes. The bill would:

* set a goal of virtual elimination for PTSs; and
* set in place a process to have more substances assessed and potentially found to be toxic, and thus allow the federal government to do more regulating.

Despite these positive attributes, there are a number of enormously important problems with the bill. These include:

Definition of Virtual Elimination

Virtual elimination is defined in the bill as "the release below any measurable quantity or concentration or approaching the level of quantification that is specified by the Minister, and results or may result, in a harmful effect on the environment or human health."

The definition under the bill is wholly inappropriate:

- *It Fails to Respond to Threats from Dangerous Substances to Ecological and Human Health:* The goal of virtual elimination is reserved only for the most dangerous substances, such as persistent, bioaccumulative and toxic substances. As such, the goal is to ensure that these substances are no longer used or generated in Canada. The definition of virtual elimination in the bill would allow and legitimize the use and generation of these most hazardous substances.

---

[117] See: Canadian Environmental Law Association and Canadian Institute for Environmental Law and Policy, Comments on the Government Response to CEPA (1996).

- *It Is Inconsistent with the Concept of Pollution Prevention:* Defining the virtual elimination goal as "no measurable release" promotes a pollution control approach rather than a pollution prevention approach. Pollution prevention is defined as a measure that avoids or prevents the use and generation of toxic substances. Its strength is that it emphasizes changes in the industrial process through such techniques as raw product substitution and process reformulation among other such techniques. By contrast, the pollution control approach focuses on building traps to try and catch pollutants.

- *The Debate will Now Focus on What is "No Measurable Release:"* Apart from the concern with the virtual elimination definition, there are also practical problems with the "no measurable release" definition. Who will define what is "not measurable"? How will that limit be set? What happens if detection technology improves?[118]

- *It is Inconsistent with Current Legal and Policy Commitments:* The proposed definition is not consistent with the definition in the GLWQA,[119] the interpretations provided by the IJC in their biennial reports on water quality,[120] the report by the Standing Committee on Environment and Sustainable Development,[121] the federal government response in *Pollution Prevention: A Federal Strategy for Action*, and the Liberal Red Book.[122]

In its *Eighth Biennial Report*, the IJC re-iterated its previous approach and stated:

> *There are various interpretations of virtual elimination and zero discharge. Virtual elimination is not a technical measure but a broad*

---

[118] In fact, Environment Canada held a workshop in June of 1996 pertaining to the concept of "limits of quantification." This workshop was supposed to provide some technical backing to the virtual elimination strategy. However, NO non-governmental groups were invited nor attended that workshop despite the attendance and participation by industry. One of the reasons given for not inviting environmental groups was that the workshop was a "technical" one, suggesting that non-governmental groups have no technical expertise in this regard.

[119] *GLWQA*.

[120] International Joint Commission.

[121] Standing Committee on Environment and Sustainable Development, *Its About Our Health! Towards Pollution Prevention*, June 1995.

[122] Liberal Party of Canada, *Creating Opportunity: The Liberal Plan for Canada*, September 1993.

> *policy goal. This goal will not be reached until all releases of persistent toxic chemicals due to human activity are stopped. Zero discharge does not mean simply less than detectable. It does not mean the use of controls based on best available technology or best management practices that continue to allow some release of persistent toxic substances, even though these may be important steps in reaching the goal. Zero discharge means no discharge or nil input of persistent toxic substances resulting from human activity. It is a reasonable and achievable expectation for a virtual elimination strategy. The question is no longer whether there should be virtual elimination and zero discharge, but when and how these goals can be achieved.*[123]

The Commission has rejected as inappropriate the "no detectable level" approach being proposed in the revised CEPA. The acceptance of this approach by the federal government is contrary to the direction of the IJC.

Passage of Bill C-74 would ignore the evolution of the virtual elimination term in the GLWQA over the past 25 years. Moreover, it would pre-determine the negotiating position of Canada both in the context of the implementation of the Great Lakes *Binational Toxics Strategy* between Canada and the U.S. and the development of the *Protocol on Persistent Organic Pollutants* (POPs)at the United Nations.

The proposed definition of virtual elimination would be a completely non-enforceable, non-workable provision that would have the result of allowing the continued use and generation of the most dangerous substances.

RECOMMENDATION: **Canada should define virtual elimination in a manner consistent with the definitions offered by the IJC and implemented through a national pollution prevention framework. The definition of virtual elimination should mean the elimination of the production, use, and generation of toxic substances.**

---

[123] International Joint Commission, *Eighth Biennial Reporton Great Lakes Water Quality*,. 1996, pp. 9-10. Also see *Seventh Biennial Report on Great Lakes Water Quality*, where the Commission stated:

> *[w]e...want to continue attempts to **manage** persistent toxic substances after they have been produced or used, or ... **eliminate** and **prevent** their existence in the ecosystem in the first place ... [s]ince it seems impossible to eliminate discharges of these chemicals ... a policy of **banning** or **sun setting** their manufacture, distribution, storage, use and disposal appears to be the only alternative.*

Inherent Toxicity and Endocrine Disruptors

Bill C-74 freezes in time what substances are subject to the goal of virtual elimination. At the present time, only substances that are persistent, bioaccumulative and toxic are subject to the goal. However,substances may have characteristics or traits that, intrinsically, give them the potential to cause harm to human health and the environment. For example, some substances are suspected of disrupting the endocrine systems of wildlife and possibly humans. Other substances may be "inherently" toxic based on a variety of intrinsic properties, such as acute lethality, chronic/sub-chronic toxicity, carcinogenicity, teratogenicity and genotoxicity.

Hence, the bill should recognize the concept of inherent toxicity and ensure that the virtual elimination goal is applicable to all persistent toxics and other intrinsically toxic substances.

RECOMMENDATION: **The definition of toxicity in CEPA should recognize the concept of inherent toxicity. Toxicity should be determined on the basis of the inherent or intrinsic toxic properties of substances such as acute lethality, chronic/sub-chronic toxicity, carcinogenicity, teratogenicity, genotoxicity, and ability to disrupt endocrine systems.**

TOXIC SUBSTANCES MANAGEMENT PLAN

The Toxics Substances Management Plan (TSMP) is a government-wide policy focusing on persistent toxic substances. It can be summarized as follows:

* the goal of the TSMP is to "virtually eliminate" persistent, bioaccumulative and toxic substances;
* the terms "virtually eliminate" and "persistent, bioaccumulative and toxic substances" are given specific definitions within the context of the policy;
* the term "virtual elimination" is defined as "non-detectable;"
* if the substances meet the criteria for persistence, bioaccumulation and toxicity, they are placed on track 1; all other substances proceed to track 2 and thus subject to various pollution prevention measures.

The TSMP was derived from the policy obligations under the GLWQA and the robust policy debates surrounding the implementation of those obligations. The government is attempting to incorporate it into the new CEPA. The criticisms of Bill C-74, therefore, are criticisms of TSMP. The primary

problems include the definition of virtual elimination, the lack of recognition of endocrine disruptors, the fact that inherent toxicity is not recognized, and the lack of a class-by-class approach.

RECOMMENDATION: **Canada's TSMP should be re-opened and revised to further the concepts of virtual elimination and pollution prevention. The virtual elimination definition in it should be redrafted to be consistent with the definition offered by the IJC in its *Eighth Biennial Report.***

ENVIRONMENTAL HARMONIZATION ACCORD

In 1993, the federal and provincial governments began to negotiate an agreement to "harmonize" their environmental activities. An accord was endorsed in 1996. That accord, called the "Environmental Harmonization Accord," is intended to be concluded by the federal and provincial governments in early 1998. The Accord provides a general framework for harmonization while the subagreements provide the specific strategies for three areas: inspections, standard-setting and environmental assessment. At least seven other subagreements are to be concluded in the future.

The environmental community in Canada has raised serious concerns with the proposed Harmonization Accord.[124] Some of primary concerns are:

(a) Abandonment of the federal role in environmental protection: One of the overall concerns is that the Accord diminishes the influence and role of the federal government in environmental protection and in particular with toxic substances. The Accord calls for the government "best situated" (which will most often be the provinces) to deal with the matter; if not "best situated," the federal government would not be allowed to act.

(b) Race to the Bottom in Standard-Setting: Under the Accord, all of the Canadian jurisdictions have to agree to a new "Canada-wide" standard. The potential of this mechanism to develop strong, proactive standards is unlikely, at best.

(c) The Standard-Setting Processes Do Not Include the Public: There is little public involvement in the decision-making structures of the Canadian

---

[124] For instance, see: K. L. Clark and M. Winfield, *Harmonizing to Protect the Environment? An Analysis of the CCME Environmental Harmonization Process*, November 1996.

Council of Ministers of the Environment, but this is where decisions are likely to be made if harmonization occurs.

The Harmonization Accord has profound influence on the ability of the federal government to deliver its traditional roles and functions. It has been recently reported that approximately 200 Environment Canada positions will be lost due to the Harmonization Accord. The capacity of Environment Canada to fulfil its obligations under the GLWQA will be diminished.

RECOMMENDATION: **The proposed Harmonization Accord should be rejected. Federal-provincial cooperation should be furthered through ways and measures that do not include the devolution of federal powers to the provinces.**

Federal Pollution Prevention Programs

Progress has been made in having the concept of pollution prevention recognized at the federal level. For example, the federal document, *Pollution Prevention: The Federal Agenda*, was released in mid-1996. It does not contain any programmatic initiatives per se; instead, its primary focus is to provide a consistent definition of "pollution prevention." Further, the CCME adopted the concept in its *National Commitment in Pollution Prevention* document.

Further, Bill C-74, the new CEPA, has proposed that pollution prevention become a national objective for Canada. It also includes various provisions for pollution prevention.

To further pollution prevention, Environment Canada established both a National Office of Pollution Prevention (NOPP) and the Great Lakes pollution prevention office. It also established a number of "projects and partnerships" with respect to pollution prevention. These include programs pertaining to pollution prevention at federal facilities; specific projects geared to specific commercial chemicals and hazardous waste and municipal initiatives; and the negotiation of memoranda of understanding with various industrial associations. It has also concluded an "Environmental Management Agreement" with Dofasco, Inc.

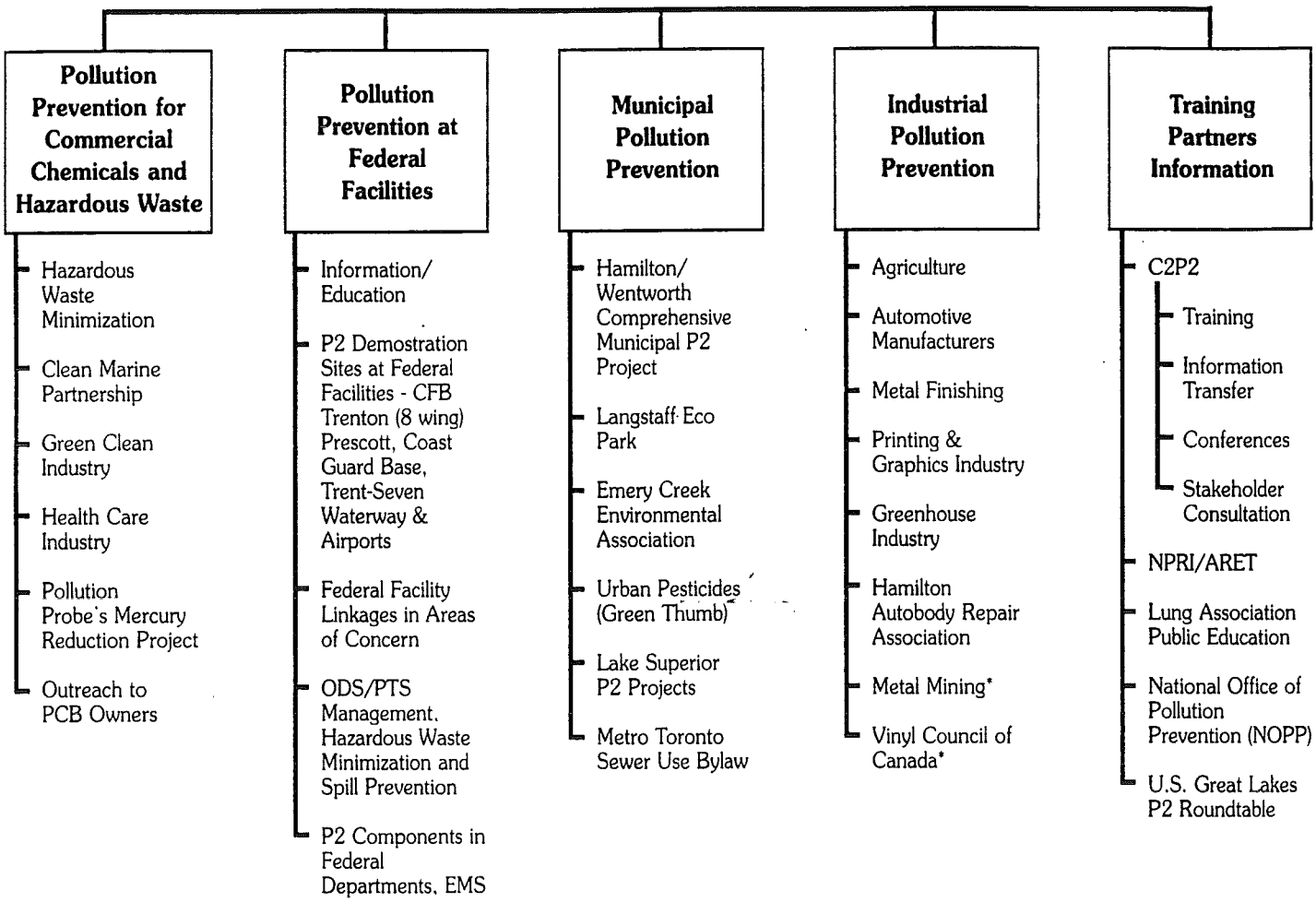
A summary of federal pollution prevention activities is provided in a recent Environment Canada chart and included at TABLE 4.

Despite progress on pollution prevention, a number of concerns are raised with respect to the federal pollution prevention programs.

1) Lack of Regulatory Initiatives

The most problematic aspect of the federal pollution prevention agenda is the lack of any regulatory initiatives with respect to pollution prevention. For the most part, Environment Canada is relying on voluntary initiatives to promote pollution prevention. It has not taken any initiative toward phasing-out the most dangerous substances.

TABLE 4: A Summary of Federal Pollution Prevention Activities[125]



ARET - Accelerated Reduction/Elimination of Toxics
C2P2 - Canadian Centre for Pollution Prevention
EMS - Environmental Management System
NPRI - National Pollutant Release Inventory
ODS - Ozone Depleting Substances
PTS - Persistent Toxic Substances

**MOU being developed*

---

[125] Environment Canada, Environmental Protection Branch, Ontario Region, *Pollution Prevention in the Ontario Great Lakes Basin: 1997*, 1997.

The voluntary programs initiated or sponsored by Environment Canada raise the following concerns:[126]

(a) Lack of Public Participation in the Negotiation of Voluntary Programs: With few exceptions, voluntary programs are undertaken outside of the public spotlight. Most memorandums of understanding between governments and industry were negotiated without the benefit of public input. The most recent agreement between Dosfaco Inc. and the federal and provincial ministries was placed on the Environmental Bill of Rights registry for a 30-day comment period.

(b) Voluntary Agreements Pre-empt Regulatory Actions: While most voluntary agreements state that governments can still take regulatory actions, the practical effect of such agreements is that governments are unwilling to regulate on any matter related to the subject matter covered in the Agreement. As a result, voluntary agreements may replace regulatory activity and result in the loss of the benefits that normally arise from having regulatory programs. For example, voluntary initiatives often have the problem of "free riders," that is, some industries share the success of the good performers without doing any of the work.

(c) Voluntary Agreements Do Not Further the Principle of Accountability: It is apparent that voluntary agreements promote accountability since they are not subject to public verification and there are no mechanisms to penalize those industries that fail to comply with the voluntary agreement.

2) Inconsistent Policy Directions

Despite the fact that the federal government has furthered the recognition of the concept of pollution prevention, in practice, this progress has been mitigated by the lack of implementation. For example, the proposed Bill C-74 recognizes pollution prevention, but then defines virtual elimination in ways that further a pollution control, as opposed to a pollution prevention, approach. Moreover, the SOP did not require the incorporation of pollution prevention in the drafting of action plans for substances found to be toxic under CEPA.

---

[126] P. Muldoon, "Drawbacks to Voluntary Pollution Prevention Agreements in Canada" Bulletin of Pollution Prevention, Insert to Great Lakes United Newsletter (Fall 1994), 15; J.Jackson "The Spread of 'Regulatory Voluntarism': Abandonment of the Goal of Zero Discharge" Bulletin of Pollution Prevention, Insert to Great Lakes United Newsletter (Fall 1994).

Federal Sunsetting Initiatives

In its *Sixth Biennial Report*, the IJC recommended that the governments:

> *in consultation with industry and other affected interests, develop timetables to sunset the use of chlorine and chlorine-containing compounds as industrial feedstocks and that the means of reducing or eliminating other uses be examined.*[127]

It has reiterated this recommendation in subsequent biennial reports.[128]

In October, 1994, the federal government released the *Chlorinated Substances Action Plan*. According to the document, "The government is taking aggressive action in dealing with chlorinated substances that pose a threat to the health of Canadians and to the environment.... Our approach is to prune the chlorine-use tree. It is not our intent to cut the tree down."[129] The document outlined a five part action plan, including:

* targeted actions will be taken including eliminating the most harmful chlorinated substances; taking a sectoral approach to managing chlorinated substances and entering into environmental performance agreements with key industrial sectors and other governments;

* to improve the scientific understanding of chlorine and its impacts on the environment and human health;

* to detail socio-economic and public health studies on the use of chlorinated substances and their alternatives;

* to improve access to information for Canadians; and

* to promote international efforts for global action on chlorinated substances.

---

[127] *Sixth Biennial Report on Water Quality*, Recommendation No. 7, p. 30.

[128] For example, see: *Seventh Biennial Report on Water Quality*, p. 9.

[129] News Release, "Environment Minister Outlines Approach to Deal with Chlorinated Substances" October 25, 1995.

2.1.3 Ontario Government

This section focuses on activities of the Ontario government in the past two years in comparison with activities and programs prior to that time. Progress under the *Canada-Ontario Agreement* (COA) has been discussed above.

MUNICIPAL-INDUSTRIAL STRATEGY FOR ABATEMENT (MISA)

The goal of the MISA program is to virtually eliminate the discharge of persistent toxic substances from Ontario's waterways.[130] The effluent limits regulations were promulgated in 1994 and 1995 after a long regulation-making process involving all stakeholders.

The regulations require:

* meeting discharge limits as defined in the regulations;
* meeting requirements that process and cooling water effluent discharges are not-acutely lethal to rainbow trout and daphnia;
* process effluent discharges be within a defined pH range;
* weekly assessment monitoring of cooling water discharges;
* semi-annual assessment monitoring for chronic toxicity;
* submission of various reports pertaining to exceedences, monitoring results, chronic toxicity testing results and updating of significant process changes; and
* the development of a storm water control study.

In July 1996, the Ontario government proposed a series of reforms to the MISA regulations.[131] Two of these are particularly significant backward steps.

1) Revocation of Requirements for AOX Elimination Plans

The preparation and submission of an AOX Elimination Plan holds the potential to eliminate the discharge of AOX effluent from pulp and paper mills over the long term. AOX, as a measure of organochlorines, represents a well-known

---

[130] See: Ministry of the Environment, *Municipal-Industrial Strategy for Abatement (MISA) A Policy and Program Statement of the Government of Ontario on Controlling Municipal and Industrial Discharges into Surface Waters (June, 1986). For a review and background, see: Burkhard Mausberg, Still Going to B.A.T. For the Environment?* Pollution Probe and the Canadian Institute for Environmental Law and Policy, 1990.

[131] Canadian Environmental Law Association, *Responding to the Rollbacks: Comments on Responsive Environmental Protection* (1996).

threat to the Great Lakes and human health. By the end of the 1980s, cumulative discharges to Canadian waters by bleaching pulp mills were estimated to be one million tonnes. Although persistent toxic substances represent only a small portion of this number, the quantity is nevertheless significant.[132] It is estimated that the regulation will result in loading reductions of 74% for AOX (from 5,500 to 1,500 tonnes per year).[133]

The requirement for the AOX Elimination Plan seeks to implement Article II of the GLWQA. The AOX Plan's promulgation made direct reference to the Agreement. The IJC has noted numerous times the importance of translating the general objectives of the Agreement explicitly into the domestic laws and regulations of both nations.[134] Moreover the Commission itself has noted the potential for the MISA program to implement the goal of virtual elimination.[135]

The proposal to revoke the AOX planning requirement can be interpreted as a repudiation of the past commitment to the goals of the Agreement .

RECOMMENDATION: **Ontario's regulatory requirement requiring the submission of AOX elimination plans should be maintained.**

2) Reducing Assessment Monitoring for Chronic Toxicity

This proposal would reduce the frequency of assessment monitoring for chronic toxicity when the MOEE has collected sufficient data for analysis of the relationship between industrial discharges and sublethal effects. The basis for the testing regime is to determine whether the effluent in question, although

---

[132] For a review, see: T. Muir, et al. "Case Study: Application of a Virtual Elimination Strategy to an Industrial Feedstock Chemical -- Chlorine" in Vol. II, Report by the Virtual Elimination Task Force to the International Joint Commission, *A Strategy for Virtual Elimination of Persistent Toxic Substances*, pp. 61-63.

[133] Review of MOEE Regulations, O.Reg 760/93, Effluent Monitoring and Effluent Limits - Pulp and Paper and Sector, "B."

[134] See: International Joint Commission, *Fifth Biennial Report on Great Lakes Water Quality*, Part II, (Ottawa - Washington, 1990), p. 1990.

[135] See: International Joint Commission, *Sixth Biennial Report on Great Lakes Water Quality*, (Ottawa - Washington: 1992), p. 9.

not acutely toxic, remains at a level that still may cause harm over a longer period of time.

Chronic toxicity testing is not a radical requirement. Such testing is required in many U.S. states.

RECOMMENDATION: **Ontario's regulatory requirement concerning chronic toxicity testing should be maintained.**

Ontario's Pollution Prevention Programs

In the early 1990s, the provincial government was in the process of developing fairly ambitious pollution prevention programs. These programs included:

* P4 Pollution Prevention Pledge Program; and

* Memorandums of Understanding (for a number of industries, such as the pulp and paper, chemical and printing sectors).

Despite these initiatives, little activity has been furthered in this realm by the new government. It is our understanding that another program, Recognized and Emergency Voluntary Action (REVA), is being developed. However, this program has not had the benefit of a public consultation that included non-governmental groups and is purely voluntary in nature.

Concerns with the voluntary approach have been described above.

At the provincial level, there is the additional concern resulting from the document "Responsive Environmental Protection," which proposes a "regulatory code of practice." Under this proposal, no new regulations could be imposed unless it could be established that a non-regulatory approach would be unsuccessful. The regulation, if one was proposed, would also have to pass an undefined economic test.

Ontario's Sunsetting Initiatives

Candidate List of Substances for Bans and Phase-Outs

In 1993, the provincial government released a *Candidate List of Substances for Bans and Phase-Outs*. This list was to help in the development of action plans for addressing these substances. In the past few years, there has been no report on progress with respect to these commitments.

RECOMMENDATION: **The process of identifying candidates for bans and phase outs should be accelerated.**

The AOX Elimination Plans

The AOX Elimination Plans are a direct way to implement the IJC's recommendation on sunsetting. However, the government is proposing to withdraw this requirement.

RECOMMENDATION: **The requirement for AOX Elimination Plans should be maintained.**

2.2 U.S. Laws, Policies and Programs

2.2.1 Federal Laws, Policies and Programs

CLEAN WATER ACT

The Clean Water Act (CWA) has made significant progress over the past 25 years in controlling direct point source discharges from cities and industries into the Great Lakes Basin. Water quality standards, effluent limitations and enforcement actions under the Act have led to decreases in loadings of select critical pollutants to the Great Lakes. Yet despite significant successes, Chapter 1 of this report documents many of the continuing threats to the Great Lakes ecosystem from persistent toxic substances in our water. People and wildlife still face these threats in part because the CWA has fallen short in the following two areas:

"Pollution Control" vs. "Reduction and Elimination"

The continued existence and releases of persistent toxic substances in the Great Lakes is due in part to the pollution control approach of the CWA, which has focussed too much on end-of-pipe solutions and too little on source reduction and elimination. The Act has not established programs and measures, as called for in Annex 12 of the GLWQA, for the elimination of discharges of persistent toxic substances through coordination between air, water, and solid waste programs assessing the total input of toxic substances to the Great Lakes System and defining comprehensive, integrated controls. To achieve virtual elimination of persistent toxic substances, aggressive preventive action is necessary to control, through prevention and elimination of the uses of chemicals and processes that result in releases, *all* sources of persistent toxic substances entering the Great Lakes.

The CWA presumes it is acceptable to continue using and releasing persistent toxic chemicals into the Great Lakes. The Act is based on a philosophy that there is acceptable level of some of these chemicals in the environment and applies technology and health based standards and criteria to stay within this 'safe' limit. The U.S. General Accounting Office (U.S. GAO) points out that EPA's methods limit the control of toxic substances, stating "EPA's program activities are analytical efforts, resulting in decisions about which toxic substances to control and at what levels. If its information is not of high quality, toxic pollutant control activities are weakened as a consequence."[136]

- Implementation of the CWA by the state and federal governments has failed to adequately control diffuse sources of pollutants, such as atmospheric deposition, contaminated sediments and runoff, which are a major source of contaminant loadings entering the Great Lakes. Through the establishment of water quality standards and effluent limitations under the CWA, attention is focused on assessing individual source pollution in isolation, rather than considering the combined impacts and possible synergistic effects of pollutants entering the water body from all sources. Discharge permit levels are based on the concentration of pollutants instead of on the total amount of pollutants being discharged. This dilution approach fails to consider the long-term build-up of contaminants in the Great Lakes ecosystem.

The Great Lakes Water Quality Guidance, or *Great Lakes Initiative* (GLI), mandated by Congress under the 1990 *Great Lakes Critical Programs Act*,[137] represents a major advance in meeting U.S. obligations under the GLWQA. The Act specifically references the conformance with the GLWQA stating, "[T]his Guidance must conform with the objectives and provisions of the GLWQA" and furthermore "will establish goals and minimum requirements that will further the next phase of Great Lakes programs."[138] In addition, the Guidance helps establish consistent goals or minimum requirements for

---

[136] U.S. General Accounting Office, *Water Pollution: Poor Quality Assurance and Limited Pollutant Coverage Undermine EPA's Control of Toxic Substances*, GAO/PEMD-94-9, February 1994.

[137] Congress amended section 118 of the Clean Water Act through the Great Lakes Critical Programs Act. The general purpose was to improve effectiveness of EPA's existing programs in the Great Lakes by identifying key treaty provisions agreed to in the GLWQA, imposing statutory deadlines for implementation of these key activities, and increasing federal resources for program operations in the Great Lakes System.

