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STUDY GROUP ON WATER RESOURCES

THE TRANSBOUNDARY WATER RESOURCES
OF CANADA AND THE UNITED STATES



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A review of the challenges facing Canada and the United States in the management, allocation and preservation of their shared water resources and the natural environment through which they flow.

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INTRODUCTION

There is growing awareness around the world that one of the greatest challenges facing governments and societies is the provision of water in suitable quantity and quality to meet human and economic needs. This challenge is becoming more acute due to significantly expanding populations, rapid economic growth and the perturbations caused by climate change.

Despite its relatively favoured situation with respect to both water quantity and quality, North America faces significant water challenges. It has a large portion of the world's fresh water in comparison with its population, but that portion has come under pressure from population and economic growth. Some parts of the continent are experiencing water shortages. Water quality has deteriorated. Many aquifers are being drawn down faster than they can be replenished. Climate change is having additional adverse impacts in many watersheds.

A Study Group of the National Capital Branch of the Canadian Institute of International Affairs (CIIA) was established to review one part of the overall problem, the shared fresh water resources along the boundary between Canada and the United States and their impact on Canada-United States relations. We were encouraged to pursue this subject by the following reference in the Speech from the Throne of February 2004:

“Safeguarding our natural environment – in the here and now, and for generations to come – is one of the great responsibilities of citizens and governments in the 21st century ... the Government will intensify its commitment to clean air and water. We will engage the United States on trans-boundary issues and the provinces to achieve more stringent national guidelines on air and water quality.”

This commitment was reinforced in the Speech from the Throne of October 5, 2004, which stated:

“The government will work with the United States and agencies like the International Joint Commission on issues such as clean air, clean water and invasive species.”

We have heard from a number of knowledgeable people both within and outside government. We have studied reports from government departments, the International Joint Commission (IJC), non-governmental organizations, and articles in the press.

This brief report does not purport to be a comprehensive and definitive examination of the subject. The Study Group's members lack the scientific and technical qualifications for such a study. They are mostly generalists with experience in international affairs and in drawing on more specialized knowledge to propose policy solutions to difficult economic and social problems. By sharing the results of their work, they hope to focus attention more sharply on the problems facing both Canada and the United States in the management of their shared boundary waters, and to suggest actions which should be taken to help resolve these problems.

The geographical extent of the subject is daunting – 400 lakes and rivers either cross or are part of the Canada-United States border, which is nearly 9,000 kms. in length. A key component is the Great Lakes system which is particularly exposed to the effects of population and economic growth. Moreover, there are large and ill-defined groundwater reserves which affect or are affected by surface waters.

Many of our shared lakes and rivers are polluted by municipalities, industrial activity and agricultural run-off, but the precise nature and seriousness of that pollution is not sufficiently understood to point clearly to the best solutions which should be sought. In some parts of the boundary, there are disputes about the sharing of limited supplies of water and about diversions across the border. The Great Lakes, although they have received much attention from federal and provincial/state governments, are facing many pollution and water-level problems, as well as the damaging invasion of aquatic alien species.

Our two countries are fortunate to have the 1909 Boundary Waters Treaty as a framework for settling disputes, and to have the almost century-long experience of the International Joint Commission (IJC), a unique body, to decide, mediate and advise. The effectiveness of the IJC in dealing with transboundary water problems is, however, dependent on the support it receives from governments at all levels for funding, staff, appropriate policies and the implementation of programs and works. Due to divided jurisdictions over water in the two federal states, the effectiveness of all levels of government is dependent on their willingness and capacity to cooperate with each other, integrate widely diverse objectives, and fund those activities which are clearly essential to good management of the resource.

Looking ahead, we note that the Boundary Waters Treaty will soon mark its hundredth anniversary. We believe this is an appropriate time to see how well Canada and the United States have met the expectations and commitments of that treaty, and to consider what must still be done to fulfil its obligations. We suggest that there should be a new undertaking to restore and maintain the ecological integrity of the waters along the length of the common boundary.