[138] U.S. Environmental Protection Agency, Final Water Quality Guidance for the Great Lakes System, Federal Register Vol. 60, No. 56, March 23, 1995.

ıial Action Plans and Lakewide Management Plans (LaMPs) that are to the success of multi-media efforts to protect and restore the Great ecosystem.

ɜLI is a set of uniform water quality standards designed to protect the ı of people, fish, and wildlife in the Great Lakes ecosystem from toxic ants. It affects all types of pollutants, but targets persistent pollutants accumulate in the Great Lakes food chain. The GLI includes minimum r quality criteria, antidegradation policies, and implementation procedures provide a coordinated ecosystem approach for addressing existing and ɜible pollutant problems in the Great Lakes system.

. EPA published final GLI standards in 1995, providing states until March 1997 to adopt provisions in their water quality programs consistent with the eral version. As of October 1997, only three Great Lakes States -- India na, sconsin and Michigan -- have adopted the new water quality standards. ıving missed the adoption deadline, Illinois, Minnesota, New York, Ohio and ɜnnsylvania continue at varying rates to move toward completion of their les. U.S. EPA was required to promulgate the federal GLI in the Great akes states that failed to meet the March 23 deadline. When U.S. EPA still id not act after nearly four months, the NWF filed suit.

J.S. EPA anticipates a reduction of nearly one million pounds of contami nants ɜntering the lakes once the GLI is fully implemented. To help combat these chemicals entering the Great Lakes, the GLI contains a "reverse onus" ɔrovision and a "weight of evidence" approach consistent with IJC ecommendations. Under this provision, numerical values on "how clean is clean" are set with whatever data are available for certain pollutants. Then, dischargers of those pollutants have the option of proving that the pollutants are not as harmful as the existing data say. By using this system for "Tier 2" ɔollutants, the GLI puts the cost and burden of data collection on the polluter, ıot the taxpayer.

Vhile the GLI is a big step forward, the standards do not implement the policy ɔf zero discharge as called for in the GLWQA, nor do they result in sunsetting ɔf chemicals as recommended by the IJC. Further, the GLI is only the first ɜtep in controlling diffuse pollution sources, including land runoff and ıtmospheric deposition.

The CWA does provide a tool for crafting pollution control solutions based on he ecosystem approach, using a watershed protection mechanism called Total Maximum Daily Loads (TMDLs). TMDLs could be used as an interim step to ɔetter control diffuse pollution sources, such as runoff, atmospheric and contaminated sediments, in imperiled and threatened water bodies (i.e., those

The CWA presumes it is acceptable to continue using and releasing persistent toxic chemicals into the Great Lakes. The Act is based on a philosophy that there is acceptable level of some of these chemicals in the environment and applies technology and health based standards and criteria to stay within this 'safe' limit. The U.S. General Accounting Office (U.S. GAO) points out that EPA's methods limit the control of toxic substances, stating "EPA's program activities are analytical efforts, resulting in decisions about which toxic substances to control and at what levels. If its information is not of high quality, toxic pollutant control activities are weakened as a consequence."[136]

- Implementation of the CWA by the state and federal governments has failed to adequately control diffuse sources of pollutants, such as atmospheric deposition, contaminated sediments and runoff, which are a major source of contaminant loadings entering the Great Lakes. Through the establishment of water quality standards and effluent limitations under the CWA, attention is focused on assessing individual source pollution in isolation, rather than considering the combined impacts and possible synergistic effects of pollutants entering the water body from all sources. Discharge permit levels are based on the concentration of pollutants instead of on the total amount of pollutants being discharged. This dilution approach fails to consider the long-term build-up of contaminants in the Great Lakes ecosystem.

The Great Lakes Water Quality Guidance, or *Great Lakes Initiative* (GLI), mandated by Congress under the 1990 *Great Lakes Critical Programs Act*,[137] represents a major advance in meeting U.S. obligations under the GLWQA. The Act specifically references the conformance with the GLWQA stating, "[T]his Guidance must conform with the objectives and provisions of the GLWQA" and furthermore "will establish goals and minimum requirements that will further the next phase of Great Lakes programs."[138] In addition, the Guidance helps establish consistent goals or minimum requirements for

---

[136] U.S. General Accounting Office, *Water Pollution: Poor Quality Assurance and Limited Pollutant Coverage Undermine EPA's Control of Toxic Substances*, GAO/PEMD-94-9, February 1994.

[137] Congress amended section 118 of the Clean Water Act through the Great Lakes Critical Programs Act. The general purpose was to improve effectiveness of EPA's existing programs in the Great Lakes by identifying key treaty provisions agreed to in the GLWQA, imposing statutory deadlines for implementation of these key activities, and increasing federal resources for program operations in the Great Lakes System.

[138] U.S. Environmental Protection Agency, Final Water Quality Guidance for the Great Lakes System, Federal Register Vol. 60, No. 56, March 23, 1995.

Remedial Action Plans and Lakewide Management Plans (LaMPs) that are critical to the success of multi-media efforts to protect and restore the Great Lakes ecosystem.

The GLI is a set of uniform water quality standards designed to protect the health of people, fish, and wildlife in the Great Lakes ecosystem from toxic pollutants. It affects all types of pollutants, but targets persistent pollutants that accumulate in the Great Lakes food chain. The GLI includes minimum water quality criteria, antidegradation policies, and implementation procedures that provide a coordinated ecosystem approach for addressing existing and possible pollutant problems in the Great Lakes system.

U.S. EPA published final GLI standards in 1995, providing states until March 23, 1997 to adopt provisions in their water quality programs consistent with the federal version. As of October 1997, only three Great Lakes States -- Indiana, Wisconsin and Michigan -- have adopted the new water quality standards. Having missed the adoption deadline, Illinois, Minnesota, New York, Ohio and Pennsylvania continue at varying rates to move toward completion of their rules. U.S. EPA was required to promulgate the federal GLI in the Great Lakes states that failed to meet the March 23 deadline. When U.S. EPA still did not act after nearly four months, the NWF filed suit.

U.S. EPA anticipates a reduction of nearly one million pounds of contaminants entering the lakes once the GLI is fully implemented. To help combat these chemicals entering the Great Lakes, the GLI contains a "reverse onus" provision and a "weight of evidence" approach consistent with IJC recommendations. Under this provision, numerical values on "how clean is clean" are set with whatever data are available for certain pollutants. Then, dischargers of those pollutants have the option of proving that the pollutants are not as harmful as the existing data say. By using this system for "Tier 2" pollutants, the GLI puts the cost and burden of data collection on the polluter, not the taxpayer.

While the GLI is a big step forward, the standards do not implement the policy of zero discharge as called for in the GLWQA, nor do they result in sunsetting of chemicals as recommended by the IJC. Further, the GLI is only the first step in controlling diffuse pollution sources, including land runoff and atmospheric deposition.

The CWA does provide a tool for crafting pollution control solutions based on the ecosystem approach, using a watershed protection mechanism called Total Maximum Daily Loads (TMDLs). TMDLs could be used as an interim step to better control diffuse pollution sources, such as runoff, atmospheric and contaminated sediments, in imperiled and threatened water bodies (i.e., those

with water quality criteria exceedances). Further, TMDLs should be used to reinforce Remedial Action Plans (RAPs) for Great Lakes Areas of Concern (AOC). Unfortunately, most Great Lakes States have failed to take TMDLs seriously. According to a recently-published report by the NWF,[139] which analyzed states' actions to use this watershed protection tool for imperiled waters, the Great Lakes states were ranked as follows:

- FAILING - Michigan, Indiana, Wisconsin and Minnesota
- POOR - Illinois, Ohio and Pennsylvania
- WEAK - New York

The GLWQA espouses a very different philosophy with respect to PTSs from that in the CWA and the GLI. The IJC has said these chemicals are basically unsafe and too risky to be tolerated in any amount; thus, the philosophy of zero discharge makes sense for these persistent toxic substances. "The complexities of unpredictable dose-response relationships; exposures to chemical combinations; variations in injury related to life stage, hormonal state, gender, site of exposure, and countless other variables will confirm the Agreement's fundamental wisdom of seeking zero discharge of persistent toxic substances."[140]

RECOMMENDATION: **The U.S. government must use its authority under the Clean Water Act to require zero discharges of persistent toxic substances by preventing the use of processes and chemicals that result in continuing releases of these substances.**

The U.S. and state governments must improve their implementation of the CWA by requiring that all sources of persistent toxic substances -- not just discharges from city and industrial pipes -- are prevented and eliminated.

EMERGENCY PLANNING AND COMMUNITY RIGHT-TO-KNOW ACT

The Toxics Release Inventory (TRI), established under the Emergency Planning and Community Right-to-Know Act of 1986, is intended to inform the public and industry of the nature and magnitude of toxic releases. The TRI is a powerful tool for informing the public about toxics in their communities and

---

[139] Pollution Paralysis: State Inaction Puts Waters at Risk, National Wildlife Federation, 1997.

[140] National Wildlife Federation, Great Lakes Natural Resource Center, Comments to the IJC, "The Agreement and You -- Questions for Sectoral Insight," May 1997.

workplaces. Consequently, this has prompted increased scrutiny by the public of such releases. While the TRI does not require enforced reductions in toxic chemical releases, it can be argued that this publicly accessible information has resulted in substantial public pressure on companies and government to improve environmental performance, including pollution prevention efforts. The TRI has also emerged as a mechanism to measure pollution prevention, by setting benchmarks and goals for pollutant reductions.

The TRI provides useful information on trends of the releases and transfers of pollutants between environmental media. For instance, the 1997 TRI report showed that while pollutant releases to the environment were falling, the amounts of toxic chemicals transferred in waste streams increased from 15 billion pounds in 1991 to 35 billion pounds in 1995.[141] Such trends data are important, as they can potentially be used to indicate areas of concern and guide policy-making and regulatory programs.

It is important to recognize that the TRI represents only a small percentage of total toxic releases. According to the 1991 U.S. GAO report, the toxic emissions not reported through the TRI system could amount to 95% of the total releases.[142] Since that time, U.S. EPA expanded the TRI to include additional chemicals, facilities, and chemical use reporting. In 1997, U.S. EPA added several major non-manufacturing facility sectors to the TRI program, including metal and coal mining, oil and coal burning electric utilities, solvent recovery services, among other sectors. It is apparent that the U.S. government is attempting to enhance this reporting device for PTSs, as demonstrated in the commentary section of the 1997 TRI Report:

> *EPA is also exploring how to get information on extremely toxic persistent bioaccumulators to the public through TRI, possible through reducing the reporting threshold for those chemicals. EPA is considering lowering the thresholds because releases of TRI chemicals that are toxic persistent bioaccumulators may not be reported because the chemicals may be manufactured below*

---

[141] *1995 Toxics Release Inventory*, U.S. EPA, Office of Pollution Prevention and Toxics, EPA 745-R-97-005, April 1997.

[142] U.S. General Accounting Office, *Toxic Chemicals: EPA's Toxic Release Inventory is Useful But Can Be Improved*, June 1991, p. 3.

the reporting threshold and because small release amounts may build up in the environment.[143]

Unfortunately, in 1997 when the TRI was expanded to include oil and coal burning electric utilities, U.S. EPA did not seize this opportunity to lower the reporting threshold to obtain information about mercury (a bioaccumulative heavy metal) emissions from coal-burning power plants, which are a significant source of mercury emissions and to the Great Lakes region.

While more can be done to maximize the TRI's effectiveness and coverage of persistent toxic substances, this informational tool should be recognized as an important component towards achieving the Agreement's goal of virtually eliminating discharges of persistent toxic substances.

RECOMMENDATION: **U.S. EPA's efforts to expand the list of TRI chemicals and include additional facilities is a step in the right direction. U.S. EPA should lower the reporting threshold for facilities that release persistent toxic substances, because these toxics are causing harm at very low levels to people and wildlife. In addition, U.S. EPA should consider including information on relative toxicity.**

TOXIC SUBSTANCES CONTROL ACT

Congress passed the *Toxic Substances Control Act* (TSCA) in 1976 to enable the U.S. EPA to obtain more information on chemicals and to control those that pose an unreasonable risk. If U.S. EPA finds that a chemical's risks are unreasonable, it can prohibit or limit its production, distribution, use, and disposal or take other action, such as requiring warning labels on the substance. In practice, however, U.S. EPA has issued only a few regulations to control toxic chemicals under TSCA because the act's legal standards are very high, and the burden of proof is essentially on EPA.[144] A 1994 U.S. GAO report summarizes the limitations of TSCA:

---

[143] 1995 Toxics Release Inventory, U.S. EPA, Office of Pollution Prevention and Toxics, EPA 745-R-97-005, April 1997, p. 12.

[144] U.S. General Accounting Office, *Toxic Substances Control Act: Legislative Changes Could Make the Act More Effective*, GAO/PEMD-94-103, Sept., 1994.

> *TSCA's unique authorities to limit the manufacture, distribution, and use of toxic chemicals could be important tools in a comprehensive program for these chemicals. However, the Act's legal standards are so high that they have usually discouraged EPA from using these authorities. In addition, EPA has generally interpreted TSCA as giving preference to dealing with chemical risks under other laws. As a result, EPA has issued regulations to control only nine chemicals in almost 18 years.*

Other laws which U.S. EPA has utilized for managing chemical risks can limit environmental releases and exposures, but do not offer TSCA's flexibility to ban or restrict chemicals' production, distribution, use, and disposal.

The IJC recommends that the onus be on the producers and users of toxic substances to establish they are safe rather than on government to prove they are harmful. TSCA was designed with such a "reverse onus" provision, making chemical manufacturers and processors responsible for developing data on the health and environmental effects of chemical substances and mixtures. The language of TSCA reads,

> *It is the policy of the United States that...adequate data should be developed with respect to the effect of chemical substances and mixtures on health and the environment and that the development of such data should be the responsibility of those who manufacture and those who process such chemical substances and mixtures.*[145]

Unfortunately, TSCA has not been effective at requiring minimal toxicity testing and data on health and environmental effects from chemical substances. A new report from the Environmental Defense Fund (EDF) scores the chemical industry's and EPA's progress toward the goals of TSCA.[146] This report documents that, today, even the most basic toxicity testing results cannot be found in the public record for nearly 75% of the top-volume chemicals in commercial use.[147] The EDF also reports that 71% of the random sample of

---

[145] 15 U.S.C. at 2601(b).

[146] *Toxic Ignorance: The Continuing Absence of Basic Health Testing for Top-Selling Chemicals in the United States*, New York: Environmental Defense Fund, 1997.

[147] *Ibid.*, p. 7.

100 chemicals examined lack minimal toxicity information. Further, the U.S. GAO report[148] cited above states that:

> *Although EPA has reviewed new chemicals in a timely manner, its process does not ensure that their potential risks are fully assessed before they enter commerce. EPA usually has few if any test data, and it predicts chemicals' potential effects with mixed results. In addition, the data that EPA uses to assess exposure may change substantially after manufacture begins. For existing chemicals, the burden is essentially on EPA to compile the data, which is time-consuming and costly. As a result, EPA has reviewed the risks of about 2 percent of the 62,000 chemicals that were already in commerce when the agency began to review new chemicals.*

Such toxicity data and assessments are essential for controlling those chemical substances found or suspected to be harmful. Furthermore, U.S. EPA cannot disseminate much of the toxicity information because industry claims it is confidential. "EPA believes that many claims are not necessary to protect trade secrets. The agency has successfully challenged the validity of some claims, but it does not have the resources to challenge a significant portion."[149]

Finally, the IJC recommends that government action should be based on the weight of accumulated evidence of harm rather than on the need for absolute proof that may take many years to demonstrate. TSCA's strict legal standards directly contradict this "weight of evidence" approach and is likely the fundamental reason why EPA has issued regulations to control only four new and five existing chemicals determined to present an unreasonable risk.[150]

RECOMMENDATION: **Congress should amend TSCA to tighten loopholes that have resulted from court decisions and EPA's interpretation of the law. In the meantime, U.S. EPA should**

---

[148] U.S. General Accounting Office, GAO/PEMD-94-103, Sept., 1994.

[149] *Ibid.*

[150] For instance, although EPA had considerable evidence of serious health problems and spent several years developing a rule to phase out the use of nearly all products containing asbestos, the Fifth Circuit Court of Appeal decided in 1991 that the agency had issued the rule on the basis of insufficient evidence.

interpret TSCA as Congress intended -- to control toxic chemicals that are causing harm to people and the environment. To do so, U.S. EPA needs to: 1) utilize TSCA rather than other laws in dealing with these toxic substances; 2) place the burden on chemical manufacturers and processors to demonstrate these substances are <u>not</u> causing harm to people and the environment; and 3) apply the weight of evidence approach to regulating suspect chemicals and classes of chemicals to protect people and wildlife in the Great Lakes region.

Federal Pollution Prevention Initiatives

Pollution prevention has evolved significantly in the past decade. U.S. EPA and the States have pioneered innovative efforts and practices that reduce the creation of pollutants in the Great Lakes region. The *Pollution Prevention Act* of 1990 defines pollution prevention in the context of source reduction: "[a]ny practices which reduce the amount of any hazardous substances, pollutant or contaminant entering **any** waste stream or otherwise released into the environment prior to recycling, treatment or disposal..."(emphasis added). Several major federal pollution prevention programs associated with the goal of virtual elimination are highlighted below:

- U.S. EPA has highlighted the *33/50 Program* as its major voluntary effort for achieving pollution prevention through source reduction under the *Pollution Prevention Act* of 1990. The program is aimed at voluntary reductions in environmental releases and transfers of 17 pollutants reported in the TRI. The program proved successful according to EPA's results; both the 33% and 50% national pollutant reduction goals were achieved a year ahead of schedule. The 1994 TRI demonstrated a 51 percent reduction from the 1988 baseline, a reduction of 757 million pounds. Among the states with "top ten" reductions were the Great Lakes States of Illinois, Indiana, Michigan, New York, Ohio, and Pennsylvania.

- U.S. EPA's *Common Sense Initiative* was designed to achieve greater environmental protection at less cost by creating strategies for controlling and preventing pollution for individual industries rather than for individual pollutants. Six pilot industry sectors were selected to participate in the Initiative including printing, auto assembly, computers and electronics, iron and steel, metal finishing, and petroleum refining. Current projects are addressing community

technical assistance/community involvement, brownfields, publicly-owned treatment works, access to capital, and industry strategic planning.

- U.S. EPA's *Partners for the Environment* program encompasses more than 28 voluntary programs. A primary goal is to encourage voluntary reduction of the use of specific hazardous chemicals by businesses, governments, and other organizations through actual design or redesign of products, processes, and technical and management systems. Of these partnership programs, *Project XL* most explicitly relates to reductions of toxic substances; it involves voluntary industry reductions of 117 toxic substances. Currently, no *Project XL* initiatives are in place in any of the Great Lakes states.

- In 1994, U.S. EPA, Federal Drug Administration, and U.S. Department of Agriculture, committed to the goal of having 75% of U.S. agricultural acreage adopt integrated pest management programs by the Year 2000. U.S. EPA is working with pesticide users on the *Pesticide Environmental Stewardship Program* to reduce pesticide risks through changes in use, chemicals and technological advances. Program participation increased from 20 charter members in 1994 to 78 partners and 15 sponsors in 1997. No data on reduced pesticide use and/or risk is currently available.

Automobile Pollution Prevention Project

This voluntary program, administered by American Automobile Manufacturers Association, is an effort of U.S. automakers in partnership with government to reduce uses and releases of 65 persistent toxic substances, known as Great Lakes Persistent Toxic substances. The Project is based on the principle of addressing environmental concerns at the design stage for vehicles and components so that substances of concern are eliminated from production and use. Since the project began in 1991, program accomplishments include a 9% reduction in 65 Great Lakes Persistent Toxic substances, on a production normalized basis.

2.2.2 State Laws, Policies and Programs

GREAT LAKES TOXIC SUBSTANCES CONTROL AGREEMENT

The *Great Lakes Toxic Substances Control Agreement*, signed by Great Lakes Governors in 1986, provided assurance for the leaders of the Great Lakes states that they would not compete with each other for polluting industries. In this Agreement, the Governors recognized that the problem of persistent toxic substances was the foremost environmental issue confronting the Great Lakes. This Agreement recognized the need for a uniform discharge permitting system among Great Lake States, which later became a reality through the GLI.

Pollution Prevention Initiatives

In recent years, the Great Lakes states have taken a leadership role in the design and implementation of pollution prevention programs. State agencies have served an integral role in: sponsoring programs; facilitating goal-setting and reporting; analyzing, developing and publicizing data; providing technical assistance, education and outreach (i.e., workshops and seminars); and administering pilot programs.

State environmental agencies have provided opportunities to enhance communication and relationships among public, private, and nonprofit sectors regarding pollution prevention. Such relationships have prompted existing and emerging pollution prevention activities that are changing the way businesses and municipalities in the basin approach their environmental management decisions.

This section is intended to highlight examples of state progress in furthering pollution prevention of persistent toxic substances. Through research and discussions with agency officials, it is evident that states' efforts thus far have primarily focussed on mercury and that little has been done to comprehensively address the IJC's list of persistent toxic substances.

- Michigan convened a multi-stakeholder effort to identify opportunities to achieve reductions in the use and release of mercury. The *Michigan Mercury Pollution Prevention Task Force* report, released in April 1996, has been used as a model by other states, U.S. EPA, and Canada. The state brought together stakeholders to examine various sectors that use and release mercury and recommend opportunities to achieve voluntary mercury reductions.

- Ohio EPA is active in integrating pollution prevention into its regulatory framework. This integration was manifested through the GLI rule-making process, which required that dischargers must integrate pollution prevention

into their planning if they intend to request permission to release harmful substances such as mercury.

- Minnesota has advanced mercury pollution prevention through legislation banning specific mercury-containing products. Since 1992, emissions from the state's 12 waste combustors have been reduced from 1,500 to 500 pounds of mercury, primarily by eliminating use of mercury-containing products. Minnesota recently embarked on a *Mercury Contamination Reduction Initiative* that is developing integrated plans to address all significant mercury sources and evaluating both voluntary and regulatory ways to reduce mercury releases.

- The University of Wisconsin (UW)-Cooperative Extension has expanded its pollution prevention outreach and technical assistance efforts in the Lake Superior basin. Through a *Mercury Reduction Initiative*, specialists assist businesses, wastewater treatment plants, households, dental and veterinary facilities to eliminate mercury uses and releases. Also, UW-Cooperative Extension has coordinated household hazardous waste "clean sweeps" annually since 1984, which cumulatively collected nearly 3 million pounds of hazardous wastes.[151]

2.2.3 Municipal Mercury Pollution Prevention Programs

Following are two examples of municipal programs to reduce mercury emissions from wastewater treatment plants in the Great Lakes Basin.

Duluth, Minnesota

- The Western Lake Superior Sanitary District (WLSSD) in Duluth, Minnesota has a *Zero Discharge Pilot Project* to identify and reduce their wastewater discharges of persistent toxic substances. This project was initiated in anticipation of the need to meet lower limits on discharge of persistent toxics under Great Lakes Initiative. Working with the WLSSD, several surrounding communities and area hospitals have instituted a series of actions to eliminate mercury uses and releases. The WLSSD also operates a permanent household hazardous waste education and collection center, which also provides information about preventing waste with an emphasis on toxics of concern to Lake Superior.

Detroit, Michigan

---

[151] University of Wisconsin, Cooperative Extension, Environmental Resources Center, Wisconsin Household Hazardous Waste Collections Summary 1984-Present, September 6, 1997.

- The City of Detroit Water and Sewerage Department *Mercury Minimization Program* is an effort to reduce/eliminate mercury loadings to the sewerage collection system. This program, which is a condition of the city's pollutant discharge permit resulting from litigation, is a model for other large cities. Pilot programs targeted at dental facilities, hospitals, laboratories, households, and industrial laundries have eliminated, or identified opportunities to eliminate, mercury uses and releases by using acceptable alternatives. Through this program, approximately 1,300 pounds of mercury (from more than 400 dentists) were collected, thereby reducing potential discharges to the collection system.

The philosophy of pollution prevention, or preventing or reducing waste where it originates, corresponds directly with the Agreement's philosophy of zero discharge of persistent toxic substances. The governments, municipalities and industries should be applauded for pollution reductions achieved through various programs and initiatives. Unfortunately, current state and federal pollution programs are not designed in the philosophy of zero discharge and rely almost exclusively on voluntary commitments from industry to achieve pollutant reductions. As a result, demonstrating tangible results, aside from the examples cited, is difficult.

The federal, state and municipal pollution prevention programs are overwhelmingly voluntary in nature. In 1994, the U.S. GAO concluded that many state programs claiming to conduct pollution prevention via source reduction were inordinately involved in waste recycling, treatment and/or disposal. This focus is inconsistent with the Agreement and was also judged to be inconsistent with the policy established under the U.S. *Pollution Prevention Act*, which places source reduction at the top of the pollution prevention hierarchy.

A key finding of a 1997 report evaluating the applicability of voluntary programs to achieve virtual elimination stated "traditional, voluntary, beyond compliance programs which generally have involved promoting pollution prevention through award, partnership and technical assistance programs may have limited applicability in addressing these contaminants."[152]

Applications of pollution prevention have primarily been based on voluntary commitments by government, business and industry, hospitals, educational institutions, and non-governmental organizations. In 1996, the IJC pointed out

---

[152] Linnett, B., Science Applications International Corporation, *Report on Applicability of Voluntary, Beyond Compliance Programs to the Virtual Elimination Strategy*, Submitted to the Great Lakes Water Quality Board, International Joint Commission, March 1997. p. 1.

that "However laudable, voluntary programs are only as strong as the incentives to create and maintain the commitment. Economic factors and legal requirements generally drive the extent of such activities,"[153] Michigan's *Pulp and Paper Program* is a stark example of the limitations associated with voluntary programs, in light of the fact that "quantitative reductions for bioaccumulative pollutants will only become part of the industry's pollution prevention goals if the mills choose them as goals initially."[154] In other words, if the pulp and paper mill does not find it in their best interest to reduce the chemicals most harmful to the Great Lakes ecosystem, it is not required to do so.

2.3 Multilateral and Bilateral Initiatives

Great Lakes jurisdictions are involved in the negotiation and implementation of international agreements that should assist them in moving to the goal of virtual elimination. Over the past few years, there have been significant developments in this regard. The IJC has recommended that the governments attempt to protect the Great Lakes ecosystem through international and global agreements.

This section will review and evaluate some of these initiatives. Because many of them remain in the negotiation stage or have just been concluded, It is premature to provide a detailed analysis.

2.3.1 Multilateral Initiatives

UN Economic Council for Europe (ECE) Long-Range Transport of Atmospheric Pollutants (LRTAP) Negotiations

The international community has become increasingly aware of the problems associated with the use, generation and release of persistent organic pollutants (POPs). In the Great Lakes Basin, POPs are a major contributor to the pollution problem. In 1997, the United Nations Economic Council for Europe initiated negotiations with member countries to develop an appropriate protocol on POPs.

---

[153] International Joint Commission, *Eighth Biennial Report on Great Lakes Water Quality*, 1996, p. 29.

[154] Linett, B., Section 3.1.3.

These negotiations, which began in January 1997, are expected to be completed by October 1997. As this negotiation process will provide a model for future negotiations on the issue of POPs, it is important to note that the completion of these discussions may determine the framework for the UNEP negotiation towards a global treaty on POPs.

At this time, many of the commitments from these negotiations remain unresolved, including the substances designated for action. Under the draft Protocol, Annex A substances are scheduled for elimination, while substances found under Annex B are scheduled for restriction in uses.[155] The final negotiating session in Geneva to be held in late October, 1997, aims to address some of the outstanding issues including the finalization of the list of substances for action, the procedure for adding substances to the Annexes, and the issues relating to trade. The Great Lakes NGO community has not had a significant role in providing input into the development of the governments' positions on the Protocol on POPs, but have monitored the progress of the negotiations.

United Nations Environmental Program (UNEP) POPs Negotiations/ UNEP Heavy Metal Negotiations

The United Nations Environmental Program has decided to initiate intergovernmental negotiations to develop a global treaty on POPs and heavy metal. These negotiations are expected to begin in July 1998. The intentions of the negotiations are to prepare a legally binding global agreement on POPs that will be ready for adoption and signatures by the year 2000.

The negotiations will focus on the following recommendations and commitments contained in the Final Report of the Intergovernmental Forum on Chemical Safety (IFCS) POPs Working Group:

• international action to begin on twelve specified POPs: DDT, aldrin, dieldrin, endrin, chlordane, heptachlor, hexachlorobenzene, mirex, toxaphene, PCBs, dioxins and furans.

• establishing an expert group to develop science-based criteria and procedures for identifying additional POPs as candidate for future international action.

---

[155] As of the end of September, 1997, Annex A Substances includes Aldrin, Chlordane, DDT, Dieldrin, Endrin, Hexabrombiphenyl, Hexachlorobenzene, Mirex, Toxaphene, Chlordecone, Heptachlor, Lindane, PCB, Pentachlorophenol.

• the Intergovernmental Negotiation Committee (INC) should be open to Governments, relevant intergovernmental and non-governmental organizations consistent with UN rules.

• for POPs which are intentionally produced, there is a slightly qualified commitment to "eliminate production and subsequently the remaining use."

• a commitment to destroy obsolete POPs stocks, and remediate environmental POPs reservoirs is qualified by concerns about the availability of appropriate and adequate destruction facilities, and by questions of the practicality and economic feasibility of full remediation.

• for POPs generated as unwanted by-products, there is a commitment to release reduction and/ or source elimination; this includes " the application of appropriate techniques and/or materials policies that minimize and/or eliminate releases of dioxins/furans."

• transition periods with phased implementation will be used.

• socio-economic factors should be addressed in developing and implementing international action on POPs.

• governments are encouraged to take early action on POPs without waiting for the conclusion of negotiations.

• governments and other actors in the position to do so are asked to provide resources and assistance to help developing countries take appropriate action on POPs.[156]

CEC Initiatives

There are a number of initiatives of the Commission on Environmental Cooperation (CEC) formed under NAFTA that are relevant to the Great Lakes. The CEC, comprised of Canada, U.S. and Mexico, has a broader mandate that the Great Lakes under its governing agreement, the North American Agreement on Environmental Cooperation. Two of the parties to the CEC are signatories to the GLWQA, and as such, it would be hoped that they would ensure consistency of actions between the two international regimes.

---

[156] Weinberg, Jack, Greenpeace, Memo dated March 14, 1997 to NGO Participants in the Chicago POPs Workshop. An Update on Recent Developments Leading Toward the Negotiations of a Legally Binding Global Agreement to Reduce and/or Eliminate the Environmental Release of Persistent Organic Pollutants (POPs).

Of the CEC initiatives that have evolved over the past few years, two are noteworthy: Resolution 95-5 and the Continental Pathways study.

(a) Resolution 95-5: RAPs

In 1994, the CEC initiated a process under article 13 of the Cooperation Agreement to examine means to limit pollutants in the North American context. This initiative resulted in Resolution #95-5, "Sound Management of Chemicals." That 1995 Resolution established a framework to promote regional cooperation for the sound management of chemical substances of mutual concern throughout their life cycle.

Further to this resolution, Mexico, Canada and the United States decided to focus on four pollutants: PCBs, DDT, Chlordane and Mercury. For each of these pollutants, Task Forces comprised of representatives of the three countries were established. Task Forces were mandated to develop a "Regional Action Plan" (RAP) for the purposes of organizing and encouraging individual behaviour and joint actions by the three countries with respect to each pollutant.

Draft RAPs were released for comment in 1996. A few of these RAPs were finalized later that year while others remain in draft form.

Continental action is required on these substances to protect the Great Lakes. However, when the draft RAPs were released for public comment, serious concerns were raised as to whether the RAPs were sufficiently strong to respond to the challenges posed by these substances. The PCBs and Mercury RAPs are examples of the concerns raised with respect to these initiatives.

Despite the recognition that PCBs are "persistent, highly toxic, and bioaccumulative, the goal of virtual elimination in the regional plan is different than the one articulated in the GLWQA. Under the RAP, the goal is the "virtual elimination of PCBs in the environment." However, the term "virtual elimination" is defined as "no measurable release of PCBs to the environment and the phase-out of PCBs uses for which release cannot be contained." Hence, the PCB goal continues to legitimize the use of PCBs without any targeted phase-out date. There is no effort to set a timetable for the phaseout of the use of PCBs; instead, the emphasis remains on ensuring that PCBs are not released into the environment once they are used. The second and third overarching goals confirm this interpretation of the approach since the second goal calls for "environmentally sound management of existing PCBs throughout their life cycles." The third goal describes the "management of PCBs as one element of comprehensive environmental management programs."

The six strategies of the RAP are also oriented to a management philosophy for PCBs.[157] The fourth strategy pertains to the proper treatment and disposal of PCBs wastes. Under this strategy, the countries will consider the development of a Code of Practice for the management of PCB wastes. Such a Code would identify guidelines for the handling and management of PCB wastes in North America.

The PCB RAP does not set goals or encourage the development of appropriate destruction technologies. Hence, there are no mechanisms to find new non-incineration technologies that could deal with PCB storage and reduce the risk of fires and spills. Moreover, even with respect to a management regime for PCBs, the Code of Practice does not call for more stringent laws for PCB management. Instead, the only mention of regulatory measures relates to the commitment of countries to exchange "information on their regulations and approved technologies."

There is no doubt that the PCB RAP will assist to find out more about PCBs in North America in terms of their sources, uses and practices. Moreover, the RAP should assist in improving the management of these substances. However, the larger question is whether the RAP will contribute to the eventual phase-out of the use of these substances and ways and measures to destroy PCBs in an environmentally acceptable manner.

The PCB RAP is inconsistent with the GLWQA. The virtual elimination goal of the GLWQA calls for the virtual elimination and the development of regulatory strategies in the "philosophy of zero discharge." Moreover, the IJC recommended the development of timetables for both the phase-out of PCBs and the development of technologies for their phase-out.

The Mercury RAP[158] suffers from the same problems as the PCB RAP. This RAP focuses on managing anthropocentric sources of mercury and in particular, to promote "safe and environmentally sound production, use,

---

[157] These strategies include:
* establish the PCB information base;
* manage the use of PCBs;
* manage the storage of PCB waste;
* promote PCB waste reduction and recycling;
* assure proper treatment/disposal of PCB wastes; and
* manage the transboundary shipment of PCB wastes.

[158] Draft North American Regional Action Plan for Mercury, Sound Management of Chemicals Project, 8 October 1996.

consumption and recycling of mercury and mercury-containing products while minimizing their release to the environment. Other criticisms of this RAP[159] include:

* the Action Plan includes no commitments that would make improvements. The stated goal of "reducing exposure posed by mercury to human health, wildlife and the environment through the sound management of chemicals" provides no standards against which progress can be measured.

* The actions proposed could in fact result in set backs on progress. The action on "science experts meeting" focuses on assessing the relative contribution of human and natural sources of mercury. The fact that mercury is naturally occurring should not be an excuse for saying that human activities that release mercury are relatively insignificant and that, therefore, action does not have to be taken. This is a piece of information that is not relevant to a serious action plan.

* While there is mention of regulatory measures, the action on regulatory measures is extremely weak. In fact, the only commitment on the regulatory side is to exchange information on regulations and all other actions are based on voluntary measures.

Like the PCB RAP, the mercury RAP falls short of the directions in the GLWQA and the recommendations of the IJC.

(b) Continental Pathways Initiative

In fall of 1997, the Commission for Environmental Cooperation (CEC) released a report entitled: *Continental Pollutant Pathways: An Agenda for Cooperation to Address Long-Range Transport of Air Pollution in North America*. The report was prepared by the Secretariat for the CEC to better understand the role long-range transport plaays in air pollution problems in North America and opportunities for successful cooperation to solve them. The forty scientists and policy experts contributed to the report. The report concluded, among other conclusions that:

• Many pollutants such as mercury and pesticides travel vast distances across North America and once deposited on land or in water bioaccumulated through food webs;

---

[159] For example, see: Letter by John Jackson, Great Lakes United to Ms. Browner, Hon. S. Marchi and Mtra Carabias, dated November 26, 1996.

- Many pollutants transported long distances through the atmosphere originate from a relatively small number of major sources, such as fossel-powered electricity generation, motor vehicles, incinerators and pesticides; and

- Domestic, bilateral and continental actions should be strengthened to deal with the issues.

The report has been submitted to the Council of the CEC for its consideration.

2.3.2 Bilateral Initiatives

CANADA-UNITED STATES AIR QUALITY AGREEMENT

The *Canada-United States Air Quality Agreement* was concluded by the two countries in 1991. The focus of the Agreement pertains to acid-rain causing emissions (sulphur dioxides and nitrogen oxides). However, in its biennial progress reports, the governments report on other issues. In its latest report, the *1996 Progress Report*, it is apparent that there is no commitment at this time to extend the *Canada-U.S. Air Quality Agreement* to cover air toxics. In fact, the governments seem to be relying solely on existing bilateral and international efforts. These efforts include Annex 14 of the GLWQA, the *Binational Toxics Strategy*, the work of the CEC, the UN ECE *Convention on Long-Range Transboundary Air Pollution* and the UN Environment Porgram's *International Forum on Chemical Safety*, and other related global chemical safety forums.

As such, it is apparent that the *Air Quality Agreement* will not be the vehicle to further the air toxics problem in the Great Lakes.

GREAT LAKES BINATIONAL TOXICS STRATEGY

Commencing in the early 1980s, the IJC has repeatedly called for a binational toxics management plan. The governments began to negotiate such a strategy in 1994-95 with an initial draft as the subject of a public consultation in August of 1995. The final version was signed in April 1997.[160]

---

[160] The Great lakes Binational Toxics Strategy - Canada-United States Strategy for the Virtual Elimination of Persistent Toxic Substances in the Great Lakes (April 1997).

Several environmental organizations in the Great Lakes subnitted a brief outlining their concerns about the draft Binational Strategy. Their concerns included:[161]

RECOMMENDATION: **We recommend that the parties include the definition of virtual elimination and zero discharge as interpreted and articulated by the International Joint Commission in the Fifth, Sixth, Seventh and Eighth Biennial Reports in order to avoid a lengthy debate during the implementation of the strategy. We urge the parties not to adopt the definition of virtual elimination in the Canadian federal Toxic Substances Management Policy either expressly in the VES or when implementing this strategy.**

RECOMMENDATION: **Specifically, we recommend that the strategy be revised to correct this deficiency in the following ways:**

1) The Strategy should be revised to describe the process that will be followed to determine the best mechanisms in the two countries to sunset the Level I Toxic Substances.

2) The Strategy should be revised to state more clearly that the timetables for reduction in the current draft are interim targets only, and that the ultimate goal is to achieve zero discharge (or to sunset) these chemicals.

At a minimum, the process of implementing the VES must be structured so as to require thorough discussion and exploration of mechanisms to sunset dioxin and other persistent toxic substances, as has been done by the Center for the Biology of Natural Systems (CBNS) for dioxins from medical waste incineration. If these changes are not made, it is inappropriate and misleading to title the strategy a "Virtual Elimination Strategy" since the content does not reflect the impression left by that title. Without these changes, the strategy represents an important but incomplete step toward virtual elimination.

---

[161] Canadian Environmental Law Association, Canadian Institute for Environmental Law and Policy, Great Lakes United, Greenpeace and National Wildlife Federation, Comments on the Canada-United States Strategy for the Virtual Elimination of Persistent Toxic Substances in the Great Lakes Basin, November 8, 1996.

RECOMMENDATION: **We recommend that the two national governments clarify their commitments to the goals and targets within the strategy.**

RECOMMENDATION: **The two governments should make a commitment to finish remediation of all sites by a specified date.**

RECOMMENDATION: **The Parties should develop action plans based on pollution prevention principles for all Level II substances. Regulatory options should be considered in every situation in the development of these action plans.**

RECOMMENDATION: **The VES should expressly recognize the regulatory approach as a legitimate approach to addressing all persistent toxic substances.**

RECOMMENDATION: **As the Great Lakes is a common ecosystem, we recommend that the federal governments attempt to standardize the elimination goals down to the common figure of zero. While we recognize the reality that milestones to reaching zero may be different, it would be helpful if more detailed explanations for all the variances were included in the VES. Simply put, the overall goal for all persistent toxic substances should be zero discharge, with all reductions understood as interim targets on the path to zero discharge.**

RECOMMENDATION: **It is recommended that the VES include a method for evaluating progress in achieving the goals of the strategy. This evaluation should be undertaken through a process that ensures full consultation with the oversight of environmental groups. Efforts should be made immediately to develop this monitoring and reporting regime, including a baseline system.**

RECOMMENDATION: **We strongly recommend that the two governments revise the strategy in the text, or an appendix, to describe how the strategy will be implemented and how interested parties and the public will be involved. This description of the process and the commitment of government resources to implementation of the strategy will be crucial in evaluating the strength of the final strategy.**

Unfortunately, the final version of the Strategy did not address the problems that were brought forward by the Great Lakes environmental community.

Conclusion

Government and industry should be applauded for pollution reductions that they have achieved through various programs. This does not mean that they have met the goals that the federal governments committed themselves to when they signed the GLWQA, or even designed their programs in ways that are consistent with the Agreement. After our assessment of the programs in this chapter, we are now in a position to answer the seven questions we posed at the beginning of the chapter.

1) Are regulatory strategies being designed in the "philosophy of zero discharge?" No. The programs are all based on the philosophy that there is some acceptable discharge level.

2) What progress has been made in furthering pollution prevention? There have been numerous government programs in this area, but they almost all suffer from two serious limitations: they are voluntary rather than regulatory; and they focus on specific pollutants rather than on processes and practices that cause the pollutants to be created. The governments in all jurisdictions have a tendency to measure progress in pollution prevention by process benchmarks, rather than by actual measures of reductions in the use, production and release of substances. For example, the U.S. General Accounting Office concluded that in EPA's Common Sense Initiative, "EPA gauges the progress of the Initiative primarily on the basis of accomplishments associated with its various processes or activities, such as stakeholder meetings, and not on the basis of its results."[162]

---

[162] U.S. General Accounting Office, *Regulatory Reinvention: EPA's Common Sense Initiative Needs an Improved Operating Framework and Progress Measures*, GAO/RCED-97-164, July 1997.

3) Have the governments adopted a "weight of evidence" approach and "reverse onus" in their laws? Neither Canada nor Ontario has laws or policies that require the use of these substances. The U.S.' GLI included these concepts, but the TSCA, which is the main instrument for controlling the use of toxic substances, directly contradicts these approaches.

4) Have the governments adopted an expanded definition of persistent toxic substances? The governments have failed to include hormone disrupting substances in their definition of substances to be targeted for virtual elimination, despite the fact that the scientific literature is showing that these substances are a major source of health problems in the Great Lakes.

5) Have the governments sunset DDT, dieldrin, toxaphene, mirex and hexachlorobenzene and sought an international ban on their production, use storage and disposal?

6) Have the governments enacted measures to direct industry to change processes and feedstocks so that dioxin, furan and hexachlorobenzene no longer result as a by-product?

7) Have the governments instituted programs to sunset the use of chlorine and chlorine-containing compounds as industrial feedstocks?

The answer to each of the last three questions is "NO." The governments' programs still focus on controlling releases. Yet these three questions pose the fundamental responses that the Great Lakes community has come to recognize as the basis for achieving the virtual elimination goal of the GLWQA.

CHAPTER 3: REMEDIAL ACTION PLANS

Since 1973, the IJC's Great Lakes Water Quality Board (WQB) has been identifying specific areas in the Great Lakes Basin that have serious water degradation problems. In 1985, the WQB found that "the programs currently in place were not adequate to solve the environmental problems identified" in these areas of concern.[163] It recommended that the governments develop Remedial Action Plans (RAPs) for the 42 areas of concern that the Board had identified. The Board recommended that RAPs for each of these areas of concern be submitted to the IJC by December 1986.

In Annex 2 of the 1987 Protocol to the GLWQA, the governments committed themselves to develop and implement remedial action plans in order to "work toward the elimination of Areas of Concern" [Article IV (f)].

More effort has been put into remedial action planning by governments and community members than any other provision in the GLWQA. Numerous activities have been stimulated by this process and communities have been pulled together to work for solutions to local problems. However, in terms, of the objectives the governments set when they signed the 1987 protocol to the GLWQA, the record has been much less positive.

Elimination of Areas of Concern:

Collingwood Harbour in Ontario is the only area of concern that has been "delisted", i.e., no longer listed as an area of concern because the impaired beneficial uses have been restored. Collingwood Harbour, which was first identified by the IJC as an area of concern in 1977, was delisted in November 1994.

Questions have arisen since the delisting of Collingwood Harbour as to whether the delisting was done too hastily. Two use impairments listed in the GLWQA have reappeared in the harbour.

Ontario's *Guide to Eating Ontario Sport Fish* places restrictions on the consumption of walleye, yellow perch and carp in Collingwood Harbour. One of the reasons for these restrictions was average concentrations of PCBs in carp in the harbour of 874 parts per billion. The levels ranged from 120 parts per billion to 4,400 parts per billion. The levels of PCBs were higher in the harbour than in surrounding areas, indicating that the problem is from a local source and should, therefore, have been addressed by the RAP.

---

[163] Great Lakes Water Quality Board, *1985 Report on Great Lakes Water Quality*, p. 32.

The second beneficial use listed in the GLWQA that has experienced an impairment since the delisting of Collingwood Harbour is restrictions on drinking water consumption. In March 1996, people in Collingwood were told not to drink treated water from the municipal water treatment plant without boiling it because of an outbreak of the parasite cryptosporidium. At least one hundred people were infected and one person was admitted to hospital because of the outbreak.

Although the water treatment plant is outside of the area of concern, the water that goes into it is affected by the area of concern. The water quality problem was attributed to fecal runoff from the agricultural area upstream (a concern that the RAP was supposed to have addressed) and an inadequate filtration system in the municipal water treatment plant. There have not been further outbreaks of this problem.

Addition of Areas of Concern:

The GLWQA requires the U.S. and Canadian Federal Governments, "in cooperation with the State and Provincial Governments and the Commission, to identify Areas of Concern" [Article IV (f)].

In February 1990, the IJC recommended to the U.S. and Canadian governments that they designate Presque Isle Bay (Erie Harbor) in Pennsylvania as an area of concern and that a RAP be developed for the area. A year later, in February 1991, the governments added Presque Isle Bay to the areas of concern designated under the GLWQA. They expect to have the Stage 2 RAP (the action plan) for this area completed in 1998.

In the past several years, neither the IJC nor the governments has conducted a systematic review as to whether other locations should be listed as areas of concern under the GLWQA. Several areas have been repeatedly raised by concerned community residents as places that should be considered for listing: the Black River/Sacketts Harbor area in New York State, Lake St. Clair bordering Ontario and Michigan, the Serpent River in Ontario, the St. Joseph River in Indiana and Michigan, and Trail Creek in Indiana.

RECOMMENDATION: **The IJC and the federal governments should carry out their obligation under the GLWQA by conducting a thorough assessment as to whether there are additional areas that should be designated as areas of concern.**

Progress on Remedial Action Plans:

Annex 2 of the GLWQA identifies three stages for RAPs: Stage 1 when the problems have been defined; Stage 2 when remedial and regulatory measures for restoration have been decided upon; and Stage 3 when beneficial uses have been restored.

In all but three cases, the Stage 1 (problem definition stage) is completed. Those that are not completed are White Lake, Muskegon, and Kalamazoo in Michigan. Also in the cases of Deer Lake and Torch Lake in Michigan, the original Stage 1 RAPs, which were completed in 1987, are now being updated. In just under half of the RAPs, Stage 2 (the action plan) has been completed or is almost completed. This is the stage that the IJC's WQB originally said should have been completed for all RAPs almost ten years ago. Only one of the 43 areas that have been defined as areas of concern has completed Stage 3 - Collingwood.

Progress varies substantially by jurisdiction. Table 5 provides a summary of the status of the RAPs in the Great Lakes Basin.

TABLE 5: RAP PROGRESS IN THE U.S.[164]

REGION	# RAPs	# COMPLETED STAGE 1	# COMPLETED STAGE 2	# COMPLETED STAGE 3
New York	6	6	2	0
Pennsylvania	1	1	1 (nearly)	0
Ohio	4	4	1	0
Michigan	11	8	2	0
Indiana	1	1	0	0
Illinois	1	1	1	0 (but with substantial progress)
Wisconsin	3	3	1	0
Minnesota	1	1	0 (half-way there)	0
Ontario	14	14	13 (near completion for all RAPs except Port Hope)	0
Binational	3	3	1	0

According to the Canadian and U.S. governments, as of December 1996 only eleven of the 303 impaired uses listed for all the RAPs in the Great Lakes had been restored.[165]

In 1990, the United States Congress passed the *Great Lakes Critical Programs Act*, which established specific time lines for the completion of RAPs. All U.S. RAPs were to be submitted to the EPA by June 1991, to the IJC by January 1, 1992, and incorporated into state water quality plans by January 1993. For the binational RAPs,

---

[164] In New York State with six RAPs, two have finished Stage 2. In Pennsylvania the only RAP is close to completing Stage 2. In Ohio, which has four RAPs, only Black River has completed Stage 2. In Michigan, which has eleven RAPs, three have not completed Stage 1 and only two have completed Stage 2. In Indiana, the Indiana Harbour/Grand Calumet RAP still has not completed Stage 2. In Illinois, Stage 2 for Waukegan, the only RAP, is completed and substantial progress has been made on Stage 3. Wisconsin, which has three RAPs, has only one RAP - the Fox River/Green Bay - that has completed Stage 2. In Minnesota, the only RAP - St. Louis River - is half done with Stage 2. In Ontario, which has fourteen RAPs, the Stage 2 RAP is finished or near being finished in all RAPs except Port Hope. Only one of the three binational RAPs - the St. Clair River - has finished Stage 2 of the RAP process. The St. Mary's and Detroit River RAPs are still far from finishing Stage 2.

[165] Environment Canada and the U.S. EPA, *State of the Great Lakes:1997 - The Year of the Nearshore*, pp. 68 & 69.

the U.S. was to cooperate with Canada to ensure that the RAPs were submitted to the IJC by June 30, 1991 and to finalize the plan by January 1993. As defined in the *Critical Programs Act*, completion meant finishing Stage 2 of the RAP, i.e., having a plan for cleanup.

It has been over six years since these Stage 2 plans were to be completed, and only eight of the twenty-eight areas of concern in the U.S. have reached the Stage 2 level. Only one of the Stage 2 documents for the three binational RAPs - St. Clair River - has been submitted to the IJC, six years after the date by which all three were expected to have been submitted.

In 1994, Canada and Ontario committed in the *Canada-Ontario Agreement Respecting the Great Lakes Basin Ecosystem* (COA) to delist nine areas of concern by the year 2000. They also committed to the restoration of 60% of impaired uses across all areas of concern on the Canadian side of the Great Lakes basin. With just over two years left until the year 2000, Canada has only delisted one of the nine areas of concern that they committed to delist and has only restored approximately 13% of the beneficial uses.[166]

Canada and Ontario are now searching for ways to speed up the delisting process. They are proposing to introduce a new designation by which they would change the designation of an area of concern to an "Area of Natural Recovery."[167] They are proposing that this new designation be used "when all reasonable and practical actions for restoring beneficial uses have been implemented, and a natural recovery period is required to achieve delisting targets."

Ontario and Canada state that an example of the type of place where they would use the natural recovery designation is for some sediment remediation situations: "Once source controls have eliminated or dramatically reduced contaminant loadings, impairments will remain until cleaner sediment covers the more polluted deposits."[168] Jurisdictions in the U.S. are also considering such a designation.

Many people on the public advisory committees fear that this new designation would become a way for the governments to sidestep their responsibilities and to pretend that this is no longer an area of concern. At a meeting on September 21, 1997,

---

[166] Presentation to Conference of Ontario Public Advisory Committees by Gail Krantzberg, Great Lakes Programs, Ontario Ministry of Environment and Energy, September 19, 1997.

[167] *Policy Regarding Change in RAP Status to "Area of Natural Recovery,"* September 1997.

[168] *Ibid.*, p. 1.

representatives of each of the PACs in Ontario unanimously passed a resolution stating that they do not want areas of concern to be renamed or redesignated until after all beneficial uses have been restored.

RECOMMENDATION: **The governments should maximize their efforts to speed up the cleanup of the areas of concern. Delisting should be achieved through actual cleanup, not by finding ways to try to justify delisting when the actual cleanup has not yet occurred.**

Reporting on RAPs to IJC:

The GLWQA requires the governments to submit reports on each RAP to the IJC for "review and comment" at the end of Stages 1, 2 and 3. The IJC puts together a team of external technical reviewers to review the RAP when each stage report is submitted by the governments.[169] These reviewers are from a multitude of disciplines, including limnology, engineering, ecotoxicology, fish and wildlife biology, and public participation. Upon receiving the comments from the external reviewers, the IJC organizes a meeting in the area of concern so those directly involved in the RAP can comment on the reviewers' comments. The IJC prepares its own report, which makes suggestions for improvements and for the next stage.

The IJC's review role and process has become a source of tension between the IJC and some jurisdictions. Concerns raised by the governments have included the timeliness of the IJC's comments and the negative comments that come through from some reviewers.

In late 1992, the State of Michigan expressed extreme unhappiness with the IJC's review process and stopped cooperating with the IJC on RAPs. The Director of the Department of Natural Resources said: "It remains our strong view that the IJC RAP review process is cumbersome, untimely and excessively staff intensive. The reviews have been inaccurate, inconsistent and have addressed issues not explicitly covered by the Great Lakes Water Quality Agreement."[170]

By contrast, local citizens' groups have been supportive of the IJC review process and have been particularly supportive of the IJC bringing in outside technical experts

---

[169] Under current IJC policy, they use outside reviewers only for Stage 1 reviews.