HOW WE USE OUR WATER

Canada, with .5% of the world's population, is blessed with a plentiful supply of fresh water, nearly 20% of the world's total fresh water, and 7% of the total renewable water flow. Most of it flows to the Pacific Ocean (almost 24%), Hudson Bay (30%), the Arctic Ocean (18%) and the Atlantic Ocean (28%), and a very small amount to the Gulf of Mexico. Although 12% of Canada is covered by lakes and rivers, only 3% of that water is located in inhabited regions. The five Great Lakes, shared with the United States, rank among the 15 largest lakes in the world, but only 1% of their vast reservoir of water is replenished each year.

Water withdrawn from its source for a variety of uses may be returned or discharged to source, sometimes in polluted condition. The difference between intake and discharge represents consumption.

The four leading water users in Canada in 1996 were:

- agriculture (9%)
- manufacturing (14%)
- electric power and other utilities (64%)
- domestic and government sectors (9%)

The four leading water consumers were:

- agriculture (64%)
- manufacturing (16%)
- electric power and other utilities (10%)
- domestic and government sectors (9%)

Water consumption in Canada has doubled in the past 30 years.

In other sections of this report, we discuss impacts on the shared Canada-United States boundary waters from withdrawals and diversions, invasive aquatic species and climate change. In this section we touch briefly on the inter-related impacts of population growth and economic growth.

Pressures of economic and population growth

One has only to reflect upon the changes in the 20th century to see the sources of the enormous stress on our water supplies:

- a growth in the Canadian population from 5.4 million in 1901 to 30 million in 2001;
- the increased urbanization of Canada - in 1901, 62.5% of Canada's population was rural and 37.5% urban, whereas in 2001 the proportion was 20.3% rural and 79.7% urban;

- looked at in a slightly different way, in 1901, 9 % of Canadians were living in cities with over 100,000 inhabitants (of which there were only two), while today 62 % live in such cities (of which there are 25). This concentration of population requires immense infrastructure to handle water supply and waste water. Urban Canadians are now the largest per capita consumers of water in the world;
- rapid industrialization, first in the United States and later in Canada, with huge amounts of water being withdrawn in connection with resource extraction and for industrial purposes, and often returned to source in greatly polluted form;
- intensive modern agriculture, with its emphasis on herbicides and pesticides and mega-farms for raising livestock. This has contributed greatly to the pollution of water bodies from surface run-off ("non-point sources") and to the contamination of both surface water and groundwater supplies;
- the rapid disappearance of wetlands to meet the perceived needs of agriculture, industry and urbanization. In the Great Lakes area alone, there has been a loss of 40 million acres of marshes since the 1700s. That disappearance means the loss of the most cost-effective way to filter pollutants, reduce storm damage and re-charge groundwater, not to mention the impact on the ecology.

This is not to say that no steps have been taken to slow down this assault on our supply of fresh water. They are insufficient, however, to meet our long-term needs.

Many cities have made and are making large expenditures to repair aging water supply infrastructure and to improve the quality of wastewater treatment. Leaks in the waterworks, however, sometimes waste as much as 30% of municipal water. Some Canadian cities are still dumping raw sewage into water bodies. The replacement cost for this huge municipal infrastructure would be in the order of \$500 billion. The Canada-wide cost of up-dating existing infrastructure to maintain adequate service levels has been estimated at \$95 billion over a 15-year period. Many of Canada's cities do not have a full water-metering system, and therefore provide no incentive to customers, through a pricing mechanism, to conserve their use of water.

Industry has been subjected to regulation of its wastes, whether in the form of effluents to water bodies, or emissions into the atmosphere, such as mercury from coal burning, which can contaminate not only the air but also the land and water. The regulatory effort over the last four decades has greatly diminished the flow from industry of many of the more obvious harmful substances which have been entering our environment (for example, chlorine from pulp mills). Industry's growing practice of recycling the water it withdraws, and containing its wastes, has also contributed to the improvement. We are, however, now becoming aware of the release of a wide variety of more subtle toxic substances, often in small amounts, which have been linked with adverse health outcomes not only in fish and wildlife but also more recently in humans living in the Great Lakes basin.