[170] Letter to Gordon Durnil and Claude Lanthier, Chairs IJC, from Roland Harmes, Director, Michigan Department of Natural Resources, December 11, 1992.

to review RAP documents. They have, however, shared the view that they would like the IJC comments to come more quickly so they can be integrated into the RAP process before the RAP has moved far forward into the next stage.

The State of Michigan has dropped out of the formal stage reporting required by the GLWQA. They have committed themselves to issue a biennial report for each RAP that would focus on "progress achieved and actions required at the state, federal and local levels."[171]

After Michigan decided to ignore the reporting provisions for RAPs in the GLWQA, other jurisdictions also became more lax at following the Agreement's requirements. Ohio now just does periodic updates. Minnesota and Wisconsin rarely report to the IJC anymore. Only Indiana, Illinois, New York and Ontario still follow the reporting requirements of the GLWQA.

The impact of these changes in the reporting process has been twofold: 1) it has meant that the valuable insights of outside reviewers and the IJC are lost, and 2) it means that it is much more difficult for the IJC to keep informed on RAP progress.

A fundamental problem in the reporting and approvals process is the amount of time that it takes from the point at which the local people working on the RAP have agreed to a document until the senior government levels have reviewed and signed off on the document and then the IJC has reviewed it. For example, Nipigon Bay finished their Stage 2 document almost two years ago, but the Canadian and Ontario governments still have not signed off on it because of confusion in the system. These sorts of delays have recurred numerous times around the basin. Similarly, IJC reviews have routinely taken well over a year.

In an effort to overcome the problems of spotty reporting from the governments and to deal with making timely input, the IJC has started to do status assessments of selected RAPs. The first three RAPs undergoing assessments are the Detroit River, St. Mary's River and Hamilton Harbour.

The IJC released its draft Detroit River status assessment for public comment in May, 1997. The report was highly critical of the governments for the slowness of progress on the Detroit River RAP and pointed to a lack of leadership by the governments as a major problem. Environmental and local citizens' groups praised the IJC report, but the governments, especially Michigan, condemned the IJC report.

---

[171] *Strategies to Improve Michigan's RAP Process*, November 1993.

The message from the governments over the past several years has been clear: the governments do not want serious involvement by the IJC or critiques from the IJC on the RAP process.

RECOMMENDATION: **The governments should follow their commitment under the GLWQA to submit their RAPs to the IJC "for review and comment." They should ensure that the documents are submitted to the IJC in a timely enough way so that the IJC's comments can be integrated into the RAPs. The governments should take the comments from the IJC seriously, as was the intent under the GLWQA, and adjust their RAPs to integrate the concerns and suggestions that the IJC brings forward.**

RECOMMENDATION: **The IJC should find ways to ensure that its comments get to the governments and the public advisory committees in the RAPs in a timely fashion. They should use outside technical reviewers to assess RAP documents at all stages.**

Listing and Delisting Criteria:

In 1989, the IJC recommended that the federal governments develop listing and delisting procedures for areas of concern. In February 1991, after consultation with the governments and the public, the IJC issued *Guidelines for Recommending the Listing and Delisting of Great Lakes Areas of Concern.*

These guidelines are based on the list of beneficial uses listed in Annex 2 and on the Specific Objectives in Annex 1 of the GLWQA. The guidelines do not take into account the broader goals of the GLWQA for the achievement of the virtual elimination of persistent toxic substances from the Great Lakes ecosystem and for zero discharge of persistent toxic substances. In their comments on the draft listing and delisting criteria, environmental groups recommended that the delisting criteria include the question: "Have all known discharge sources of persistent toxic contamination been eliminated?" This was not added to the guidelines.

The guidelines issued by the IJC are the ones that the IJC and its Boards use in making their recommendations. The federal governments have not formally adopted the IJC guidelines nor have they issued their own listing and delisting criteria. The governments emphasize the need to tailor criteria to suit the local situation. For example, Canada and Ontario list as their first principle that "delisting criteria should

be developed on a site-specific basis by the agency RAP Teams, in conjunction with the Public Advisory Committees."[172] They make no reference to the IJC's criteria for listing and delisting.

Public Involvement:

Annex 2 of the GLWQA says that "the Parties, in cooperation with State and Provincial Governments, shall ensure that the public is consulted in all actions undertaken pursuant to this Annex." The IJC in its recommendations has also stressed the central role of citizens in the development and implementation of RAPs.

Formal public advisory committees (PACs) have been established for most RAPs. The areas of concern without RAP public advisory committees are Port Hope and Wheatley in Ontario. A public advisory committee was established for Torch Lake, Michigan, in the summer of 1997 and one is now being developed for Deer Lake, Michigan. Michigan did not form PACs in several RAPs, including Manistique, Kalamazoo, Muskegon, River Raisin and White Lake, until after the Stage 1 RAP had been completed.

Some public advisory committees have become inactive recently as government support for the operation of public involvement has decreased or disappeared; these include Peninsula Harbor in Ontario, and Sheboygan River and Milwaukee in Wisconsin.

Extensive public involvement is generally pointed to as the outstanding feature of most RAPs. A tremendous amount of volunteer time has been put into the RAP process through the PACs. The public has played a lead role in reviewing and assessing government documents. In some cases, for example, the St. Clair River, the PAC members have participated as equal partners with the governments writing team in the development of recommendations. The PACs have also played a lead role in outreach programmes to the community, coming up with many creative ways to reach into the community.

The role of the PACs has varied substantially from area to area. In some areas, the PACs have played a lead role; in others the governments have been unwilling to listen seriously to the input from the PACs and have not fully involved them in decision-making. Some, such as the St. Clair River Binational Public Advisory Committee (BPAC), have strong representation from all sectors, with all sectors participating in efforts to make the RAP work; in others such as the St. Mary's RAP, industry participation in the PAC has been minimal or not constructive.

---

[172] Canada-Ontario, *A Guide to Producers, Users and Reviewers of Stage 2 and Stage 3 Reports*, September 1997, p. 27.

In some areas, the PAC process has broken down. In the Detroit River, for example, almost half of the BPAC members refused to endorse the Stage 2 report placed before the meeting by the State of Michigan in June 1996. These members, including the representatives of environmental groups, labour, academia and other citizens' representatives, left the meeting. The remaining BPAC members, now primarily business, industry and local government, stayed and voted to support the Stage 2 document. Since the walk-out over a year ago, the BPAC has not pulled back together. The existing public advisory committee process is no longer a valid representation of the community.[173]

The PACs are now confronting two major problems. The first is frustration among many PAC members because of the ten years that they have spent on the RAP process. Many members are having trouble seeing what progress has been made. Barry Boyer, a member of the Buffalo River RAP, has expressed the frustration in poetry, sung to the tune "Both Sides Now:"

> PACs and RACs and C-A-Cs
> All write reports to the IJC
> restore the lakes by killing trees --
> I've looked at RAPs that way.
>
> But now I think they're lots of fun,
> I go to meetings one by one;
> I don't know where ten years have gone,
> Since RAPs got in my way.
>
> I've seen Great Lakes from both sides now
> From clean and dirty, still somehow
> It's great illusions I recall,
> I really don't see lakes at all.[174]

The other major problem that the PACs are now confronting is dramatic reductions in government support for their work. The most successful PAC and public outreach programmes are those that had financial and staffing support from the governments. Over the past two years, most governments in the Great Lakes Basin have reduced or eliminated such support. The U.S. EPA eliminated its grants to the states that were supporting public outreach. In November 1995, Michigan announced that it was

---

[173] Clean Sites, *Final Report: An Assessment of Concerns Related to the Detroit River Binational Public Advisory Council*, May 1997.

[174] November 2, 1995.

transferring "primary leadership responsibilities from the Department of Environmental Quality to the local public advisory councils."[175] What this meant was that they were removing their staff who had worked with the PACs. At approximately the same time, Ontario eliminated all contracts for public involvement coordinators. The Canadian federal government has made some efforts to increase its support to PACs to make up for Ontario's withdrawal, but has by no means gone so far as to bring support near the levels that were there before. Reductions in support for the PACs has occurred in most parts of the Great Lakes.

RECOMMENDATION: **The governments should fulfil their commitment under the GLWQA to consult with the public on RAPs. At a minimum, the governments should restore funding to support PAC work and public outreach and education to the levels that existed several years ago.**

RAP-Lakewide Management Plan Interrelationship:

In Annex 17 of the GLWQA, the governments committed to "determine the pollutant exchanges between the Areas of Concern and the open lakes ..." This is essential in order to determine whether the cleanup being proposed in the RAP is sufficient to address the goals set for the adjacent lake.

Only in Lake Michigan is a serious effort being made to carry out this commitment. The U.S. EPA is conducting a Lake Michigan mass balance study. In 1994 and 1995, tributary samples were gathered during snow melt and heavy rains - when most pollutants are washed into the lake. Among other items, this will show the discharges from the areas of concern around Lake Michigan to the Lake. In addition, the Lake Michigan Forum, the public advisory committee to the Lakewide Management Plan (LaMP), has added a representative from each RAP to it. This will help ensure that the relationship between the Lake and the areas of concern is taken into account.

Such an approach is not being taken in the other lakes. For example, Lake Superior is being developed as a demonstration zone for the zero discharge of persistent toxic substances. But a Stage 2 RAP is now being passed for Peninsula Harbour on the edge of Lake Superior, that is inconsistent with this lakewide goal. Massive areas of sediments contaminated with mercury, many at depths of 30 to 40 metres below the surface of the water, lie in and around Peninsula Harbour. The Canadian and Ontario governments are proposing not to remove or cover up most of these contaminated sediments. They are choosing to let natural remediation occur, i.e., wait for the sediments to be covered over or washed out further into the Lake. The

---

[175] Letter to RAP Participants from Robert Miller, Surface Water Quality Division, November 28, 1995.

governments are predicting that it will take 400 years for the mercury levels in these sediments to stop being at elevated levels. While reviewing the Peninsula Harbour RAP, no studies were carried out to assess the impacts of the washing out of these sediments into the Lake and to address how that meshes with the goal of "virtual elimination of mercury within the Lake Superior Basin from all sources within the basin" that was set by the Lake Superior Forum.

RECOMMENDATION: **The governments should follow their commitment in Annex 17 of the GLWQA and assess the interrelationships between the areas of concern and the lakes. They should ensure that the goals of the RAPs and the action plans in them are adequate to meet the goals that are set in Lakewide Management Plans.**

Human Health Concerns:

In 1994, the IJC urged the governments to include human health concerns in RAPs. This has been one of the weakest parts of the RAP process. Most RAP documents make only a cursory reference to human health concerns. For example, the Niagara River RAP on the New York State side completely ignores human health concerns. Their Stage 1 document makes no reference to human health. This is despite the fact that the report speaks of 215 inactive hazardous waste sites in the area, and reports on the high level of fishing all along the Niagara River. It also describes the considerable number of restrictions on fish consumption but raises no questions about the impacts on people who eat the fish. This also contrasts with a New York Department of Health report in 1993 that says that discharges from the 102nd Street Landfill among others pose "a major public health concern."

Health Canada has tried to assist by including human health concerns in the RAPs in Canada. A member of Health Canada's *Great Lakes Health Effects Program* reviews RAP documents from the perspective of gaps around human health issues. They have also conducted a health risk assessment for the St. Mary's River RAP, and fish eaters studies in some areas of concern. They are also compiling mortality and morbidity data for each area of concern. Nevertheless, despite these efforts, human health concerns still remain peripheral to decision-making on RAPs.

A review of the incorporation of human health in RAPs concluded that:

> *While some RAPs are addressing health issues both directly and in secondary ways, it is apparent from our review that most RAPs do not address human health issues even though there are many justifications for doing so. In addition to the fact that each area requires a*

unique approach, there are two overarching difficulties that affect all RAPs: 1) the complexity of the relationship between environmental and human health, and 2) the limitations of the "use impairment" approach on which the RAPs are built.[176]

RECOMMENDATION: The governments should ensure that human health concerns are addressed in each RAP.

Pollution Prevention in RAPs:

Pollution prevention is a basic principle of the GLWQA and therefore applies to the RAP process. The IJC has reiterated the need to include pollution prevention measures in RAPs.

Most RAPs have recognized the need to include pollution prevention goals and measures in their RAPs; after all what is the point of cleaning up an area of concern and then having to do another expensive clean up at some point down the road because more pollutants have been added to the area?

A survey by GLU in 1995 showed that almost half of the RAPs set zero discharge or virtual elimination of persistent toxic substances as one of their goals. Almost 70% said that pollution prevention activities are making a serious contribution to their RAP activities, although less than 30% said that the pollution prevention activities occurring in their RAPs are a result of the RAP.[177]

RAPs in Québec:

The provisions of the GLWQA end at Cornwall/Massena on the St. Lawrence River. Nevertheless there are areas of concern further down the St. Lawrence River into Québec. Québec and Canada have designated eighteen Zones d'Intervention Prioritaire (ZIPs) along the St. Lawrence River. These are the equivalent of areas of concern in the Great Lakes. ZIP public advisory committees have been set up in 10 of these areas. They are to develop Plans d'Action et de Réhabilitation de l'Environnement (PAREs).

---

[176] Sheila Myers, Jack Manno, David Schmeltz and Tanya Cabala, *Report on Incorporating Human Health Considerations into RAPs.*

[177] Mary Ginnebaugh, Great Lakes United, *Pollution Prevention in RAPs: Truth or Myth?*, June 1995, p. 9.

Support for RAPs:

Recently the RAP process is being threatened by lack of support from the governments. This is taking two primary forms: 1) withdrawal of financial and personnel support for activities that the governments were previously providing, and 2) lack of resources to implement the plans that have been developed.

Almost all state, provincial and federal governments have reduced their funding for RAP activities over the past two years. After budget cuts by the Canadian and Ontario governments in 1995, the governments assessed their capability to achieve their targets for the RAPs.[178] The status for most targets was put as "yellow", indicating it was in doubt; for some targets the status was listed as "red", meaning that it was unlikely to be achieved. The goals that were then listed as unlikely to be achieved included surveillance to track progress in areas of concern, upgrading of sewage treatment plants, rehabilitation of degraded native fish and wildlife communities, and cleanup of contaminated sediments.

Reductions in staffing have occurred throughout the Great Lakes Basin. For example, only the St. Clair River has a full-time RAP coordinator funded by the Ontario government. Most other RAP coordinators in Ontario were removed from the job in late 1996 and early 1997. Some governments have justified these reductions by stating that that these types of positions are no longer needed after the plan is developed. But the implementation stage will be the most difficult stage and is the one that will require more serious full-time coordination.

Some areas are trying to overcome these reductions by setting up new partnerships to oversee the RAPs - coalitions where the federal and provincial governments play much more minor roles. Such an arrangement has been made in Severn Sound in Ontario and is being developed in the Bay of Quinte in Ontario.

Such a partnership has also been set up for the Ashtabula River RAP in Ohio. In 1994, a partnership was set up to pursue sediment remediation options for the area. This is a partnership that is frequently held up as an example of what other RAPs need to do. It is important to recognize that this successful partnership had two critical components that made it possible: the threats of law suits from government against those who had contaminated the sediments, and a financial commitment from the federal and Ohio governments to the cleanup. These are not conditions that we can assume will be available elsewhere in the Great Lakes.

The second problem is even more fundamental. No arrangements have been made to figure out where the billions of dollars that are necessary to carry out the cleanups

---

[178] Canada-Ontario Agreement RAP Steering Committee, *Review of Status of RAPs*, 1995.

around the Great Lakes basin will be derived from.[179] This is a concern that citizens' groups have had from the beginning of the RAP process. They have repeatedly asked for a commitment from the governments and industry that have polluted the areas of concern to ensure that money will be available to carry out the cleanup. For example, at a meeting attended by citizen representatives on PACs from all across the Great Lakes in 1987, the citizens' groups unanimously concluded that:

> *RAPs must include detailed plans for providing the money to implement the plan. Procedures for assessing additional funding needs and potential sources should also be included. Federal, provincial, state and municipal governments and industry should all be assigned responsibilities in this financial plan.*[180]

The RAPs are now at the cleanup stage and each RAP is just now beginning to try to hammer out on a case by case basis financial arrangements - arrangements that take years to pull together.

RECOMMENDATION: **The governments should ensure that the RAPs can be completed by ensuring that the funding is provided to complete the planning process and to carry out the cleanup plans.**

Conclusion:

RAPs are both one of the greatest successes and one of the greatest failures of the GLWQA. They have been a tremendous success because there has been much activity in the RAP areas, much public education, and long-term public community involvement to an extent rarely seen before.

But they have been a tremendous failure because of the huge amount of time that has gone into the planning process - over a decade has passed since most of the RAPs started planning and still only half have developed action plans - and because the funding mechanisms have not been put into place to ensure that the cleanup will actually occur.

---

[179] The Canadian Auditor General has estimated that cleaning up the areas of concern in Canada will take "several billion dollars," *Report of the Auditor General of Canada to the House of Commons*, 1991, p. 274.

[180] Great Lakes United, *Citizen Action in Developing Clean-Up Plans for the 42 Great Lakes Toxic Hot-Spots*, September 1987.

Recently, Tom Baldini, U.S. Section Chair of the IJC, expressed the thoughts that so many of those who have worked for over a decade on RAPs have:

> *In light of recent financial cutbacks, one must ask whether the governments and jurisdictions that created and endorsed the RAP concept can maintain the trust of the people whom they encouraged to participate in the process. Is reinventing government just a way to pass the buck to the local level? Have RAPs become the prototype for another often-talked about concept - the unfunded mandate?*[181]

The federal governments must follow up on their commitment in the GLWQA to eliminate the areas of concern. They must not now drop them on the local communities and on the state and provincial governments. It is the federal governments who made the commitment and are, therefore, responsible for ensuring that the cleanup occurs.

---

[181] Michigan Department of Conservation, *Michigan Areas of Concern News*, Spring 1997.

CHAPTER 4: LAKEWIDE MANAGEMENT PLANS, LAKE SUPERIOR AND POINT SOURCE IMPACT ZONES

4.1 Lakewide Management Plans

In the GLWQA, the federal governments committed to "work toward the elimination of Critical Pollutants" [Article IV (f)]. Critical Pollutants, as defined in the Agreement, refer to persistent toxic substances that "singly or in synergistic or additive combination, are causing, or are likely to cause, impairment of beneficial uses despite past application of regulatory controls" [Annex 2, 1 (b)].

The federal governments agreed to develop Lakewide Management Plans (LaMPs) "for open lake waters." These plans "shall be designed to reduce loadings of Critical Pollutants in order to restore beneficial uses; LaMPS shall not allow increases in pollutant loadings in areas where Specific Objectives are not exceeded" [Annex 2, 6(a)]. The plan developed for each of the Great Lakes is to include an evaluation of beneficial use impairments and pollutants contributing to those impairments (the critical pollutants); a summary of sources and loads of these critical pollutants; identification of ongoing prevention, control, and remediation actions as well as additional efforts needed to reduce pollutant loads and restore beneficial uses; and monitoring activities to evaluate the effectiveness of program actions.

Elimination of Critical Pollutants:

In the ten years since the addition of these provisions to the GLWQA, the governments have not succeeded at eliminating the presence of any critical pollutants from the open waters of any lake; there have, however, been some reductions in the levels of some critical pollutants in the Great Lakes. Changes in levels of critical pollutants in the open lakes are discussed in Chapter 1 of this report.

Progress on LaMPS:[182]

According to the Agreement, LaMPs are to consist of four stages: 1) definition of the problem, 2) a schedule of load reductions, 3) selection of remedial measures, and 4) monitoring to demonstrate that critical pollutants are no longer impairing beneficial uses. The LaMP is to be submitted to the IJC for "review and comment" at the end of each stage.

Lake Erie: Development of the Lake Erie LaMP planning process began in April 1993. A year and a half later, the governments formed a management committee to

---

[182] Information in this section is primarily based on a survey of LAMP coordinators conducted by Fé de Leon and John Jackson in September and October 1997.

do the work on the plan. The major focus of this LaMP thus far has been on fisheries and on phosphorus issues.

Lake Huron: The governments have not yet begun developing a LaMP for Lake Huron.

Lake Michigan: The Lake Michigan LaMP has been under development since 1990. Draft stage 1 LaMPs were issued in 1992 and 1993. The 1993 draft lists seven critical pollutants (PCBs, DDT, dieldrin, chlordane, mercury, dioxins, and furans). It also lists ten pollutants of concern and three emerging pollutants. A Lake Michigan mass balance study is now underway to come to a better understanding of the sources of the critical pollutants, and to help in the development of reduction plans. A draft Stage 2 document is planned for release for public comment in the spring of 1998. The Stage 1 LaMP was never submitted to the IJC for review and comment.

Lake Ontario: In 1987, Canada, the U.S., Ontario and New York State signed an agreement to develop a toxics management plan for Lake Ontario and the Niagara River. In 1989, they issued the *Lake Ontario Toxics Management Plan*. This has become the basis for the Lake Ontario LaMP.

In May 1996, the governments began the formal LaMP planning process. In April 1997, they issued a draft Stage 1 Lake Ontario LaMP. Six critical pollutants were identified in this plan (PCBs, DDT, dieldrin, mirex, dioxins/furans, and heptachlor/heptachlor epoxide). They plan to release a draft Stage 2 report in 1999.

Lake Superior: The Lake Superior LaMP process began in September 1991, when Canada, the U.S., Michigan, Minnesota, Ontario and Wisconsin signed the *Binational Program to Restore and Protect the Lake Superior Basin*. A draft Stage 1 LaMP was released for public comment in October 1993. The Lake Superior LaMP lists as critical pollutants the nine substances selected for zero discharge (chlordane, DDT, dieldrin, hexachlorobenzene, mercury, octachlorostyrene, PCBs, dioxin, and toxaphene). It also lists twelve other substances as critical pollutants (alpha-BHC, heptachlor epoxide, PAHs, aluminum, arsenic, cadmium, copper, iron, lead, manganese, nickel and zinc). The ongoing work on the Lake Superior LaMP is limited to the nine zero discharge substances.

Two years later in October 1995, the Stage 1 LaMP was submitted to the IJC for review. The IJC released its final comments on the Stage 1 LaMP a year later in November 1996. The IJC was highly supportive of the Stage 1 LaMP with the exception of pointing out the need for more information on threats to human health and on atmospheric loadings from sources outside of the Lake Superior basin.

The Lake Superior Forum, the public advisory committee for Lake Superior, took the lead in developing the load reduction targets for the Stage 2 LaMP. The Forum

completed its work on this topic in September 1995. A year later, the governments released the draft Stage 2 LaMP for public comment. The core of this draft is the load reduction schedules that the Forum put together. As of October 1997, the governments have not adopted the Stage 2 LaMP and have not forwarded it to the IJC for comment.

Assessment of Progress: In the U.S.'s *Great Lakes Critical Programs Act* of 1990 the government committed to publish a LaMP for Lake Michigan by January 1, 1993 and to have submitted it to the IJC for comment by that date. The Act made no time commitments for completion of LaMPs for the other Lakes. It is now four and a half years since the time by which the Lake Michigan LaMP was supposed to have been completed and a Stage 2 document listing load reduction targets and timetables has not been released, let alone a Stage 3 remedial measures plan. The U.S. EPA has tried to get around this commitment in the legislation by defining the law to mean that only the Stage 1 LaMP needs to be done by 1993, i.e., the definition of the problem. The LaMP Program Manager for the EPA justified this by saying, "The law does not prescribe the contents of the LaMP."[183] Despite the commitment in the *Critical Programs Act*, the EPA never submitted the Stage 1 LaMP to the IJC for review.

In the *Canada-Ontario Agreement* signed in 1994, the governments committed to develop a Stage 1 LaMP for Lake Superior by 1995 (this was achieved), for Lake Ontario by 1995 (a draft was not released until two years later) and for Lake Erie by 1998. A Stage 2 LaMP was to be developed for Lake Superior by 1996 (a draft was released in 1996 but is not expected to be finalized until the spring of 1998), for Lake Ontario by 1997 (those working on the LaMP are now predicting a draft will be finished in 1999), and for Lake Erie by 2000.

Public Involvement:

In Annex 2 of the GLWQA, the governments committed themselves to consult with the public on the development of LaMPs.

Public advisory bodies, known as Forums, have been developed for Lake Erie, Lake Michigan and Lake Superior. These Forums have representatives from around the lake and from the range of interested sectors. The Lake Michigan Forum also has a representative from each area of concern to encourage coordination among the RAPs and the LaMP.

Public participation has not been regularized around Lake Ontario in either the Toxics Management Planning process or the LaMP process. The Lake Ontario LaMP relies

---

[183] Memo from Jim Giattina, LAMP Program Manager, to LAMP Management Committee, August 21, 1991.

upon periodic meetings for public input. The governments plan to develop a Lakewide Advisory Network to meet periodically to discuss major issues. This will not, however, be an ongoing public advisory committee similar to the Forums that have been set up in the other LaMPs.

Sam Sage, president of the Atlantic States Legal Foundation, who has tried to be an active participant in the Lake Ontario process for the past decade, expressed his considerable frustration with this process in a letter to the New York State Department of Environmental Quality in April 1996:

> *There has been no public involvement and no distribution of materials, even to us, as a repository.... Those of us who are (or were) interested in the Great Lakes Program(s) need to feel that we are part of the program and not just marched out to meet public participation requirements.*[184]

RECOMMENDATION: **The governments should carry out their commitment under the GLWQA to public consultation by strengthening the public involvement programme for the Lake Ontario LaMP. This should include the creation of a Lake Ontario Forum. The governments should also ensure that the resources are made available for the proper functioning of all Lake Forums.**

Human Health Concerns:

The first item that the GLWQA lists for including in a LaMP is "a definition of the threat to human health or aquatic life posed by the Critical Pollutants" [Annex 2, 6(a)(i)].

Human health issues have not been seriously included in the LaMPs. Only the Lake Superior Stage 1 LaMP has been submitted to the IJC for comment thus far. The IJC criticized the LaMP for not adequately addressing health concerns:

> *The document submitted to the Commission relied heavily on information available from previously published RAPs [to address health issues], which by definition, do not focus on open lake waters. In addition, most RAPs, to date, have not focused explicitly on human health*

---

[184] Letter from Samuel Sage to Marna Gadoua, NYSDEC, April 9, 1996.

concerns and as a result neither does the Stage 1 Lake Superior LaMP.[185]

The most recently released draft Stage 1 LaMP document, the Lake Ontario LaMP, does no better job of addressing human health issues. It lists fish and wildlife consumption advisories but does not discuss why these advisories are important, i.e., that consumption of fish and wildlife poses a threat to human health. There is no discussion of communities that are more at risk because they are heavier than average consumers of fish and wildlife, e.g., native communities, some immigrant communities, and those who fish or hunt for recreational purposes and eat their catch.

RECOMMENDATION: **The governments should fulfil their obligations in the GLWQA by including human health considerations in LaMPs.**

Atmospheric Deposition:

Atmospheric deposition to the open waters of the lakes is a significant source of critical pollutants for each of the lakes. One of the major challenges for the LaMPs is estimating sources of air pollutants coming from outside of the individual lake's basin.

In Lake Superior, for example, atmospheric sources account for 93% of total mercury and 98.8% of PCB loadings to the Lake.[186] The IJC stressed this in their review of Lake Superior's Stage 1 LaMP: "Two topics that require particular attention are: the significance of atmospheric loadings of Critical Pollutants to the Lake Superior Basin and the sources of Critical Pollutants from outside the Great Lakes Basin."[187] The government agencies on the Lake Superior LaMP have not taken the IJC's advice on atmospheric deposition issues. At a meeting in February 1997, they set as a basic principle that "the LaMP addresses all in-basin sources. Other mechanisms will deal with out-of-basin sources."[188]

---

[185] International Joint Commission Lake Superior Stage 1 Lakewide Management Plan Review, November 15, 1996.

[186] State of the Great Lakes - 1997, pp. 47 7 48.

[187] *Ibid.*

[188] Minutes, Lake Superior Task Force Meeting, April 29-30, 1997.

There is no indication that the other LaMPs will be taking a different approach.

RECOMMENDATION: **The governments should ensure that each LaMP assesses and identifies sources of critical pollutants from outside the Lake's basin and that the Stage 3 LaMP includes actions to address the sources of critical pollutants that are outside of the basin.**

Conclusion:

The LaMP process is taking an inordinately long period of time. As of yet, none of the LaMPs have reached the stage of developing an action plan to address the critical pollutants. Lake Superior has been proceeding at a faster pace than the other LaMPs, having put out a draft Stage 2 (loading reduction schedules) after five years of work. Lake Michigan has been working for seven years and does not expect to have its draft Stage 2 out until next year. The situation in Lake Ontario is even worse: after ten years, a draft Stage 2 is not expected to be released for another two years. Lake Erie only began serious work on the LaMP in 1995, eight years after the governments committed to develop a LaMP for each of the Great Lakes. The LaMP planning process for Lake Huron still has not begun.

There is no indication that the pace will speed up. As with the RAP programme, resources are being reduced for this programme. For example, the Lake Erie LaMP coordinator designated by the Province of Ontario was removed from the position in 1997 as a result of government cuts. Likewise Canada's Department of Fisheries and Oceans pulled out the money that they had planned to put into the Lake Erie LaMP. Similar resource pressures are being felt in each of the LaMPs.

RECOMMENDATION: **The governments should fulfil the commitment they made in the GLWQA to develop and implement LaMPs and should ensure that the resources are available to expedite their development. They should put particular emphasis on moving the LaMPs beyond the study stage to the action stage, with the development and implementation of plans to eliminate the critical pollutants.**

4.2 Lake Superior

Lake Superior is the least degraded and most healthy of all the Great Lakes. Much of the 2700 miles of shoreline along Lake Superior is as wild and remote as when the earliest inhabitants arrived. Nevertheless, human activities have contributed to, and continue to contribute to, serious threats to the Lake.

At the IJC's Biennial Meeting in Hamilton in October, 1989, a citizen activist and businessman from Thunder Bay recommended that Lake Superior be used as the place where the zero discharge experiment is first carried out:

> *If it is not politically or technically possible in Lake Superior [to achieve zero discharge], then there is probably no hope anywhere on this planet.*[189]

The IJC was inspired by this recommendation and recommended that "the Parties designate Lake Superior as a demonstration area where no point source discharge of any persistent toxic substances will be permitted."[190] This recommendation resulted in considerable lobbying by citizen activists around Lake Superior and throughout the Great Lakes Basin for its adoption. A multi-stakeholder committee, the Lake Superior Forum, was set up in May 1991 to push for the implementation of the IJC's recommendations.

In October 1991, in Traverse City, Michigan, at the next biennial meeting of the IJC, Canada, the U.S., Michigan, Minnesota, Ontario and Wisconsin signed the *Binational Program to Restore and Protect the Lake Superior Basin*. This binational program has two parts: the *Lake Superior Zero Discharge Demonstration Program*, which has the goal of "achieving zero discharge and zero emissions of certain designated persistent, bioaccumulative toxic substances", and the *Broader Program to Restore and Protect the Lake Superior Ecosystem*, which is aimed at developing "an integrated, ecosystem-based program to protect and restore the Lake Superior basin." The first part of the *Binational Program* was a direct response to the IJC's recommendation.

In its biennial reports in 1992, 1994 and 1996, the IJC emphasized three recommendations for the Lake Superior programme: 1) "prohibiting new or increased point source discharges of persistent toxic substances"; 2) "establishing a coordinated, planned phaseout of existing sources"; and 3) a biennial State of the Lake Superior Basin report starting in 1994.

---

[189] Bruce Hyer, *Transcripts: International Joint Commission 1989 Biennial Meeting on Great Lakes Water Quality*, October 11-13, 1989, p. 185.

[190] IJC, *Fifth Biennial Report on Great Lakes Water Quality*, Part II, March 1990, p. 24.

Prohibiting New or Increased Discharges:

When the governments signed the *Binational Program* in 1991, Canada, the U.S., Michigan, Minnesota, Ontario and Wisconsin agreed to give Lake Superior "special protection designations" to prevent new or increased discharges.

Canada and Ontario committed to explore a special designation under the *Canada Water Act* to achieve this goal. They renewed this commitment when they signed the COA in 1994. As of October 1997, they have failed to bring forward any concrete proposals for special designation - let alone put a special designation in place.

The state governments have been exploring special designation status for Lake Superior as part of their deliberations under the GLWQI, but none of them has passed such a designation.

The IJC recommended a "prohibition of new or increased point source discharges of persistent toxic substances" to Lake Superior. The only existing U.S. designation that would achieve this goal is designation of the whole of Lake Superior as an Outstanding National Resource Water under the CWA.

None of the states is proposing this designation, except in small areas in national parks, along national shorelines, or in designated fish or wildlife refuges. Instead the states are proposing an undefined designation under the GLI as Outstanding International Resource Water. This designation would allow new or increased discharges of persistent toxic substances, so long as the facility used "the best technology in process and treatment." This designation would create a major loophole, which would be fundamentally inconsistent with the IJC's recommendations. In addition, the designations advocated by the states address only nine chemicals (many of which are already banned), which are only a small percentage of the harmful chemicals entering the Lake.

In October 1994, the NWF and GLU petitioned Michigan, Minnesota and Wisconsin to classify Lake Superior as an Outstanding National Resource Water. Four months later, Michigan denied NWF and GLU's petition, refusing to even hold a public hearing on the matter. NWF and GLU then notified the U.S. EPA of their intention to sue the EPA to compel it to institute the special designation. Despite these legal proceedings, the U.S. government has refused to act and has failed to provide any leadership in designating Lake Superior as a place where no new or increased discharges of persistent toxic substances are allowed.

The special designations debate has been characterized by the governments clinging to the status quo rather than pursuing innovative options for eliminating toxics. This is completely contradictory to the intent of the IJC when it recommended a

"demonstration area where no point source discharge of any persistent toxic substances will be permitted."

RECOMMENDATION: **Canada, the U.S., Michigan, Minnesota, Ontario and Wisconsin should immediately designate the whole of Lake Superior as an area where no new or increased discharges of persistent toxic substances are allowed.**

Planned Phaseout of Existing Sources of Persistent Toxic Substances:

The Lake Superior Forum, a multi-stakeholder committee, prepared targets and timetables for the phase out of the emission and use of the nine substances designated by the governments when they signed the *Binational Program* in 1991. The Forum submitted the last of these phase-out timetables to the governments in September 1995.

Two years have passed and the governments still have not officially adopted phase-out timetables. A September 1997 government draft of reduction targets for Lake Superior includes stepped, phase-out timetables for each substance, similar to those recommended by the Lake Superior Forum. Each reduction target ends with a zero discharge or zero release goal: mercury at zero release by 2020, PCBs by 2020, aldrin/dieldrin, chlordane, DDT/DDE and toxaphene by 2000, and dioxins, hexachlorobenzene and octachlorostyrene by 2020.

Seven years have passed since the IJC recommended that Lake Superior be a demonstration zone for zero discharge. The governments still have not set reduction timetables, let alone developed plans for how to achieve the phase out.

While adoption of the timetables and targets just described would be an excellent first step, they apply only to sources within the Lake Superior Basin. Since the overwhelming percentage of many of these substances are transported through the air from sources outside of the Lake Superior basin this vitiates the entire Lake Superior program. The Lake Superior Forum has expressed its distress with this situation: "Until the Lake Superior Task Force demonstrates the political leadership required to address atmospheric deposition of toxic contaminants into Lake Superior, the Lake Superior community will continue to face undue barriers to achieving zero discharge."[191]

In addition, the governments are only developing phase-out plans for nine substances, rather than the estimated 56 persistent toxic substances in the basin.

---

[191] Letter from Bob Carlson and John Jackson, Forum co-chairs, to Simon Llewellyn and Jodi Traub, Task Force co-chairs, October 3, 1997.

RECOMMENDATION: **The governments should speed up the development of phase out plans for all PTS in the Lake Superior basin, including the development of mechanisms by which the targets will be achieved. The action plans to achieve the targets should include actions for sources beyond the Lake Superior Basin.**

A Biennial State of the Lake Superior Basin Report starting in 1994:

A Stage 1 LaMP was released in early 1995. This was a state of the lake report. In response to the IJC's recommendation, the U.S. committed to update and publish a state of Lake Superior report on a biennial basis.[192] Even though the U.S. commitment said that it would prepare the report jointly with Canada, Canada did not commit to making a regular state of Lake Superior report.[193]

No updated State of the Lake report has been released as of October 1997.

RECOMMENDATION: **The governments should follow the IJC's recommendation by releasing an updated state of Lake Superior report every two years.**

Conclusion:

The commitment made by Canada, the U.S., Michigan, Minnesota, Ontario and Wisconsin when they signed the *Binational Program* was a significant step. Unfortunately, six years later, two fundamental flaws are evident in the implementation of the program:

1) The governments have failed to take action to prevent new or increased releases of PTS to the basin; and
2) The governments have failed to address sources of pollutants from outside the Lake Superior basin.

---

[192] U.S. Environmental Protection Agency, *United States Response to the International Joint Commission's Seventh Biennial Report on Great Lakes Water Quality*, March 1995, p. 10.

[193] *Canada's Response to the Recommendations in the Seventh Biennial Report of the International Joint Commission*, October 1994, p. 8.

4.3 Point Source Impact Zones

In the 1987 amendments to the GLWQA, the governments committed themselves to "identify and work toward the elimination of Point Source Impact Zones" [Article IV]. Point source impact zones are areas where the specific objectives in the Agreement are not met because of discharges from industrial or municipal sources. The governments agreed to identify, delineate and report to the IJC on these point source impact zones every two years, beginning in 1989 [Annex 2, 7(a)]. The governments have never carried out this commitment.

This provision in the Agreement has always been a controversial one between the governments. The 1978 Agreement had a provision on "limited use zones." When the Agreement was renegotiated in 1987, the U.S. wanted all references to limited use zones removed from the GLWQA because they conflict with U.S. policy. Canada insisted that limited use zones be in the Agreement. They said they wanted to ensure that these areas were documented and listed. Finally the federal governments agreed to leave the concept in the Agreement, but to change the title from "limited use zones" to "point source impact zones."[194]

Commentators in the U.S. were cynical about Canadian motivations for wanting to keep these limited use zones, which are more commonly referred to as mixing zones. Paul MacClennan, a long-time follower of Great Lakes issues, said, "Canadian officials have long held out for mixing zones as a means of reducing costs of eliminating pollution."[195]

Neither Canada nor the U.S. has carried out their commitment in Annex 2 of the Agreement to identify, delineate and report every two years on the point source impact zones. When reporting on their activities under Annex 2, they ignore this provision.

One reason that they have given for ignoring the provision on point source impact zones is that they feel that areas of concern cover this provision. For example, in 1987, the U.S. recommended that "limited use zone provisions be eliminated and replaced with a process for designation of areas of concern."[196] They did, however,

---

[194] John Jackson, The Negotiation of the 1987 Protocol to the Great Lakes Water Quality Agreement: A Paper Prepared for the Great Lakes Governance Project of Dartmouth College, February 1996, p. 17.

[195] "Negotiators Agree on Lakes Act Revisions," Buffalo News, October 19, 1987.

[196] U.S. Department of State, United States Response to the International Joint Commission Third Biennial Report, September 1987, p. 6.

leave the provision in the Agreement. As has been noted in the RAPs section of this report, the governments have not been assessing whether new areas of concern should be designated; therefore, the need for this section has not been replaced. Also there may be an area that would qualify as a point source impact zone that is not large enough to justify designation as an area of concern. Nevertheless, the impacts on local aquatic and wild life and humans could be significant.

RECOMMENDATION: **The governments should comply with the Agreement by identifying, delineating, and reporting on point source impact zones every two years. The governments should also work towards their goal of eliminating point source impact zones.**

CHAPTER 5: NON POINT SOURCES

5.1 Airborne Toxic Substances

By the time they revised the GLWQA in 1987, the governments had recognized that the atmosphere was likely the most important pathway by which persistent toxic pollutants were entering the Great Lakes. In October 1986, before the 1987 Protocol amending the GLWQA was signed, an extremely important research report was published by the Science Advisory, Water Quality and International Air Quality Advisory Boards of the IJC. This report showed that, relative to other pollutant pathways, the atmosphere is the most important source of many persistent toxics coming into the Lakes.[197]

1986 Great Lakes Mass Balance Model	% PCBs From Air	% Lead from Air	%B[a]pyrene from Air
Lake Superior	90	97	96
Lake Michigan	58	99.5	86
Lake Huron	78	98	80
Lake Erie	13	46	79
Lake Ontario	7	73	72

In response to this emerging concern, the governments added Annex 15 on Airborne Toxic Substances to the Agreement. This Annex provides that Canada and the U.S. "shall conduct research, surveillance and monitoring, and implement pollution control measures for the purpose of reducing atmospheric deposition of toxic substances, particularly persistent toxic substances, to the Great Lakes Basin." The Annex goes further to pledge that the parties shall "implement measures for the ... elimination of sources of emissions of persistent toxic substances in cases where atmospheric deposition of these substances, singly or in synergistic or additive combination with other substances, significantly contributes to pollution of the Great Lakes System." The Parties shall also assess and encourage the development of pollution control technologies and alternative products to reduce the effect of airborne toxic substances on the Great Lakes System.

Recent studies summarized in Chapter 1 of this report and in the U.S. EPA's First and Second Great Waters Reports to Congress have refined some of the estimates made

---

[197] IJC, Summary Report of the Workshop on Great Lakes Atmospheric Deposition, 1986.

by scientists at the 1986 workshop. But these efforts have mostly served to confirm what has now been known for more than 10 years: the atmosphere is the most important source for the most dangerous toxic pollutants entering the Lakes.

The critical question is: have the governments exerted maximum efforts to implement measures to eliminate sources of persistent toxic substances fouling the Lakes?

5.2 Research, Surveillance, and Monitoring

On-going efforts in this area have included assessment, monitoring and modeling of emission sources for airborne toxic substances. In and around the Great Lakes, these studies have shown that atmospheric transport and deposition of persistent toxic substances meet the standard set by Annex 15 of "significantly contribut[ing] to pollution of the Great Lakes System."[198]

U.S. Activities:

The *National Toxics Inventory* (NTI) tracks nationwide emissions trends for toxic air pollutants listed in the *Clean Air Act*. The NTI contains information on toxic emissions in 1990 of approximately 8.8 billion pounds, which includes emissions from large industrial sources, smaller stationary sources, or "area" sources and mobile sources. The NTI represents a significant improvement in the characterization of the air toxics issue. Using the NTI data, U.S. EPA classified the Great Lakes states, with the exception of Minnesota and Wisconsin, as having "high" hazardous air pollutant emissions in 1990.[199]

The Lake Michigan *Mass Balance Study* is a multi-agency effort to assess the overall importance of various sources and pathways for PCBs, mercury, atrazine, and trans-nonachlor in the Lake. Although the study has great potential as a tool for identifying major input and output pathways for pollutants, it is not clear that it will provide information on the relative importance of local versus. regional and long-range sources contributing to loadings from the atmosphere.

The U.S. EPA is conducting special studies to assess the magnitude and effects of air toxics focusing on specific sources, receptors, and pollutants. Three of these studies, the *Mercury Study*, *Utility Air Toxics Study* and *Dioxin Reassessment*, have gone

---

[198] U.S. Environmental Protection Agency, Deposition of Air Pollutants to the Great Waters: Second Report to Congress, Office of Air Quality Planning and Standards, EPA-453/R-97-011, June 1997, p. 177.

[199] U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, *National Air Quality and Emissions Trends Report*, 1995, p. 51.

through inordinately long review and revision periods. Preliminary draft reports on mercury and dioxin show that medical waste incinerators and municipal waste combusters are major sources of both mercury and dioxin to the air, and coal-fired power plants are additional sources of mercury. (See chapter 1 of this report.) Because so much of the inputs of these persistent toxic chemicals to the Great Lakes comes through the air, the data in these reports indicates the need for the government to implement stronger regulations using the *Clean Air Act* on these major sources of mercury and dioxin.

U.S. EPA's *Great Waters Study*, another requirement of the U.S. *Clean Air Act*, assesses the extent of atmospheric deposition of air toxics and other pollutants to the Great Waters, including the Great Lakes. The most important provision of the Great Waters program is that it requires EPA to identify the need for and then to promulgate additional measures to protect the Great Waters from air toxics, where current *Clean Air Act* programs are not adequate to protect human health and the environment.[200] U.S. EPA's 1997 report to Congress on the Great Waters Program, "Deposition of Air Pollutants to the Great Waters," confirmed earlier findings that the atmosphere is a significant source of hazardous air pollutant loadings to the Great Lakes, but the agency has failed, thus far, to pledge to take the action needed to address the problem.

The cross-media approach of the Great Waters Program is a major step forward in assessing the importance of air deposition on contaminant loadings to the Great Lakes. However, the Agency tentatively determined that current law adequately protects public health and the environment from hazardous air pollutants and that they have adequate authority to address this pollution problem under Section 112 of the *Clean Air Act*. Environmental groups were highly critical of EPA's decision arguing that the agency must look beyond the narrow question of the effectiveness of its existing authority and also examine the effectiveness of programs and measures under current law.[201] EPA's final decision on the need for the Great Waters program to take action now or to wait is due in March, 1998.

Canadian Activities:

Canada has not developed special air monitoring programmes to assess impact on the Great Lakes.

---

[200] *Ibid.*

[201] National Wildlife Federation, Comments on U.S. EPA's Great Waters Program, Aug, 1997.

Binational Activities:

The *International Atmospheric Deposition Network* **(IADN)** was established in 1987 by Canada and the U.S. as a binational monitoring system that assesses the magnitude and trends of wet and dry loadings of toxic substances from the atmosphere to the Great Lakes. The U.S. conducted an intensive one-year mercury monitoring program at the U.S. IADN sites in October 1994.

Through cooperative efforts of the Great Lakes states, U.S. EPA, and Environment Canada, air regulatory agencies are now capable of providing an inventory of toxic air pollutants for the Great Lakes region. Using the *Regional Air Pollutant Inventory Development System* (RAPIDS) software, individual state and provincial inventories have been prepared for point, area, and mobile sources for 49 air pollutants of potential concern in the Great Lakes. These inventories are currently being put through a regional quality assurance check. The *Air Toxics Emissions Inventory Protocol*, developed in 1994, is a guide for identifying sources and estimating emissions to ensure the inventory is complete, accurate, and consistent. When completed in late 1997 or early 1998, the data will be available electronically.

5.3 Control Measures

U.S. Activities:

The *Clean Air Act* (CAA) currently lists 188 toxic air pollutants to be regulated by EPA. The 1990 CAA Amendments greatly expanded the number of industries affected by national air toxic emissions controls. The emissions reductions from these controls are just beginning to be realized for some industries.[202] As of October 1996, EPA issued air toxics standards, referred to as maximum achievable control technology (MACT) regulations, for 47 source categories, such as chemical plants, oil refineries, aerospace manufacturers, and steel mills, as well as area sources including dry cleaners, secondary lead smelters, and chromium electroplating. When these standards are fully implemented, toxic emissions from stationary sources should be reduced by approximately 35%.

The Specific Pollutants Strategy required under Section 112 (c)(6) of the CAA, requires EPA to identify sources of 90% of air emissions of alkylated lead compounds, polycyclic organic matter, hexachlorobenzene, mercury, PCBs, and dioxins and furans. The Agency is required to develop a strategy to promulgate standards for these sources by the year 2000.

---

[202] *National Air Quality and Emissions Trends Report*, p. 51.

Pollution prevention measures are explicitly provided for in Section 129(a)(2) of the U.S. *Clean Air Act* that states EPA's standards "shall be based on methods and technologies for removal or destruction of pollutants before, during and after combustion" (EMPHASIS ADDED).

Unfortunately, the U.S. EPA is not seizing opportunities to apply the pollution prevention approach toward air toxics control measures for incinerators. For instance, the standards EPA developed for medical and municipal waste incinerators, two major sources of dioxin and mercury emissions,[203] allow continuing releases of dioxin and mercury to the atmosphere. EPA says that emissions of dioxin and mercury from these incinerators will drop sharply from the new regulations, but the new standards do not require source reduction, separation or product substitution to ensure that these pollutants aren't released at all.

The Agreement requires that releases of persistent toxic substances be virtually eliminated and yet there are no regulations under consideration for coal-fired power plants, which are a significant source of mercury emissions and other hazardous air pollutants.[204] In Michigan and Ohio, fish consumption advisories apply to *every* single inland waterway because of mercury contamination. The IJC's Air Quality Advisory Board pointed out that increased electricity generation by coal-fired utilities, if it occurs without mitigation as a result of pending U.S. regulatory decisions, should lead to concern about an increase in mercury transported to the Great Lakes basin.[205] Moreover, U.S. EPA's draft Utility Air Toxics Study report predicts that in the next two decades there will be roughly a 30% increase in hazardous air pollutant emissions from coal-fired utilities based on projections in energy demand and fuel usage.[206]

---

[203] Municipal and medical waste incinerators contribute 49 percent of all mercury released from human sources in the U.S. and account for approximately 70 percent of all airborne dioxin deposited in the Great Lakes. There are more than 600 medical waste incinerators and more than 50 municipal waste incinerators in the Great Lakes region.

[204] Mercury Study Report to Congress, Science Advisory Board Review Draft, U.S. Environmental Protection Agency, Office of Research and Development, June 1996. Mercury in Michigan's Environment: Human Health and Environmental Concerns, Michigan Environmental Science Board, 1993. Michigan Mercury Pollution Prevention Task Force Report, 1996.

[205] International Joint Commission, *Eighth Biennial Report on Great Lakes Water Quality*, 1996, p. 21.

[206] *National Air Quality and Emissions Trends Report*, pp. 54 and 55.

Canadian Activities:

In October 1996, the Ontario the Ministry of Environment and Energy (MOEE) released consultation documents that proposed to revise the Ambient Air Quality Criteria (AAQC) and Point of Impingements (POI) for a number of substances:

- arsenic
- cadmium
- carbon tetrachloride
- cyclohexane
- ethylene dichloride
- formaldehyde
- methylene chloride
- nickel and its compounds
- perchloroethylene
- styrene
- trichloroethylene

In addition, proposed AAQCs are also proposed for acetaldehyde, 1,4-dichlorobenzene, chromium VI.[207] In general, AAQCs are established to protect human health, other environmental receptors and to prevent odours, nuisance and aesthetic impacts.[208] POIs, which are based on AAQCs, are used to specify the maximum allowable one-half-hour average air concentrations that are permitted at the nearest receptors. AAQCs are not directly enforceable unless they are included in legal instruments, while POIs are enforceable.

In its standards setting activities, MOEE proposed to review 283 stardards within three years. For the fourteen substances currently under review, significant reductions have been proposed.

Currently, standards are under development for another eighteen substances.[209]

---

[207] Ontario Ministry of the Environment and Energy, "Proposed Standards Information Package Presentation Overheads," presented by Jim Smith on January 17, 1997 Information Session, pp. 11-16.

[208] Ontario Ministry of the Environment and Energy, *Rational Document for the Development of Ontario Air Standards for Formaldehyde: Consultation Draft* (October 1996), p. i.

[209] Ontario Ministry of the Environment and Energy, "Proposed Standards Information Package Presentation Overheads" presented by Jim Smith on January 17, 1997 Information Session, p. 10.

Air Standards Under Development include: Ammonia, Acetonitrile, Acrylonitrile, Chlorine, Chloroform, Ethyl ether, Ethylbenzene, Hexane, Hydrogen chloride, Isopropylbenzene, Methanol, Methyl ethyl ketone, Methyl isobutyl ketone, Mineral spirits, Propylene oxide, Toluene, Vinylidene chloride, Xylenes.

However, other critical substances are missing from the original list of fourteen substances and the proposed eighteen substances. The emissions include benzene, a substance which has shown elevated levels in Sault Ste. Marie and Hamilton, according to MOEE's *1992 Status Report on Ontario's Air, Water and Land.*

Conclusion

Scientific research on the sources, fate and impacts of hazardous air pollutant deposition in the Great Lakes provides sufficient basis to unequivocally assent that significant emission reductions from present levels are needed **now**. Since at least 1986, scientists and Great Lakes managers have known that the air is a major, often the largest, source of toxic pollutant loadings to the Great Lakes. More recent science has refined and confirmed that finding, but too little has changed to control the sources in the interceding eleven years. The 1990 U.S. *Clean Air Act* amendments resulted in tough new standards on incinerators, and Ontario has introduced some new standards, but even these rules fall short: they are not consistent with the Agreement's zero discharge philosophy; they allow continued release of dioxins, mercury and other pollutants; and they do not require source reduction, product substitution or bans as the most efficient means of eliminating releases of persistent toxic substances.

There is injury to human health and environment from these pollutants, primarily through fish consumption. Vulnerable subpopulations, including children, pregnant women and women of childbearing age, indigenous peoples and others that rely on fish and wildlife as a major part of their diet, face higher associated risks of cancer, birth defects and development problems as a result.

Significant source categories and emissions rates provide the factual basis to set priorities to control many hazardous air pollutants. Aggressive preventive action is necessary to eliminate the emission of persistent toxic substances because atmospheric deposition of these substances significantly contributes to pollution of the Great Lakes System. Improved emission reduction technologies and pollution prevention techniques and processes are available to substantially reduce emissions of many of these pollutants.[210] Control strategies ought to focus on a relatively small number of major sources and emphasize pollution prevention to eliminate emissions of persistent toxic air pollutants through process changes, substitution of materials and other modifications.

---

[210] Commission for Environmental Cooperation *Continental Pollutant Pathways: An Agenda for Cooperation to Address Long-Range Transport of Air Pollution in North America*, Montreal, Sept. 1997.

Finally, there is a need for increased coordination within agencies among air and water divisions in all jurisdictions in the Great Lakes Basin, especially with those involved in ecological research and monitoring of terrestrial and aquatic systems. Enhanced bilateral integration of research, monitoring and control strategies is a essential to confront issues associated with transboundary transport and deposition of airborne toxics.

RECOMMENDATION: **U.S. EPA should complete and publish its long-overdue reports on the *Mercury Study*, *Utility Air Toxics Study*, and *Dioxin Reassessments*. These studies form the crucial foundation for programs, standards and regulations to reduce and eliminate these persistent toxic substances.**

RECOMMENDATION: **Control strategies should target a relatively small number of major sources and emphasize pollution prevention to eliminate emissions of persistent toxic air pollutants. The governments ought to begin regulating power plant mercury emissions, because it is known that coal-fired power plants emit substantial amounts of mercury into the Great Lakes ecosystem causing widespread pollution problems.**

RECOMMENDATION: **Controls should focus primarily on strong regulatory measures. Market-based policies, such as a mercury "cap and trade" programme, should be used only in conjunction with strict regulatory programs.**

5.4 Contaminated Sediments and Dredging

The Agreement requires the Parties, in cooperation with state and provincial governments, to identify the nature, impact and extent of sediment pollution in the Great Lakes system and to implement demonstration projects for the management of polluted bottom sediments at selected AOCs. These provisions are included in Annex 14. Annex 7 encourages research on dredging technology and the pathways, fate, and effects of nutrients and contaminants of dredged materials. The Agreement's requirements to clean up contaminated sediment sites are found in several places, including:

> *The Purpose, General Objectives and Specific Objectives of the Agreement clearly require action to clean up of contaminated sediments, since polluted bottom sediments interfere with beneficial uses and produce conditions that are toxic or harmful to human, animal or aquatic life. In the*

1987 amendments to Annex Two on Remedial Action Plans and Lakewide Management Plans, Canada and the U.S. committed to cleaning up the Areas of Concern, where contaminated sediment problems are most severe, and to developing plans to reduce loadings of critical pollutants through LaMPs in order to restore beneficial uses.

In all forty-two Great Lakes AOCs, people and wildlife are unable to fully and safely use the waters because of toxic pollution problems stemming from contaminated sediments. Some of the use impairments include fish and wildlife consumption advisories, fish tumors, bird deformities, and restricted navigational dredging (see Table 6). A recent report from the Water Quality Board Sediment Action Committee stated that "It is critical that some of these concentrated deposits of contaminated sediment be addressed relatively quickly, because over time these contaminants may be transported from a river or harbor to the Great Lakes. Once dispersed into the lakes, cleanup is virtually impossible."[211]

While the past ten years have been marked by many meetings, reports and studies by the state, provincial and federal governments to address the Agreement's provisions relating to contaminated sediments and dredging, very few contaminated sediment sites have actually been cleaned-up. While there has been progress to study and test various sediment clean-up technologies, the governments have not developed a specific clean-up strategy for contaminated sediments. In the U.S., many laws exist that can be used to clean up these sites, though they may not be specific to contaminated sediments problems; they are often program-, agency-, and/or media-specific. Implementation and interpretation of these laws and regulations can result in overlap and conflicting clean-up goals. Consequently, there is often a lack of clear regulatory and programmatic focus behind the profusion of studies,

---

[211] *Ibid.*

TABLE 6: A summary of use impairments potentially associated with contaminated sediment and the numbers of Areas of Concern with such use impairments.

USE IMPAIRMENT	HOW CONTAMINATED SEDIMENT MAY AFFECT USE IMPAIRMENT	NUMBER OF AREAS OR CONCERN WITH THE IMPAIRED USE (N-42; % in parentheses)
Restrictions on fish and wildlife consumption	Contaminant uptake via contact with sediment or through food web	36 (86%)
Degradation of fish and wildlife populations	Contaminant degradation of habitat; contaminant impacts through direct sediment contact; food web uptake	30 (71%)
Fish tumors or other deformities	Contaminant transfer via contact with sediment or through food web; possible metabolism to carcinogenic or more carcinogenic compounds	20 (48%)
Bird or animal deformities or reproduction problems	Contaminant degradation of habitat; contaminant impacts through direct sediment contact; food web uptake	14 (33%)
Degradation of benthos	Contact; ingestion of toxic contaminants; nutrient enrichment leading to a shift in species composition and structure, due to oxygen depletion	35 (83%)
Restriction on dredging activities	Restriction on disposal in open water due to contaminants and nutrients, and their potential impacts on biota	36 (86%)
Eutrophication or undesirable algae	Nutrient recycling from temporary sediment sink	21 (50%)
Degradation of aesthetics	Resuspension of solids and increased turbidity; odors associated with anoxia	25 (60%)
Added costs to agriculture or industry	Resuspended solids; presences of toxic substances and nutrients	7 (17%)
Degradation of phytoplankton or zooplankton populations	Toxic contaminant release; resuspension of solids and adsorbed contaminants, and subsequent ingestion	10 (24%)
Loss of fish and wildlife habitat	Toxicity to critical life history stages; degradation of spawning and nursery grounds due to siltation	34 (81%)

Source: OVERCOMING OBSTACLES TO SEDIMENT REMEDIATION TO THE GREAT LAKES BASIN, WHITE PAPER, WATER QUALITY BOARD, IJC 1997

reports and activities surrounding sediment cleanup efforts.[212] Funding for removal, storage and treatment of sediments is also a monumental barrier.

U.S. Policies and Programs

U.S. environmental laws provide authority for a wide range of regulatory approaches to assess, research and remove contaminated bottom sediments in the Great Lakes basin. These authorities include the *Clean Water Act*; *Water Resources Development Act*; *Comprehensive Environmental Response, Compensation, and Liability Act*; *Toxic Substances Control Act*; *Resource Conservation and Recovery Act*; and the *Rivers and Harbors Act*, along with various state laws.

Since 1987, U.S. EPA's Great Lakes National Program Office (GLNPO) has administered the *Assessment and Remediation of Contaminated Sediments* (ARCS) program, a requirement of Annex 14 and a provision of the U.S. *Clean Water Act*. Starting in 1987, GLNPO conducted a five-year study and demonstration project of remediation technologies to control and remove toxic pollutants in bottom sediments. The ARCS program was extended to conduct three full-scale demonstrations using promising remediation technologies.

Under the *Water Resources Development Act*, the U.S. Army Corps of Engineers provides technical, planning and engineering assistance for contaminated sediment remediation through Great Lakes RAPs. The Corps has new authority to dredge for environmental purposes, whereas previously it was limited to dredging for navigational purposes. Currently, the Corps is developing feasibility plans for contaminated sediment remediation and disposal facilities at the Ashtabula River (Ohio) and Grand Calumet River (Indiana) RAPs. In 1994, U.S. EPA and the Corps jointly developed the Great Lakes Dredged Material Testing and Evaluation Manual, which provides guidelines for evaluating potential contaminant impacts associated with the discharge of dredged materials into the Great Lakes and their tributaries.

Through enforcement action at the Waukegan Harbor Area of Concern in Illinois, funding was leveraged to remove more than one million pounds of PCBs in harbor sediments.[213] In total, 97% of the PCBs were removed by the time cleanup was completed in 1993. Although the harbor is still listed as an AOC, the dredging has

---

[212] Ad Hoc Great Lakes Sediment Focus Group, *Barriers to Managing Great Lakes Contaminated Sediments*, April 1995, p. 7.

[213] PCB levels in some harbor sediments were as high as 500,000 ppm. In other words, half of certain harbor sediments were PCBs. After dredging, PCB concentrations were lower than the 50 ppm limit set by the *Toxic Substances Control Act*.

cleaned up the local environment. In early 1997, a major milestone at Waukegan Harbor was celebrated when the Illinois EPA removed the ban on eating fish caught in the harbor. The fish in and around the harbor are now no more contaminated than fish in the rest of Lake Michigan. Further, the million pounds of PCBs that laced the harbor are now removed so that they no longer bleeds toxics into the rest of Lake Michigan.

Unfortunately, Waukegan Harbor is more the exception than the rule for sediment cleanup in the Great Lakes. Progress at many other AOCs is very slow, often characterized by lengthy litigation proceedings, public opposition to disposal facilities, lack of leadership, lack of clear regulatory approaches to clean up the polluted bottom sediments and lack of funding. In its Eighth Biennial Report, the IJC commented on necessary components for successful remedial actions in AOCs:[214]

> *The successful Area of Concern initiatives are those with strong local institutional structures and government support to drive broad and meaningful public participation, implementation and monitoring, and to demand accountability for progress. Also needed are mechanisms to secure financial commitments.*

The experience of the Ashtabula River AOC illustrates what can be achieved to clean up polluted sediments through strong local leadership, specific funding strategies and a collaborative partnership. Until several years ago, the remediation process was characterized by costly litigation proceedings that did not result in any removal of sediments. Almost $50 million had spent on litigation and studies by U.S. EPA and the Potentially Responsible Parties (PRPs) of the Fields Brook Superfund site. In late 1994, U.S. EPA had evidence to designate the Ashtabula River as part of the Superfund site. By this time, local leaders in Ashtabula and even the PRPs were frustrated by the high costs of litigation and lack of environmental progress made through the Superfund program.

The Ashtabula River Partnership formed with an agenda to take action. The Partnership eventually involved citizens, local leaders, industry, and state and federal agencies. A crucial component is the support of the Congressman Steve LaTourette, an influential Great Lakes leader in the U.S. House of Representatives. U.S. EPA has deferred the Superfund designation pending the Partnership's progress. The Partnership has established a nonprofit foundation, and by September 1997, completed its funding plan and environmental impact statement for the clean-up project, anticipating implementation soon thereafter. Ashtabula possessed elements that are common among nearly all Great Lakes AOCs with contaminated sediments

---

[214] International Joint Commission, *Eighth Biennial Report on Great Lakes Water Quality*, 1996, p. 26.

(i.e., threatened use and enjoyment of the water body, need for a disposal facility for contaminated dredged material, multiple stakeholders, large financial commitments). Yet, Ashtabula stands apart from other AOCs because of strong community and political support and the cooperative and highly productive work of the Ashtabula River Partnership.

Canadian Activities:

Between 1990 and 1996, Canada's *Great Lakes Cleanup Fund* provided approximately one-quarter of its $55 million in funding to help develop and demonstrate innovative cleanup technologies for contaminated sediments in the Canadian areas of concern. The projects involved the demonstration of techniques for assessing sediment quality, for removing sediments without releasing them to the water, and for in-place and off-site treatment of contaminated sediments. They assessed thirty technologies at the benchscale and conducted six pilot projects. The pilot projects were carried out in Thunder Bay, the St. Mary's River, Toronto Harbour, Hamilton Harbour, and the Niagara and Welland River. The demonstration stage of the contaminated sediments programme is now completed. The programme now acts only as an advisory service.

Several RAPs are now at the stage of trying to pull together major funding to carry out the actual cleanup of substantial quantities of contaminated sediments.

Thunder Bay:

A fourteen-hectare area of sediments in the bottom of Thunder Bay Harbour is heavily contaminated. A major part of the contamination source was from the pentachlorphenol and creosotes that leaked from a wood preserving plant on the edge of the harbour. After almost a decade of legal battles, a clean-up deal was signed on March 6, 1997. Canada, Ontario, and the four companies associated with the contamination problems signed a $9.3 million agreement to build barriers around the sediments to prevent them from moving further and to then dredge the contaminated sediments and treat them. The dredging activity began in October 1997. The contaminated sediments will be stored on a freighter beside the site until a treatment method has been decided on. The plan is to create habitat in the area once the contaminants have been dug up. Concerns have been raised as to whether enough of the contaminants are being removed, and as to whether the barrier is being placed far enough out in the harbour. The RAP public advisory committee played a key role in the pulling together the deal that led to the cleanup that is now underway.

Hamilton Harbour:

A five-hectare section of Hamilton Harbour contains heavily contaminated sediments. Coal tar from past activities of Stelco, a steel producer, has caused this problem. The area known as Randle Reef has PAH levels between 200 and 800 parts per million (ppm). The cost of cleaning up the sediments is estimated to be between $8.5 and 15 million. Years of negotiations have been going on to try to get the commitments for the cleanup. In 1995, the Canadian Government committed to provide up to a third of the costs, or $5 million. Finally, in February, 1997, the Provincial Government agreed to give $1 million for the cleanup. Stelco still refuses to commit any money towards the cleanup. As a result , the cleanup has not yet begun. Stelco's refusal to participate has hurt the company's reputation in the community. A local environmental reporter wrote a column criticizing the company, pointing out that "Stelco has cash for big ad campaign, but not cleanup."[215]

CONCLUSION:

Although many laws and regulations exist that can be used to remediate contaminated material, they are not specific to contaminated sediments. Numerous state, provincial and federal agencies interpret and implement these policies, often resulting in a regulatory maze with overlap and sometimes conflicting clean-up goals.

Remediation at any one site may vary according to the nature and extent of the polluted sediments, funding mechanisms, public acceptance, and the applicable laws and regulatory approaches. There is often a lack of clear regulatory and programmatic approaches driving the remediations. For instance, *Comprehensive Environmental Response, Compensation and Liability Act* actions in the U.S. are based on the existence of, or the potential for, an unacceptable risk to human health or the environment. Without that risk, an action may not be taken, even when state standards are exceeded.[216] Moreover, there is a lack of established criteria for determining action levels and clean-up goals. Remediation efforts, when taken, can be piecemeal, leaving the problem partly unresolved and the potentially responsible parties without certainty as to whether the liability still exists.[217] In short, there is no specific clean-up strategy for contaminated sediments.

---

[215] Mark McNeil, "Stelco ahs cash for big ad campaign, but not for cleanup." *Hamilton Spectator*, May 16, 1997.

[216] Ad Hoc Great Lakes Sediment Focus Group, 1995, p. 7.

[217] *Ibid.* p. 1.

Funding is a major barrier in both countries to achieving effective and timely management and cleanup of polluted bottom sediments. Future funding in Canada appears uncertain, with the termination of the *Great Lakes 2000 Cleanup Fund.* The Water Quality Board Sediment Priority Action Committee concludes:

> *The ability to secure funding for sediment remediation is especially problematic as this is often one of the largest single costs associated with RAP implementation....Without enforcement, or the threat of it, there is no source of funding capable of addressing the costs associated with large-scale remediation of sediment at U.S. RAPs.*[218]

Litigation and enforcement actions can be a double-edged sword. They are resisted by responsible parties, but they are critical for funding the clean-up projects. Litigation is often difficult, time-consuming and expensive, especially considering that many of the sites contain historically polluted sediments where liable parties no longer exist. Enforcement actions, which involve identifying pollutant sources, proving causation and apportioning liability, can be equally challenging. Yet, the record in the Great Lakes clearly indicates that litigation and enforcement often appears to be the only tool that works. Even in the case of Ashtabula, the threat of continuing and expensive litigation was an important incentive to prod the parties into action. The Sediment Priority Action Committee confirms this stating, "In the U.S., virtually all of the sediment remediation completed to date has been funded as a result of enforcement actions taken against polluters, typically industries and municipalities."[219]

5.5 Land Use

In the GLWQA, the governments committed themselves to take "measures to encourage and facilitate improvements in land use planning and management programs to take account of impacts on Great Lakes water quality" [Article VI].

The governments' *1997 State of the Lakes* report concluded that the impacts from inappropriate land use are worsening: "Most of these indicators [of land use impacts]

---

[218] Sediment Priority Action Committee, p. 7 and 8.

[219] Sediment Priority Action Committee, p. 7.

were rated as *poor, mixed and deteriorating, or mixed and stable*, indicating that land use practices remain a major source of stress to the Lakes."[220]

Agriculture:

In Article IV of the GLWQA, the governments agreed to take measures "for the abatement and control of pollution from animal husbandry operations" and "to control soil losses from ... rural areas."

During the past decades, governments in all jurisdictions have carried out numerous programmes aimed at decreasing the negative impacts on the environment from agriculture. These have included programmes to support farmers in managing the manure from their farms to keep it from running into streams (either by fencing the waterways so animals can't get into them or by building structures to capture the manure before it runs off into streams). Integrated pest management programmes have also been introduced to encourage farmers to reduce the amount of pesticides that they use. Contour ploughing, no-till and conservation tillage methods, and the planting of buffers have been used to lessen the runoff of contaminated soils into streams.

Despite these numerous programmes, agriculture continues to have major negative impacts on the Great Lakes Basin ecosystem. According to a study of agriculture in the Great Lakes Basin coordinated by the Great Lakes Commission, "soil erosion and sedimentation, agricultural pesticide use, and manure management are three basin land-use issues with significant implications for water quality and the agricultural economy."[221]

Urban Land Use:

Four-fifths of the population of the Great Lakes basin lives in 17 metropolitan areas. Most of these people live near the shores of the Great Lakes. Urban sprawl has been a major characteristic of this development. Predictions are that Ontario's population will grow by 20% (two million people) over the next 20 years. The U.S. side is expected to experience much more limited growth.[222]

---

[220] State of the Lakes - 1997, pp. vii & viii.

[221] Great Lakes Basin Agricultural Profile, 1996.

[222] State of the Lakes Ecosystem Conference '96: Background Paper, Land Use, p. 6.

Major pollution consequences of this urban development include contaminated runoff from the urbanized areas, and discharges from sewage systems. The success of programmes to control sewage are discussed in chapter 8 of this report. The predicted population growth, especially on the Canadian side, will put major strains on sewage treatment systems, some of which are already overloaded.

Alternative methods of controlling runoff from urban areas, such as building more porous surfaces than concrete and asphalt, and diverting storm drainage into holding ponds and onto lawns rather than discharging directly into sewers or streams, are being used to try to lessen the impacts, but they have been limited in their success. The governments concluded in 1997 that urban stormwater quality based on nutrient and toxic loadings to the Great Lakes is "poor/stable." They also found that municipal pesticide and fertilizer usage merited a rating of "poor/stable."[223]

Watershed Management:

In the GLWQA, the governments committed themselves to "develop and implement watershed management plans ... on priority hydrologic units to reduce non-point source inputs" [Annex 13, 2(b)].

Although many efforts have been made at watershed planning, these plans have not proven to be adequate to control polluted runoff. The National Wildlife Federation assessed the states' success at watershed protection. They gave Michigan, Indiana, Wisconsin and Minnesota failing grades. Illinois, Ohio and Pennsylvania received "poor" grades, and New York did best with a "weak" grading.[224]

RECOMMENDATION: **The governments should put much more emphasis on improving landuse practices to protect the Great Lakes from contamination. More innovative methods are required.**

---

[223] State of the Great Lakes - 1997: Report Highlights, pp. 12 & 13.

[224] Pollution Paralysis: State Inaction Puts Waters at Risk.

5.6 Groundwater

The governments committed themselves to:

> * identify existing and potential sources of contaminated groundwater affecting the Great Lakes;
> * map hydrogeological conditions in the vicinity of existing and potential sources of contaminated groundwater;
> * develop a standard approach and agreed procedures for sampling and analysis of contaminants in groundwater in order to: (1) assess and characterize the degree and extent of contamination; and 2) estimate the loadings of contaminants from groundwater to the Lakes ...;
> * control the sources of contamination of groundwater and the contaminated groundwater itself, when the problem has been identified [Annex 16].

Papers prepared for the governments' 1996 State of the Lakes conference clearly show that efforts in this area have been one of the greatest failures in the Agreement. They concluded that the actual state of groundwater quality was "mixed," but "likely to deteriorate." They also found that the quality of data on groundwater quality was "poor," meaning "not available at all or severely deficient database."[225]

In 1995, Canada's Auditor General was very critical of government efforts to clean up contaminated sites. His conclusions included:

> * "Comprehensive and consistent information on the number and characteristics of contaminated sites in Canada is not available."
> * "An adequate legislative framework is not yet in place" to address contaminated sites.
> * "The National Contaminated Sites Remediation Program is sunsetting, but the need for clean-up continues."[226]

RECOMMENDATION: **The governments must make maximum effort to fulfil their commitments in Annex 16 of the GLWQA. Contaminated groundwater is one of the major sources of contamination problems in the Great Lakes but at the same time one of the least studied and least acted upon problems.**

---

[225] State of the Lakes Ecosystem Conference '96: Background Paper - Land Use, p. 13.

[226] Auditor General of Canada, Environment Canada: Managing the Legacy of Hazardous Wastes, May 1995.

5.7 Pesticides

Annex 10 of the GLWQA lists 271 Hazardous Polluting Substances and 106 Potentially Hazardous Polluting Substances, based on known or potential toxic effects, respectively, on aquatic and animal life in the Great Lakes Ecosystem.[227] In addition, these chemicals are listed based on a risk of being discharged to the Great Lakes system. Many of the chemicals are pesticides, including restricted chemicals such as DDT and dieldrin, and currently used chemicals such as chlorpyrifos, captan, and carbaryl. Many of the Great Lakes Basin pesticides reported to be most heavily used in the late 1980s (e.g., metolachlor, atrazine, alachlor, cyanazine, and mancozeb)[228] are not included in the Annex 10 lists.

Use of Pesticides:

Approximately 57 million pounds of 157 agricultural pesticide active ingredients are used in the Great Lakes Basin annually, a figure which does not include uses such as applications in food storage or processing, or for tree farms or other nonagricultural purposes.[229] As noted recently by the National Research Council, a complete accounting of the fate of any pesticide applied to a field does not exist.[230] World Wildlife Fund has pointed out numerous problems with the current approach to managing pesticides:[231]

* There is minimal review of currently used pesticides for their human health and environmental effects.
* Numerous recent studies that document effects of pesticides on the endocrine (or hormonal) systems of wildlife were not taken into account or did not exist when the pesticides were registered for use. These may have implications for human health as well.

---

[227] IJC, 1989, Appendices 1 and 2, op. cit.

[228] World Wildlife Fund, Reducing Reliance of Pesticides in Great Lakes Basin Agriculture, Hoppin, P.J., Liroff, R.A., Miller, M.M., 1997.

[229] *Ibid.*

[230] National Research Council, *Soil and Water Quality: An Agenda*, National Academy Press, Washington, D.C., 1993.

[231] World Wildlife Fund, 1997, op. cit.

* Determination of pesticide levels in environmental samples that do not violate regulatory standards may not be sufficient measures of risk from exposure. Risk assessment methods that have traditionally targeted cancer endpoints may be inappropriate in the case of other harmful effects.

An example of the potential risk of pesticides is the concern regarding the increase in breast cancer in Hawaii; researchers have suggested the possibility that part of the increase is due to the presence of several endocrine disrupting chemicals (chlordane, heptachlor, and 1,2-dibromo-3-chloropropane) at levels that sometimes exceeded federal standards by a factor of 50 or more.[232]

In contrast to the relative abundance of long-term trend data for chemicals such as PCBs and DDT and its metabolites in the Great Lakes, there is relatively little data for the most heavily used pesticides. Two recent Environment Canada studies investigated the commonly used herbicides atrazine and metolachlor:

* In a study of atrazine and metolachlor in precipitation, Struger and Chan[233] found that concentrations were highest during the month of May at sites along the shore of southern Lake Huron, Lake St. Clair, and a site on Pelee Island in western Lake Erie. The lowest concentrations were found at Lake Superior sites. The high concentrations of metolachlor and atrazine (over 1000 ng/l and 800 ng/l, respectively) were 20 times higher than other months of the year, and the spatial and temporal trends correlated with application time and usage, indicating atmospheric transport of the herbicides.

* In a study of herbicides in the Niagara River, concentrations did not change significantly from 1990 to 1994; loadings to Lake Ontario ranged from 7,000 to 20,000 kg/yr for atrazine, and from 1860 to 4900 kg/yr for metolachlor, which the authors noted were substantial in comparison to loads of PTS such as PCBs.[234]

In the *First Great Waters Report*, the U.S. EPA recommended exploring the feasibility of creating an inventory of pesticide use within the U.S. and establishing a program to

---

[232] Allen, R.H., Gottlieb, M., Clute, E., Pongsiri, M.J., Sherman, J., Obrams, G.I., Environmental Health Perspectives, 105(Suppl. 3): 679-683.

[233] Struger, J., Chan, C.H., *Occurrence and Transport of Herbicides in Precipitation from the Canadian Section of the Great Lakes Basin*, Environment Canada Report, 1997.

[234] Kuntz, K., Struger, J., *Occurrence of Atrazine and Metolachlor in the Niagara River, 1989-1994*, Environment Canada Report, 1997.

identify and quantify stockpiles and emissions of pesticides of known and potential concern, including banned pesticides. The *Second Great Waters Report* noted that while the inventory is "feasible," the EPA has no plans to compile the information.[235]

Many of the current discussions regarding potential harmful effects of pesticides and other chemicals utilizes the risk assessment framework. But as noted in a recent paper on ecological risk assessment in pesticide registration:

> *From a scientific perspective, risk assessments are essentially complex hypotheses, not conclusive or factual statements... If we wish to retain a scientific basis in registration, follow-up work that tests the risk-prediction hypothesis needs to be done.*[236]

These authors noted that well-designed monitoring programs would help reduce uncertainties and the ambiguities in the current practice.

RECOMMENDATION: **The governments should make greater efforts to implement both pesticide monitoring programmes and use inventories to better understand the potential for harm from these chemicals on aquatic organisms, wildlife and people in the Great Lakes Basin.**

Control of Pesticides:

The only pesticides that Canada and the U.S. have committed to eliminate in the Great Lakes Basin are those whose use in the basin has already been banned or severely restricted: aldrin/dieldrin, chlordane, DDT, mirex, and toxaphene. Neither the *Great Lakes Binational Toxics Strategy* signed by Canada and the U.S. in April 1997 nor COA signed in 1994 lists other pesticides in their list of substances on which their actions will focus.

RECOMMENDATION: **The governments should include in their action plans other pesticides in use in the Great Lakes Basin that are PTS or are endocrine disruptors.**

---

[235] U.S. EPA, *Deposition of Air Pollutants to the Great Waters, Second Report to Congress*, Office of Air Quality Planning and Standards, EPA-453/R-97-011, June, 1997.

[236] Kapustka, L.A., Williams, B.A., and Fairbrother, A., 1996, Environmental Toxicology Chemistry, 15(4): 427-431.

CHAPTER 6: RADIOACTIVE SUBSTANCES

Sixty nuclear reactors are located in the Great Lakes basin. The basin also contains uranium mines and refineries, numerous nuclear waste sites, nuclear research laboratories and nuclear weapons production facilities.

Specific Objectives for Radioactive Substances:

The GLWQA sets objectives for radioactivity in waters. It states that "for dose commitments greater than 5 millirems [at the periphery of the source control area], the responsible regulatory authorities shall determine appropriate corrective action" [Annex 1].

Rio Algom and Denison Mines have closed their uranium mining operations near Elliot Lake, Ontario. They left over 200 million tonnes of radioactive tailings in the area. Contaminants are washing from these tailings down the Serpent River and, hence, into the northern part of Lake Huron. The companies' decommissioning plans after corrective action would result in doses of between seven and 8.8 millirems. This dose is over 50% higher than the level at which the governments agreed in the GLWQA that they would take corrective action. Nevertheless, the Canadian federal government has approved this decommissioning plan.[237]

RECOMMENDATION: **The governments should follow their commitment in the GLWQA to take corrective action when the specific objective for radioactive substances is exceeded.**

Radioactive Substances as Persistent Toxic Substances:

In 1994, the IJC recommended that the:

> *Governments incorporate those radionuclides which meet the definition of persistent toxic substances in their strategy for virtual elimination.*[238]

This means that the principles of virtual elimination, zero discharge and phaseout of the use of PTS should apply to persistent radioactive substances.

---

[237] John Jackson, *Application of Great Lakes Principles to the Elliot Lake Decommissioning Plans* (A Submission to the Federal Environmental Assessment Panel], 1995.

[238] IJC, *Seventh Biennial Report on Great Lakes Water Quality*, 1994.

Both Canada and the U.S. rejected this recommendation. The reasons they gave for their responses included: most of the radionuclides occur naturally; there are adequate regulations in place to limit the releases; existing controls are consistent with international standards; stronger actions would have serious impacts on the nuclear fuel cycle and nuclear medicine; and lack of evidence that current levels of radionuclides in the Great Lakes basin are causing environmental or health damage.[239]

In 1996, the IJC rejected the governments' arguments and repeated their belief that radioactive materials and nuclear wastes "should be addressed under the GLWQA in a similar way to persistent toxic chemicals."[240] In its response to the IJC's reiteration of its earlier recommendation, the U.S. again rejected the recommendation.[241] Canada had not yet responded to the IJC's *Eighth Biennial Report* when this report was written.

In August 1997, Ontario Hydro closed seven of its nineteen nuclear reactors after it received a report condemning the management of its nuclear division. Ontario Hydro has approved a $5 billion to $8 billion nuclear recovery plan to reopen these plants and keep the others operating, rather than using this as a step in the phaseout of the use and production of toxic persistent radionuclides.

RECOMMENDATION: **The governments should follow their commitment in the GLWQA and set goals for virtual elimination and zero discharge for all PTS, including those that are radioactive.**

---

[239] Government of Canada, Canada's Response to the Recommendations in the Seventh Biennial Report of the International Joint Commission, October 1994, pp. 17 & 18, and United States Response to the International Joint Commission's Seventh Biennial Report on Great Lakes Water Quality, March 1995, p. 12.

[240] IJC, *Eighth Biennial Report on Great Lakes Water Quality*, 1996, p. 36.

[241] United States Response to Recommendations in the International Joint Commission's Eighth Biennial Report on Great Lakes Water Quality, September 1997, pp. 23 - 25.

Remediation:

Part of the virtual elimination strategy developed by the IJC is "to remediate problems from past and present inputs."[242] Neither Canada nor the U.S. has succeeded at setting up a permanent repository for high level wastes.

In the U.S., dry cask storage is now being used to deal with the large quantities of high level nuclear wastes piling up around each nuclear power plant. These six-foot tall concrete containers have proven inadequate to handle spent fuel. A cask stored at the Palisades plant on the Michigan side of Lake Michigan cracked within six weeks of being loaded. At the Point Beach plant on the Wisconsin shore of Lake Michigan, a hydrogen explosion occurred at the dry cask storage facility.

The other issue that neither Canada nor the U.S. has addressed is how to decommission nuclear power plants. Plants all around the Great Lakes are reaching the point where they need to be closed down. But neither Canada nor the U.S. knows how to properly decommission a nuclear power plant. In addition, the money has not been set aside to carry out the decommissionings. This leaves us with the prospect of concrete hulks contaminated with highly radioactive materials deteriorating all around the shores of the Great Lakes.

RECOMMENDATION: **The governments should focus their attention on looking for new alternatives for the long-term storage of radioactive wastes and for decommissioning of nuclear power plants. The governments should ensure that the public is fully involved in the assessment of alternatives. Full public involvement necessitates the provision of adequate funding to public intervenors to carry out technical assessments of alternatives.**

Port Hope Harbour: Port Hope Harbour on the shore of Lake Ontario was listed by the IJC's WQB as an area of concern primarily because 90,000 cubic metres of sediments in the harbour are contaminated by uranium and thorium series radionuclides, heavy metals and PCBs. The radioactive contamination is the result of dumping wastes from refining and processing of uranium and radium in Port Hope.[243]

The Canadian federal government has taken responsibility for the development and implementation of this RAP. The RAP has been on hold for the last few years as

---

[242] *A Strategy for Virtual Elimination of Persistent Toxic Substances*, August 1993, Volume 1, p. 16.

[243] Canada-Ontario, *Remedial Action Plan Update*, October 1996.

Canada tries to find a location to dispose of the radioactive sediments. In 1995, it appeared that Deep River would agree to take the low-level radioactive wastes, but the deal appears to have fallen through.

The radioactive sediments remain in the Port Hope Harbour. As well as resulting in restricted use of the harbour, these radioactive sediments have caused public concerns that the sediments may be moving out into Lake Ontario and about contamination of fish and town water supplies.

RECOMMENDATION: **Canada should speed up the development and implementation of the Port Hope RAP.**

Conclusion:

The Canadian and U.S. governments have made it clear that they do not intend to carry out their commitments under the GLWQA with respect to radioactive substances and that they do not intend to follow the IJC's advice on how to address these issues. Therefore, rather then simply making general recommendations about the ways radioactive substances should be addressed, the IJC should conduct in-depth assessments of the problems and of the ways to address these problems.

RECOMMENDATION: **The IJC should conduct in-depth assessments of the problems posed by human use of radioactive substances around the Great Lakes and develop recommendations for ways to address these problems. The IJC should ensure that the public is fully involved in its deliberations on these matters.**

CHAPTER 7: PHOSPHORUS

The major impetus behind the 1972 GLWQA was excess algal growth in the Great Lakes, especially in Lake Erie. The Agreement focussed on reducing the release of phosphorus to the Lakes since it was seen as a major cause of the growth of algae. Nutrient enrichment causes excess growth of algae, which decompose to reduce oxygen supply in the lake. Oxygen is essential to sustain aquatic life. The conditions created by excess algal growth are referred to as eutrophication.

The Commitments:

The 1972 Agreement called for each country to have in place by the end of 1975:

* municipal sewage systems providing levels of treatment consistent with the achievement of the GLWQA objectives;
* industrial waste treatment systems providing levels of treatment consistent with the achievement of the GLWQA objectives;
* measures to limit phosphorus inputs to the Lakes to the limits outlined in the Agreement; and
* programmes to reduce pollution from agricultural, forestry, solid waste disposal, and other land use activities.

In 1983, the Phosphorus Load Reduction Supplement was added to the Agreement in recognition that the total phosphorus loading goals for Lakes Erie and Ontario would not be met under the programmes then established. The Supplement called for: the development of reduction plans for Ohio, Pennsylvania, Michigan, New York and Ontario; continued efforts to limit phosphorus in household detergent; and reduced urban and agricultural runoff through specific measures.

Degree of Success:

The governments have had considerable success at addressing the problem of excess algal growth in the Great Lakes. They made substantial investments in building and upgrading municipal sewage treatment plants and in putting into place bans or limitations on the use of phosphates in detergents used in Great Lakes jurisdictions. These actions have dramatically reduced the discharge of phosphorus to the Great Lakes.

Lake Erie, which has historically been most negatively affected by eutrophication problems, mainly because of its shallow waters, has had a 60% reduction in phosphorus loadings since the late 1960s. Since 1981, the reduction targets set for Lake Erie have been met every year except 1982, 1984 and 1990. Loadings of phosphorus have fluctuated at or near the target for Lake Ontario since 1981. The reduction targets set by the Agreement for phosphorus loadings to lakes Huron and

Michigan have been met since 1981. The loading targets for Lake Superior have been met ever since 1985.[244]

Open lake concentrations of phosphorus have met targets set in the GLWQA since 1976 in Lake Michigan, since 1980 in Lake Huron and since 1986 in Lake Ontario. In Lake Erie, open lake concentrations have fluctuated around the targets. In the western end of Lake Erie, the most shallow part of the Lake, concentrations have exceeded the target in some recent years. Open lake concentration goals have never been exceeded in Lake Superior.[245]

Lake Ontario has recently demonstrated trends towards an oligotrophic state, indicative of low nutrient levels.[246] This has raised concerns among some people, especially those who fish, that the reduced levels of nutrients are contributing to a decrease in the population of certain fish species dependent on alewife for food. Considerable controversy is now arising around lakes Erie and Ontario as to the respective roles that the following factors are having on the observed drops in alewife populations in the lakes: reduced inputs of nutrients for their food, competition from zebra mussels, and high levels of stocking of fish that eat alewives.[247]

Despite the success at reducing eutrophication problems in the open lakes, eutrophication continues to be a major problem in many harbours, rivers and streams in the lower lakes. Twenty-one of the areas of concern for which RAPs are being prepared list "eutrophication with undesirable algae" as a serious problem.[248] Saginaw Bay in Lake Huron, and the Bay of Quinte in Lake Ontario are prime examples of this.

---

[244] Environment Canada & U.S. Environmental Protection Agency, *State of the Lakes Ecosystem Conference: Nutrients: Trends and System Response*, pp. 6 & 7.

[245] *Ibid.*

[246] Government of Canada, *State of Canada's Environment*, 1996, p. 6-31.

[247] See for example, D.B. MacNeill, "Lay Perspectives on Lake Ontario Fisheries," and Stephen Brandt et al., "A Review of the Current Status of Lake Ontario's Pelagic Fish Community: Report of the 1996 Lake Ontario Technical Panel," in *Great Lakes Research Review: Great Lakes Fisheries*, July 1996.

[248] *State of the Lakes - 1995*, p. 24.

Remaining Problems:

Non-Point Sources: Discharge of nutrients from non-point sources is now the main concern. Approximately 80% of the phosphorus loading now comes from agricultural runoff.[249]

The need to control non-point sources of nutrients has been recognized for twenty years. After one of the most extensive consultations ever carried out by the IJC, the Pollution from Land Use Activities Reference Group (PLUARG) released its final report in 1978. This report stressed the need to put substantially more emphasis on non-point sources of nutrients.

Most jurisdictions now have programmes to encourage farmers to change their farming practices to reduce the release of nutrients to waterways. In Canada, a total phosphorus management programme is under development in several areas including the Bay of Quinte, the Thames River and the Grand River, to address the management of nutrient loadings to the tributaries. The Bay of Quinte RAP is looking at a phosphorus trading programme to achieve its loadings targets.[250] The Lake Erie LaMP has established a Task Force on phosphorus to discuss the emerging issues on phosphorus reduction programs.

Point Sources: The Canadian and U.S. governments recently stated: "There is a tendency to perceive eutrophication as a 'mature issue' that requires no further effort. In reality, control of sewage effluents has just begun."[251] They concluded that improvements at sewage treatment plants will have to go even further "to maintain the low loads now in place and to avoid reversing hard-won progress"[252] because of population growth. They also raised alarm about the impact of untreated sewage discharges from combined sewer overflows in many large Great Lakes cities.

These upgrades will be more difficult to carry out on the Canadian side of the Great Lakes than in the past because both the federal and Ontario governments have dropped all funding for sewage treatment plants and infrastructure upgrading. On the

---

[249] Government of Canada, *State of Canada's Environment,* 1996 & tel. con. with Ian Smith.

[250] D.W. Draper, *Bay of Quinte RAP Phosphorus Trading Program Evaluation and Design,* 1987.

[251] Environment Canada & U.S. Environmental Protection Agency, *State of the Lakes Ecosystem Conference '96, Background Paper, Nearshore Waters of the Great Lakes*, November 1996, p. 119.

[252] *Ibid.*

U.S. side, federal revolving loan funds used to fund capital expenditures for sewage treatment systems are still in place. These are averaging over one billion dollars a year across the U.S.

Nitrate-Nitrite Sources: Thus far activity to reduce eutrophication has focussed on phosphorus loadings. Increasingly, governments are recognizing that nitrates and nitrites are an important part of the problem. Levels of these have been increasing over the past two decades, especially in Lake Ontario.[253] The major sources for these nutrients are from agriculture, municipal sewage treatment plants, and the atmosphere.

RECOMMENDATION: **The governments should fulfil their commitments in the GLWQA by taking stronger action to control non-point sources of phosphorus.**

RECOMMENDATION: **The governments should also focus on the sources of nitrogen to the Lakes.**

RECOMMENDATION: **The governments should assess whether the standards set for sewage treatment plant discharges are strict enough and the governments should take action to stop all combined sewer overflows to the Great Lakes system.**

---

[253] *State of the Lakes - 1995*, pp. 24 & 25.

CHAPTER 8: SURVEILLANCE AND MONITORING

Annex 11 of the GLWQA requires Canada and the U.S. to establish programmes that:

* monitor compliance with the principles of the Agreement;
* assess achievement of the objectives;
* evaluate water quality trends;
* identify emerging problems for the Great Lakes; and
* support the development of RAPs and LaMPs.

These programmes are vital to the overall success of the GLWQA.

Substantial monitoring and surveillance of the Great Lakes has been undertaken individually and cooperatively by Canada and the U.S. Some of these programmes have been discussed and assessed in other parts of this report.

In recent years, restructuring and cutbacks in government programmes have negatively affected Great Lakes monitoring and surveillance. Research projects that have been ongoing in the Great Lakes since the 1970s and their associated extensive databases are now being threatened. In its *Eighth Biennial Report*, the IJC reported that the number of scientists working in the Great Lakes basin was projected to drop by between 38 and 53% by 1997 compared to 1994 levels.[254]

Canada:

The federal government has been cutting its monitoring and surveillance activities and transferring some of its programmes to the provinces. In turn, the provinces have been cutting their budgets and transferring some monitoring responsibilities to the municipalities. Municipalities do not have the resources to carry out the monitoring since they have a very limited tax base and are having more and more services downloaded to them.

In addition, both the federal and provincial governments have been increasingly relying on industry to monitor itself. Without adequate government double-checking and auditing of industry self-monitoring, it is impossible to assess the adequacy of the data.

Some examples of monitoring and surveillance cuts in Canada include:

* The *Fish Contaminant Program*, which operates through the Canadian Centre for Inland Waters of the Department of Fisheries and Oceans, is

---

[254] IJC, *Eighth Biennial Report on Great Lakes Water Quality*, 1996, p. 6.

responsible for measuring the whole lake response to pollution abatement and for identifying emerging problems. This programme now operates at only 60% of the level it was at three years ago. Its laboratory staff has been reduced by more than half.

* Canada's State of the Environment reporting has been eliminated.
* The Ontario Ministry of Environment and Energy's water quality monitoring facilities have dropped from 700 in 1991 to 200 in 1997 and there has been a 21% reduction in aquatics and ecosystem science staff.[255]
* Ontario has dropped its drinking water testing services to municipalities.[256]
* Ontario's fish consumption advisory guide, which used to be updated each year, is now prepared only every second year.

The United States:

Monitoring and surveillance programmes in the U.S. have been negatively affected by loss of staff, merging of departments, the eradication of long-term projects, and the accumulation of unanalyzed data. Programs that have been affected include:

* The *Great Lakes Fish Consumption Study* has numerous samples that have not been analyzed.
* The *National Water Quality Assessment Program* has undergone restructuring, resulting in a reduction of data collection and monitoring.
* EPA's *Environmental Monitoring and Assessment Program* monitors a more limited number of contaminants than it used to.
* The Great Lakes National Program Office has not received enough funding to develop a Geographic Information Systems database for existing information.

RECOMMENDATION: **The governments must recognize the central role of monitoring and surveillance to the successful implementation of the GLWQA and ensure that the funding is available to play this role.**

---

[255] CIELAP, *Ontario's Environment and the Common Sense Revolution*, 1996, p. 43.

[256] *Ibid.*

CHAPTER 9: REPORTING TO IJC AND THE PUBLIC

Biennial Reporting to the Commission and the Public:

The governments stated that one of the main purposes behind the amendments to the GLWQA in 1987 was to increase government accountability. The mechanism by which accountability was to be improved was regular government reporting to the IJC and the public. The governments committed to report by December 31, 1988, and every two years thereafter on:

1) implementing Remedial Action Plans and Lakewide Management Plans [Annex 2, 7(b)],
2) programs and measures to reduce the generation of contaminants [Annex 12, 8],
3) developing watershed management plans and programs to control non-point sources of pollution [Annex 13, 5],
4) implementing Annex 14 on contaminated sediments [Annex 14, 4],
5) implementing Annex 15 on airborne toxic substances [Annex 15, 6], and
6) implementing Annex 16 on pollution from contaminated groundwater [Annex 16, (v)].

The governments have been reporting on these matters every two years. They have not, however, been reporting by the dates specified. The reports that were due in December 1988 were released by Canada two months late and by the U.S. six months late, even though the reports were dated December 1988. Since then the governments have shifted the reporting time to come out just before the IJC's biennial meetings. This means that the reports have been coming out in September or October of the year after which they were supposed to have been released - a delay of nine to ten months.

The IJC has been considering dropping its major biennial meeting - an event that has in recent years attracted almost 2000 people and major media attention. If this meeting is dropped, the question arises as to what milestone the governments will use as the deadline by which they must report to the IJC and the public. Will there be even more slippage in the timing of this reporting and thus a lessening of accountability?

The governments' reports have changed dramatically over the past several years. The first two reports were in depth, annex by annex, reporting on activities. The last two reports (those released in 1993 and 1995) have been much less detailed and much less rigorous in their reporting. They have become more like public relations pieces, providing anecdotal evidence of progress. By being less rigorous in their reporting and not referring to their commitments in the Agreement, the governments have avoided showing the weaknesses of their programmes.

Annual Inventory of Pollution Abatement Requirements and Compliance:

In the 1978 GLWQA, the governments committed to release a report to the IJC and the public each year that would list "pollution abatement requirements for all municipal and industrial facilities discharging into the Great Lakes System" and would include "status of compliance with monitoring and effluent restrictions" [Article VI (c)].

Each year, Ontario used to fulfil this commitment by releasing the *Report on the Industrial Direct Discharges in Ontario* and the *Report on the Discharges from Sewage Treatment Plants in Ontario*. The last such reports issued by Ontario were for discharges in 1991. Since then, the data is available only on computer disk in a lotus spreadsheet format and at a cost of $100. This certainly is not what one would call publicly available information. Canada has not stepped in to fulfil this commitment.

The U.S. has never compiled this information nor released it to the IJC and the public.

Responding to IJC Recommendations:

The GLWQA requires the IJC to release a report on Great Lakes water quality every two years. In this biennial report, the IJC always includes recommendations to the governments on ways to improve the implementation of the GLWQA.

In the past, the governments have done a very poor job of responding to the IJC's recommendations. In 1982, the U.S. General Accounting Office reported that ...

> *Since 1972, the IJC has issued 16 reports to the U.S. and Canadian Governments which contain specific recommendations or request clarification of or information on agreement matters. The Department of State has formally responded to only three of these requests, despite repeated IJC requests for formal U.S. responses.*

The Canadian response was no better.

Since 1989, the governments have done a much more thorough job of responding to the IJC's recommendations. Both Canada and the U.S. have been releasing reports in which they list each IJC recommendation and state whether they agree with the IJC's recommendations and, if they don't, stating why they have decided not to follow the recommendation. The responses have not been prompt, however; the government responses have usually come out about one-and-a-half years after the IJC made the recommendations.

In its 1990 biennial report, the IJC urged the governments to report once a year on "the status with respect to implementation of [the IJC's] recommendations or the reasons why a delay has occurred or action has not been taken." The governments have not followed this recommendation.

State of the Lakes Reporting:

In 1994, the IJC recommended that the governments publish biennial "State of the Great Lakes Ecosystem" reports. They recommended that the first report be released by September 30, 1995. Through this recommendation, the IJC was supporting an action that the Federal Governments had already initiated.

The governments organize State of the Lakes Ecosystem Conferences (SOLEC), which are a series of science-based meetings, held biennially, to review and assess the state of the Great Lakes. These conferences are preceded by in-depth assessments of the topics to be discussed and followed by a State of the Lakes Report that summarizes the findings from the conference. The first of these summary biennial reports came out in 1995.

The first SOLEC and its reports focussed on the overall health of the Great Lakes basin ecosystem. The second SOLEC narrowed the scope to summarize the health of the nearshore ecosystem and to examine the effects of land use practices on ecosystem health. The third SOLEC will seek to develop Great Lakes indictors that can be used to track progress in overall ecosystem health.

The IJC recommended that the first SOLEC report "address specific measures of progress towards virtual elimination and zero discharge of all known persistent toxic substances in the Great Lakes Basin, and include specific information on sources of pollutants." The 1995 State of the Great Lakes report included measures of progress towards virtual elimination of the presence of PTS Great Lakes Basin. It did not, however, measure progress towards zero discharge of PTS, and did not include "specific" information on the sources of pollutants. As stated in the responses of both Canada and the U.S. to this recommendation from the IJC, the report contained only "summary" information of pollutant sources.

Twice Yearly Government Meetings:

When the governments amended the GLWQA in 1987, they agreed to meet twice yearly "to coordinate their respective work plans with regard to the implementation of this Agreement and to evaluate progress made" [GLWQA, Article X, 3]. This addition was made to replace the coordination that had previously occurred through the IJC's

WQB and its committees. Canada said, "These meetings will ensure closer work co-ordination and should result in better progress in control of toxics."[257]

The Federal Governments set up the Binational Executive Committee (BEC) as the forum through which these twice annual meetings would be held. The BEC is chaired by the heads of Environment Canada's Great Lakes Office and the head of the Great Lakes National Program Office of the U.S. EPA. The BEC has representatives from the federal departments involved in the implementation of the GLWQA and from each state and province, including Québec.

During the four years between 1988 and 1991, the governments fulfilled this commitment. But in the four years between 1992 and 1996, they have only met once each year. As of mid-October, the governments had not yet met in 1997. It is now 15 months since the BEC last met.

Conclusion:

The governments said that one of the major reasons for the 1987 amendments to the GLWQA was to increase government accountability to the IJC and the public.

As this section has shown, the government record indicates an ever decreasing emphasis by the governments on accountability for their commitments under the Agreement.

RECOMMENDATION: **The governments should abide by the commitments they made in the GLWQA to be accountable to the IJC and the public by strictly adhering to the reporting requirements in the Agreement.**

RECOMMENDATION: **The governments should ensure that the BEC meets at least twice yearly, as required by the GLWQA.**

---

[257] Environment Canada, *Backgrounder*, October 1987.

CHAPTER 10: FUNDING FOR COMMITMENTS

In article XI of the GLWQA, the federal governments committed themselves "to seek" ... "the appropriation of funds required to implement this Agreement."

In the 25 years since they signed the GLWQA, governments throughout the Great Lakes basin have substantially increased the money that they have put into Great Lakes programmes. Recently, however, this funding has been reduced. In 1996, the IJC expressed alarm about recent funding trends:

> *Despite this success, and the need for continued vigilance and effort, the progress of the last quarter century of investments in the Great Lakes is in jeopardy. The following proposals and actions in both countries place in question their capacity to sustain this progress:*
>
> ** proposals to weaken regulatory frameworks that underpin pollution control and other effective programs, including reporting and compliance requirements; and*
> ** erosion of funding and expertise for research, monitoring and enforcement, and transferred responsibilities to other levels of government without the requisite resources.*[258]

U.S. Federal Government Expenditures:[259]

In 1978, the Great Lakes Regional Program Office (GLNPO) was created to oversee fulfilment of U.S. commitments under the GLWQA. In 1987, Congress created a statutory mandate for GLNPO to lead U.S. implementation of the GLWQA. As a result, funding for GLNPO doubled between 1987 and 1989. Funding rose to a peak of $15.7 million in 1993 and then dropped by 15% to $13.1 million in 1997. The budget approved by Congress for 1998 provides for a partial recovery of the lost funding to $14.7 million.

Great Lakes research initiatives funded by the federal government increased throughout the late 1980's and early 1990's, but most have decreased since then. For example, funding for the Great Lakes Environmental Research Laboratory of the National Oceanic and Atmospheric Administration (NOAA) rose from $3.2 million in

---

[258] IJC, *Eighth Biennial Report on Great Lakes Water Quality*, 1996, pp. 2 & 3.

[259] The data used in the assessment of U.S. federal expenditures was compiled by Rochelle Sturtevant, Coordinator, U.S. Senate Great Lakes Task Force.

1981 to a peak of $6.01 million in 1993. Since then the funding has dropped by 14% to $5.2 million in 1997. The Agency for Toxic Substances and Disease Registry (ATSDR) fish consumption study, which was initially approved in 1990, rose to a peak of $4 million in funding in 1995 and was cut in half to $2 million in 1996 and 1997. For 1998, the Congress has passed a budget that increases funding for this programme to $2.5 million.

The *Great Waters Program*, which focusses on air deposition to the Great Lakes, Lake Champlain and Chesapeake Bay, was first funded in 1992. Its funding peaked at $3.6 million in 1995 and has been reduced by 16% to $3 million for 1998.

Sediment remediation is generally considered to be the most expensive problem that the Great Lakes region has to confront. Programmes aimed at sediment remediation reached a funding peak between 1993 and 1995, but have been in decline since. The total of these programmes dropped dramatically from $3.2 million in 1993 to $850,000 in 1996 and 1997. This represents a 75% reduction. It is hoped that new programmes established under the *Water Resources Development Act* in 1996 will result in increased funding.

Canadian Federal Government Expenditures:

When the first *Great Lakes Action Plan* was passed by the Canadian federal government in 1989, annual budgets for Great Lakes programmes were increased substantially by $125 million over five years. A similar plan for the St. Lawrence River in 1991 committed $100 million to be spent over six years.

In 1994, Canada announced the *Great Lakes 2000* programme with $125 million to be carried out over six years and the *St. Lawrence Vision 2000* programme with $100 million in funding. These new programmes were not entirely additional money. When the 1994 commitments were made, 35% of the money committed in 1989 had not yet been spent and was part of the money announced in 1994.[260] This was also the same money that the government announced when it signed the COA in 1994.

Shortly after the announcements in 1994, the Canadian federal government instituted a series of cutbacks. Between 1994 and 1997, Environment Canada's budget was reduced by $221 million, close to 40% of the previous budget. Fourteen hundred staff positions were eliminated. Environment Canada is further reducing its budget for 1998, including eliminating an additional 200 positions. The main areas that will be affected by the most recent cuts are "waste management and risk management in

---

[260] World Wildlife Fund Canada, *Special Issue on Spending: Eagle's Eye*, Winter 1994/95.

mining, chemical and pulp and paper sectors."[261] Other departments are also undergoing cuts. The health protection branch of Health Canada will have been cut in half from $237 million in 1993 to $118 million by 1999.[262]

These cuts have had severe effects on Great Lakes programmes. Three hundred and seventy-six staff positions had already been eliminated in the Ontario region before the cuts announced in 1997.[263] Environment Canada funding for the Great Lakes programme has been reduced by 15%.[264] Health Canada funding for Great Lakes work has been cut by 30%.[265] Instead of referring to these as cuts, Environment Canada said that they were using "a stretching strategy" by which the money would be stretched out over a longer period of time.[266] The money keeps being stretched over more and more years as new rounds of cuts are made.

Likewise the *St. Lawrence Vision 2000* programme has been cut. Federal spending has been reduced by $42 million - almost half of the commitment.[267]

Provincial Expenditures:

Ontario: Operating expenditures for Ontario's MOEE were cut by 44% between 1995 and 1997,[268] resulting in the loss of 880 positions - a 36% reduction in staff. The Ministry of Natural Resources has lost more than 2100 positions.

---

[261] "Message from Deputy Minister to All Environment Canada Employees," October 1997.

[262] "Scientists warn cuts put lives in danger," *The Calgary Herald*, October 6, 1997.

[263] Environment Canada, "Program Review and Environment Canada," February 27, 1995.

[264] This data is based on information compiled by the World Wildlife Fund Canada.

[265] *Ibid.*

[266] Environment Canada, Ontario Region, "The Great Lakes Program," February 1995.

[267] World Wildlife Fund Canada.

[268] Canadian Institute for Environmental Law and Policy, *Ontario's Environment and the "Common Sense Revolution,"* July 1997, p. 3.

Provincial cuts have forced Canada and Ontario to reassess their ability to carry out the commitments they made when they signed the COA. Some of the most dramatic impacts have been on monitoring and surveillance, public involvement, non-point source control programmes, and support for sewage treatment plant upgrades.

Québec: Between 1992 and 1997, Quebec's environment ministry has been cut by two-thirds. At the same time as these cuts were happening, the duties of the ministry were expanded; the environment ministry was combined with the ministry for hunting, fishing and parks to form the new Québec Environment and Fauna Ministry.

When Canada and Québec announced the *St. Lawrence Vision 2000* programme in 1994, Québec committed $91 million to it. Québec has reduced that commitment by 31%.[269]

State Expenditures:

At the July 1996 meeting of the BEC, the last meeting that had been held as of October 1997, the state governments described their funding of Great Lakes programmes as stable at best, but reduced in most cases.[270] In all cases except Pennsylvania, they said that they had made cuts in programmes because of reduced funding to them from the U.S. EPA.

Pennsylvania was the only state to report that they had made no cuts and were actually expanding their Great Lakes focus by establishing a Great Lakes office.

Conclusion:

In response to the IJC's expression of concern about funding cuts for Great Lakes programmes, the U.S. said:

> *The U.S. is aware of the need for vigilance and innovation to protect and to more efficiently utilize limited resources. The U.S. commitment to the Great Lakes remains firm and undiminished. Every reasonable effort is being made to*

---

[269] World Wildlife Fund Canada.

[270] Binational Executive Committee Meeting Minutes, Chicago, July 18, 1996.

minimize any negative impacts from the current funding scenarios.[271]

The U.S. states that these problems will be taken care of by increased efficiencies and "through increased participation from all Great Lakes stakeholders."[272] All federal, provincial and state jurisdictions have made similar statements.

These two approaches can only achieve limited results. Other stakeholders are also experiencing budget cuts so they cannot be relied upon to make up for federal, provincial and state reductions. In addition, it is critical for the federal governments to remember that they are the ones who made the commitments in the GLWQA and, therefore, have a responsibility to be the leaders in ensuring that the resources are available to carry out the work.

RECOMMENDATION: **The Canadian and U.S. governments should fulfil their commitment in the GLWQA to make adequate funds available to carry out the provisions of the GLWQA. This requires restoration of the funding that has been cut over the last several years.**

RECOMMENDATION: **The provincial and state governments should also ensure that they make adequate funding available to carry out their roles under the GLWQA.**

---

[271] *United States Response to Recommendations in the International Joint Commission's Eighth Biennial Report on Great Lakes water Quality*, September 1997, p. 1.

[272] *Ibid.*

CONCLUSIONS AND RECOMMENDATIONS TO THE REPORT

The purpose of this report was to provide an overview of the state of the Great Lakes and a status report with respect to the progress of governments in furthering the goals of the GLWQA. As noted in the introduction, the rationale for drafting this report is the belief that the Great Lakes public has the right to know the efforts of their governments in furthering Great Lakes' protection and clean-up goals. Furthermore, the historical source of this information, the Water Quality Board of the IJC no longer undertakes this task. In fact, this task has not been assumed by any IJC or government advisory body since 1989.

All efforts were made to be as fair and balanced as possible in the review and interpretation of data presented in the report. However, limited budget and resources and access to some information meant, despite best efforts, the report is not complete. However, it is submitted that the report does provide an accurate reflection of governments action with respect to the goals of the Agreement. Recommendations were made in most sections in an attempt to be constructive and assist governments in terms of determining needed actions.

The State of the Lakes

Toxic Effects

The weight of evidence suggests the Great Lakes are still being damaged from PTS. While evidence of harm from toxic substances has existed since the early 1960s, a more complete picture is now emerging in terms of the effects of these substances on fish, wildlife and humans. While early concerns focussed on cancer risks, research has demonstrated a broad array of effects including developmental, reproductive and other effects. More specifically, there is clear evidence that exposure to endocrine disrupting chemicals have affected fertility and embryo survival and development in fish and egg mortality and deformities in the offspring of various bird species. In fact, it is estimated that dioxin equivalent concentrations in Great Lakes waters were sufficiently high from the 1940s to the late 1970s to prevent natural reproduction and thus contributed to the collapse of some fisheries.

Effects from toxic contamination are not limited to fish and wildlife. For example, a series of studies have found that children born to mother who consumed fish contaminated with PCBs and other organochlorines show decreased IQ scores and more behavioral problems than other children. These problems have persisted from the time of infancy to eleven years of age. Studies of newborn children mothers consuming high amounts of Lake Ontario fish were also found to exhibit behavioral deficits.

While one may assume that fisheaters are most at risk, some research has demonstrated that other foods, including meats, diary products, grains and cereals may also contribute significant amounts of persistent toxic substances to the human body.

Clearly, the case against persistent toxics substances is growing with more research devoted to the topic. It should be recalled though that basic toxicity testing data is not available in the public record for 75% of the top-volume chemicals in the U.S.

Fish Advisories

One measure of the state of the lakes is the number of advisories in place urging citizens to limit or avoid eating contaminated fish. From the nature and number of fish advisories, it is apparent that there is still a major concern in the Great Lakes. For example, the number of advisories in the U.S. has increased 72% since 1993, in part due to increases in the number of assessments of contaminant levels in fish and wildlife tissues. In Canada, while levels for many contaminants have declined over the last 20 years, concentrations are still sufficiently high in some species to warrant advisories.

Loadings and Concentration Trends of Persistent Toxic Substances in Great Lakes Regions

Although there has been progress in reducing toxic substances from direct discharges, there is still much work yet to be done. Studies demonstrate that the biggest source of toxic substances is to air, with 73% of the releases in the Great Lakes being released into air. In 1995, over 17 million pounds of endocrine disrupting compounds were released to the air.

In terms of concentrations, it is apparent that for most persistent toxic substances of concern in the environment, the levels in biota, water, air and sediments, which showed more rapid declines in the 1970s and the early 1980s, have since levelled off. In addition, healthy population levels are still not seen in all bird and wildlife species.

In the end, the evidence from hundreds of studies over the past thirty years indicates that injury to fish, wildlife and humans has occurred and continues to occur in parts of the Great Lakes basin due to contamination from persistent toxic substances. This contamination is continuing via inputs from sources including contaminated sediments, landfills and industrial stacks. The impairment of beneficial uses includes restrictions on fish and wildlife consumption, degradation of fish and wildlife populations and animal deformities and reproductive problems.

In the midst of the emerging research on the ecological and human health impacts, the funding base to monitor and undertake further research is in fact in decline.

RECOMMENDATION: Therefore, the governments need to take additional actions to address the continuing sources of toxic contaminants to the Great Lakes, and continue and fully fund on-going monitoring networks and specimen banking projects.

RECOMMENDATION: The governments need to create new programs and expand existing programs assessing the sources of PTSs to the environment, make greater efforts to investigate the importance of different loading pathways of a larger number of toxics to the Great Lakes, and continue and fully fund ongoing monitoring networks and specimen banking projects.

RECOMMENDATION: The governments need to fully support programs such as the U.S. *Great Lakes Human Health Effects Research*, Canada's *Great Lakes Health Effects Program* and the *Effects on Aboriginals from the Great Lakes Environment*, continue to support investigations of ecological and human health effects of endocrine disrupting chemicals, and give greater priority to research on the effects of multiple chemical exposure on fish, wildlife, and human.

RECOMMENDATION: The governments need to take additional actions to address the continuing sources of toxic contaminants to the Great Lakes (atmosphere deposition, contaminated sediments, and landfills) that are impairing the health of wildlife, fish and people in the Great Lakes region.

Virtual Elimination of Toxic Substances

The goal of "virtual elimination" of persistent toxic substances is the cornerstone commitment under the GLWQA. The report examined in length the activities of the governments with respect to furthering the virtual elimination goal. The virtual elimination chapter of this report outlined specific findings with respect to this goal.

However, it should be made clear that the overall conclusion is that neither party to the GLWQA are designing their regulatory strategies to achieve virtual elimination in that such strategies are not intended to achieve "zero discharge." The most telling example of this issue is the proposed definition of "virtual elimination" under the new *Canadian Environmental Protection Act* (CEPA). It is apparent that neither government is willing to engage in concrete strategies to phase-out persistent toxic substances.

Similarly, there has been progress in having the concept of pollution prevention accepted. However, both federal governments has a difficulty in furthering and implementing the concept. Most of the efforts are directed to voluntary as opposed to regulatory initiatives. Further such efforts tend to focus on specific pollutants rather than on processes and practices that cause the pollutants to be created.

The Canadian government seems to be less eager to further the "weight of evidence" and "reverse onus" approaches. While the U.S. GLI included concepts, (although there is a question as to how far these approaches can be implemented in light of the *Toxic Substances Control Agreement*, it should be recalled that the proposed new CEPA does not included either of these concepts.

Perhaps one of the most obvious omissions in the regulatory strategies on both sides of the border is the absence of regulatory attention to the problem of endocrine disruptors. Although more research is needed to further identify what substances are endocrine disruptors, there remains little energy for directed regulatory strategies.

Finally, one of the key problems in both the U.S. and Canadian regulatory strategies is that the efforts to date focus on toxic emissions as opposed to toxics use. The IJC has commonly noted that the toxics use in terms of focusing on industrial feedstocks is an essential component to further the goal of virtual elimination.

RECOMMENDATION: The parties to COA renew their efforts to achieve the 90% reduction targets for the designated substances with specific work plans, regulatory measures, and interim targets developed as soon as possible.

RECOMMENDATION: CEPA should be amended with the following provisions incorporated in it, including:

(a) a commitment to virtual elimination and zero discharge as defined by the IJC;
(b) the recognition of the concept of "inherent toxicity," that is, the need to eliminate substances that have inherently problematic properties such as persistence, bioaccumulation or are know to disrupt endocrine systems; and
(c) assessment of more substances within strict time frames, including classes of substances.

RECOMMENDATION: The SOP process should be revamped with the aim of improving the consultation process, instilling the concept of pollution prevention and ensuring regulatory action follows to address toxic substances.

RECOMMENDATION: Canada should define virtual elimination in a manner consistent with the definitions offered by the IJC and implemented through a national pollution prevention framework. The definition of virtual elimination should mean the elimination of the production, use, and generation of toxic substances.

RECOMMENDATION: The definition of toxicity in CEPA should recognize the concept of inherent toxicity. Toxicity should be determined on the basis of the inherent or intrinsic toxic properties of substances such as acute lethality, chronic/sub-chronic toxicity, carcinogenicity, teratogenicity, genotoxicity, and ability to disrupt endocrine systems.

RECOMMENDATION: Canada's TSMP should be re-opened and revised to further the concepts of virtual elimination and pollution prevention. The virtual elimination definition in it should be redrafted to be consistent with the definition offered by the IJC in its *Eighth Biennial Report.*

RECOMMENDATION: The proposed Harmonization Accord should be rejected. Federal-provincial cooperation should be furthered through ways and measures that do not include the devolution of federal powers to the provinces.

RECOMMENDATION: Ontario's regulatory requirement requiring the submission of AOX elimination plans should be maintained.

RECOMMENDATION: The process of identifying candidates for bans and phase outs should be accelerated.

RECOMMENDATION: The U.S. government must use its authority under the Clean Water Act to require zero discharges of persistent toxic substances by preventing the use of processes and chemicals that result in continuing releases of these substances.

RECOMMENDATION: U.S. EPA's efforts to expand the list of TRI chemicals and include additional facilities is a step in the right direction. U.S. EPA should lower the reporting threshold for facilities that release persistent toxic substances, because these toxics are causing harm at very low levels to people and wildlife. In addition, U.S. EPA should consider including information on relative toxicity.

RECOMMENDATION: Congress should amend TSCA to tighten loopholes that have resulted from court decisions and EPA's interpretation of the law. In the meantime, U.S. EPA should interpret TSCA as Congress intended -- to control toxic chemicals that are causing harm to people and the environment. To do so, U.S. EPA needs to: 1) utilize TSCA rather than other laws in dealing with these toxic substances; 2) place the burden on chemical manufacturers and processors to demonstrate these substances are <u>not</u> causing harm to people and the environment; and 3) apply the weight of evidence approach to regulating suspect chemicals and classes of chemicals to protect people and wildlife in the Great Lakes region.

RECOMMENDATION: We recommend that the parties include the definition of virtual elimination and zero discharge as interpreted and articulated by the International Joint Commission in the Fifth, Sixth, Seventh and Eighth Biennial Reports in order to avoid a lengthy debate during the implementation of the strategy. We urge the parties not to adopt the definition of virtual elimination in the Canadian federal Toxic Substances Management Policy either expressly in the VES or when implementing this strategy.

RECOMMENDATION: Specifically, we recommend that the strategy be revised to correct this deficiency in the following ways:

1) The Strategy should be revised to describe the process that will be followed to determine the best mechanisms in the two countries to sunset the Level I Toxic Substances.

2) The Strategy should be revised to state more clearly that the timetables for reduction in the current draft are interim targets only, and that the ultimate goal is to achieve zero discharge (or to sunset) these chemicals.

RECOMMENDATION: We recommend that the two national governments clarify their commitments to the goals and targets within the strategy.

RECOMMENDATION: The two governments should make a commitment to finish remediation of all sites by a specified date.

RECOMMENDATION: The Parties should develop action plans based on pollution prevention principles for all Level II substances. Regulatory options should be considered in every situation in the development of these action plans.

RECOMMENDATION: The VES should expressly recognize the regulatory approach as a legitimate approach to addressing all persistent toxic substances.

RECOMMENDATION: As the Great Lakes is a common ecosystem, we recommend that the federal governments attempt to standardize the elimination goals down to the common figure of zero. While we recognize the reality that milestones to reaching zero may be different, it would be helpful if more detailed explanations for all the variances were included in the VES. Simply put, the overall goal for all persistent toxic substances should be zero discharge, with all reductions understood as interim targets on the path to zero discharge.

RECOMMENDATION: It is recommended that the VES include a method for evaluating progress in achieving the goals of the strategy. This evaluation should be undertaken through a process that ensures full consultation with the oversight of environmental groups. Efforts should be made immediately to develop this monitoring and reporting regime, including a baseline system.

RECOMMENDATION: We strongly recommend that the two governments revise the strategy in the text, or an appendix, to describe how the strategy will be implemented and how interested parties and the public will be involved. This description of the process and the commitment of government resources to implementation of the strategy will be crucial in evaluating the strength of the final strategy.

Remedial Action Plans

It has been noted that perhaps one of the greatest successes and one of the greatest failures of the GLWQA relates to RAPs. Their success is attributed to the fact that they have sparked community awareness and involvement in areas of concern. Their failure is the lack of action in actual remedial. Only half of the plans have been developed, and as of 1996, only eleven of 303 impaired uses for all the RAPs in the Great Lakes have been restored. Many of the plans do not adequately deal with human health concerns. Moreover, funding mechanisms necessary to resource the actual clean-up have yet to be put in place.

There is little doubt that RAPs are at a crossroads and government leadership is urgently needed in terms of concrete action, completing action plans and financial support.

RECOMMENDATION: The IJC and the federal governments should carry out their obligation under the GLWQA by conducting a thorough assessment as to whether there are additional areas that should be designated as areas of concern.

RECOMMENDATION: The governments should maximize their efforts to speed up the cleanup of the areas of concern. Delisting should be achieved through actual cleanup, not by finding ways to try to justify delisting when the actual cleanup has not yet occurred.

RECOMMENDATION: The governments should follow their commitment under the GLWQA to submit their RAPs to the IJC "for review and comment." They should ensure that the documents are submitted to the IJC in a timely enough way so that the IJC's comments can be integrated into the RAPs. The governments should take the comments from the IJC seriously, as was the intent under the GLWQA, and adjust their RAPs to integrate the concerns and suggestions that the IJC brings forward.

RECOMMENDATION: The IJC should find ways to ensure that its comments get to the governments and the public advisory committees in the RAPs in a timely fashion. They should use outside technical reviewers to assess RAP documents at all stages.

RECOMMENDATION: The governments should fulfil their commitment under the GLWQA to consult with the public on RAPs. At a minimum, the governments should restore funding to support PAC work and public outreach and education to the levels that existed several years ago.

RECOMMENDATION: The governments should follow their commitment in Annex 17 of the GLWQA and assess the interrelationships between the areas of concern and the lakes. They should ensure that the goals of the RAPs and the action plans in them are adequate to meet the goals that are set in Lakewide Management Plans.

RECOMMENDATION: The governments should ensure that human health concerns are addressed in each RAP.

RECOMMENDATION: The governments should ensure that the RAPs can be completed by ensuring that the funding is provided to complete the planning process and to carry out the cleanup plans.

Lakewide Management Plans

LaMPs are proceeding for every lake, except for Lake Huron. However, it is apparent that, for some of the LaMPs like Lake Ontario, there is a call for strengthened public involvement. There is also an issue as to whether the LaMP reports that are being draft adequately deal with human health considerations and the assessment and identification of sources of critical pollutants from outside of the basin. Like RAPs, there is also the need to ensure that there is sufficient government commitment to fund and implement LaMPs.

RECOMMENDATION: The governments should carry out their commitment under the GLWQA to public consultation by strengthening the public involvement programme for the Lake Ontario LaMP. This should include the creation of a Lake Ontario Forum. The governments should also ensure that the resources are made available for the proper functioning of all Lake Forums.

RECOMMENDATION: The governments should fulfil their obligations in the GLWQA by including human health considerations in LaMPs.

RECOMMENDATION: The governments should ensure that each LaMP assesses and identifies sources of critical pollutants from outside the Lake's basin and that the Stage 3 LaMP includes actions to address the sources of critical pollutants that are outside of the basin.

RECOMMENDATION: The governments should fulfil the commitment they made in the GLWQA to develop and implement LaMPs and should ensure that the resources are available to expedite their development. They should put particular emphasis on moving the LaMPs beyond the study stage to the action stage, with the development and implementation of plans to eliminate the critical pollutants.

RECOMMENDATION: Canada, the U.S., Michigan, Minnesota, Ontario and Wisconsin should immediately designate the whole of Lake Superior as an area where no new or increased discharges of persistent toxic substances are allowed.

RECOMMENDATION: The governments should speed up the development of phase out plans for all PTS in the Lake Superior basin, including the development of mechanisms by which the targets will be achieved. The action plans to achieve the targets should include actions for sources beyond the Lake Superior Basin.

RECOMMENDATION: The governments should follow the IJC's recommendation by releasing an updated state of Lake Superior report every two years.

Point Source Impacts Zones

Simply put, neither Canada nor the U.S. has carried out their commitments in Annex 2 of the GLWQA to identify, delineate and report every two years on the point source impact zones. Not only reporting on them, the governments should be working toward the goal of eliminating point source impact zones.

RECOMMENDATION: The governments should comply with the Agreement by identifying, delineating, and reporting on point source impact zones every two years. The governments should also work towards their goal of eliminating point source impact zones.

Airborne Toxic Substances

There is overwhelming evidence that there is need to control toxic air pollution in the Great Lakes. In Lake Superior, 90% or more of PCBs, lead and Benzo(a)pyrene emanate from the air. Moreover, there is emerging evidence of human health harm

from such toxics. Immediate regulatory action is needed in both countries, especially the major sources of air pollution, such as power plants.

RECOMMENDATION: U.S. EPA should complete and publish its long-overdue reports on the *Mercury Study*, *Utility Air Toxics Study*, and *Dioxin Reassessments*. These studies form the crucial foundation for programs, standards and regulations to reduce and eliminate these persistent toxic substances.

RECOMMENDATION: Control strategies should target a relatively small number of major sources and emphasize pollution prevention to eliminate emissions of persistent toxic air pollutants. The governments ought to begin regulating power plant mercury emissions, because it is known that coal-fired power plants emit substantial amounts of mercury into the Great Lakes ecosystem causing widespread pollution problems.

RECOMMENDATION: Controls should focus primarily on strong regulatory measures. Market-based policies, such as a mercury "cap and trade" programme, should be used only in conjunction with strict regulatory programs.

Contaminated Sediments

There is both good news and frustration with respect to contaminated sediments in the Great Lakes. While progress can be seen in Waukegan Harbor and Ashtabula River, progress in other areas has stalled, such as Hamilton Harbour. The reality is that the legal framework in both countries is confusing and overlapping, making it impossible to take direct and timely action. Moreover, funding remains a barrier in both countries.

RECOMMENDATION: The governments should put much more emphasis on improving landuse practices to protect the Great Lakes from contamination. More innovative methods are required.

Land Use

One of the areas where there needs to be more emphasis by the governments relates to improving landuse practices. In areas relating to agriculture, urban land use and watershed management, it is obvious more work is needed. Indeed, the governments reported that most of the indicators of land use impact were rated as poor, mixed and deteriorating or mixed and stable. This was interpreted to suggest that land use practices remain a major source of stress to the ecosystem.

RECOMMENDATION: The governments should put much more emphasis on improving landuse practices to protect the Great Lakes from contamination. More innovative methods are required.

Groundwater

Even though the GLWQA outlines a work agenda with respect to groundwater, the efforts in this area have been one of the greatest failures in the Agreement. Again, the government themselves have suggested that the actual state of groundwater quality was "mixed" but "likely to deteriorate."

RECOMMENDATION: The governments must make maximum effort to fulfil their commitments in Annex 16 of the GLWQA. Contaminated groundwater is one of the major sources of contamination problems in the Great Lakes but at the same time one of the least studied and least acted upon problems.

Pesticides

A conservative figure estimates that 57 million pounds of 157 pesticide active ingredients are used in the Great Lakes Basin annually. More emphasis must be placed on pesticides particularly with respect to understanding their impacts and including persistent toxic pesticides and endocrine disruptors in the government action plans.

RECOMMENDATION: The governments should make greater efforts to implement both pesticide monitoring programmes and use inventories to better understand the potential for harm from these chemicals on aquatic organisms, wildlife and people in the Great Lakes Basin.

RECOMMENDATION: The governments should include in their action plans other pesticides in use in the Great Lakes Basin that are PTS or are endocrine disruptors.

Radioactive Substances

Despite IJC recommendations, the governments are not following their commitment in the GLWQA to set goals for virtual elimination for all PTSs, including radioactive substances. The IJC needs a more active involvement to prompt government action by conducting an in-depth assessment of the problems posed by the human use of radioactive substances.

RECOMMENDATION: The governments should follow their commitment in the GLWQA to take corrective action when the specific objective for radioactive substances is exceeded.

RECOMMENDATION: The governments should follow their commitment in the GLWQA and set goals for virtual elimination and zero discharge for all PTS, including those that are radioactive.

RECOMMENDATION: The governments should focus their attention on looking for new alternatives for the long-term storage of radioactive wastes and for decommissioning of nuclear power plants. The governments should ensure that the public is fully involved in the assessment of alternatives. Full public involvement

necessitates the provision of adequate funding to public intervenors to carry out technical assessments of alternatives.

RECOMMENDATION: Canada should speed up the development and implementation of the Port Hope RAP.

RECOMMENDATION: The IJC should conduct in-depth assessments of the problems posed by human use of radioactive substances around the Great Lakes and develop recommendations for ways to address these problems. The IJC should ensure that the public is fully involved in its deliberations on these matters.

Phosphorous

There is little doubt that phosphorous is a major success story of the GLWQA, especially pertaining to eutrophication problems in the open lakes. However, eutrophication continues to be a major problem in many harbours, rivers and streams in the lower lakes. Moreover, discharge of nutrients from non-point sources is now the main concern.

RECOMMENDATION: The governments should fulfil their commitments in the GLWQA by taking stronger action to control non-point sources of phosphorus.

RECOMMENDATION: The governments should also focus on the sources of nitrogen to the Lakes.

RECOMMENDATION: The governments should assess whether the standards set for sewage treatment plant discharges are strict enough and the governments should take action to stop all combined sewer overflows to the Great Lakes system.

Surveillance and Monitoring

Annex 11 requires the parties to undertake surveillance and monitoring programs. However, in the past three years, it was projected that the number of scientists working in the Great Lakes basin could drop between 38 and 53%. The list of programs that are being dropped or threatened is long and important. These programs are essential to the understanding of whether the Agreement's goals are being fulfilled.

RECOMMENDATION: The governments must recognize the central role of monitoring and surveillance to the successful implementation of the GLWQA and ensure that the funding is available to play this role.

Reporting to the Public

While there is an obligation under the agreement to report to the public, governments actions in recent years have resulted in decreased accountability. The slowness in responding to the IJC recommendations, the nature and content of SOLEC meetings and the insular nature of the BEC meetings leaves the public with many questions

unanswered. As such, governments become much less accountable under the Agreement.

RECOMMENDATION: The governments should abide by the commitments they made in the GLWQA to be accountable to the IJC and the public by strictly adhering to the reporting requirements in the Agreement.

RECOMMENDATION: The governments should ensure that the BEC meets at least twice yearly, as required by the GLWQA.

Funding for Commitments

While there have been significant cuts or reductions in funding on both sides of the border, it is apparent that Canada is taking the lead in instituting the most severe cuts. Over the past three years, both Environment Canada and the Ontario Ministry of the Environment has been cut by over 30%, some of which directly impacts Great Lakes work. In a time where one coulde argue that there is need for more funding, all government agencies are battling to retain present resources.

RECOMMENDATION: The Canadian and U.S. governments should fulfil their commitment in the GLWQA to make adequate funds available to carry out the provisions of the GLWQA. This requires restoration of the funding that has been cut over the last several years.

RECOMMENDATION: The provincial and state governments should also ensure that they make adequate funding available to carry out their roles under the GLWQA.