Water quality

Pollutants of any kind and from any source which enter boundary waters, or groundwater connected to such waters, are of immediate relevance to Canada-United States water

relations. Article IV of the Boundary Waters Treaty includes the sweeping condition that "boundary waters and waters flowing across the boundary shall not be polluted on either side to the injury of health or property on the other." Moreover, the Great Lakes are subject to detailed bi-national attention through the 1978 Great Lakes Water Quality Agreement, successor to the 1972 Agreement.

A large part of the work of the IJC is devoted to the water quality of the Great Lakes and the progress of the two countries in implementing the Agreement. That work is set out in detail in the IJC's biennial reports on Great Lakes water quality, on which we have drawn in other sections

It is sometimes forgotten that a major contributor to degraded water quality is the airborne transboundary transport of contaminants and nutrients to lake systems. There is serious contamination of the Great Lakes and other transboundary waters from PCBs, pesticides, phosphorus, NOx, nitrates and other pollutants, some of it from the United States and as far away as Mexico. Much of the mercury in the Great Lakes and other lakes, for example, comes from coal-fired power plants in the Ohio valley.

Although the quality of the water that we drink is not a primary focus of this report, we draw attention to two considerations which have given rise in Canada to public concern with respect to drinking water and which should be taken into account in the Canada-United States context. One is animal waste from large hog farms, cattle feed lots and chicken farms, which is not subject to the same standards that apply to municipal waste water treatment. A large hog operation can create as much organic waste as a small city. The second consideration is municipal waste water treatment plants which are designed to remove the risk from bacteria but not to remove all pollutants, e.g., some of the newer chemicals, pharmaceutical traces, endocrine-disrupting substances and heavy metals. As these two problems are tackled in Canada and the United States, there is obvious advantage in having common standards apply to the treatment of waste that can find its way into boundary waters.

Responsible use of water

The responsible use of our water from a social, economic and environmental perspective is essential if we are to meet the water quantity and quality needs in North America of a growing population and expanding economy. As is brought out in subsequent sections of this report, this will entail a significant increase in the human and financial resources devoted to the wise management of our water resources. The price of water to our cities, agriculture and industry should be increased to take into account at minimum the full cost of treatment and distribution, and perhaps to reflect its scarcity value. In urban areas, householders and other users should be charged a price sufficient to cover the full cost of water treatment and distribution, including the cost of treating wastewater. Conservation can be encouraged by education, but will be greatly influenced by price.

Governments should continue to limit, by legislation and regulation, the release and, if necessary, use of substances which are unacceptably harmful to the environment and human health. Legislation and regulations should apply to resource extraction, energy generation, industry, transportation, municipal wastewater and agriculture. Essential to effective regulation is firm and comprehensive enforcement, which has human and financial resource implications.

Experience has shown that in some cases regulation can be effectively augmented by economic instruments. Imposing a high charge on effluent and emission releases can make it economic for industry or municipalities to recycle, reuse and dispose safely of harmful substances.

GROUNDWATER

Importance of groundwater

Groundwater is the supply of water beneath the earth's surface, usually in aquifers. The groundwater resources of Canada may be larger than all the surface waters in rivers and lakes combined. The issue, however, is not the total quantity, but rather the volume of renewable groundwater than can be drawn upon. As noted below we do not have the data.

The importance of groundwater was not recognized at the time the 1909 Boundary Waters Treaty was negotiated. We now realize, however, that surface and groundwater form part of a single hydrological system and cannot be dealt with in isolation. Any lowering of water tables represents a removal of water stored in the aquifer system. This use can be unsustainable in the long term if withdrawals exceed natural replenishment of rainfall or snowmelt. Wetlands are an essential element in the maintenance of aquifers as they accumulate water, which seeps into the aquifers and help purify the water in the process. Aquifers which if untapped would feed into boundary waters or feed into lakes or rivers on either side of the border, must be viewed as an integral part of the total boundary water regime.

A substantial part of the flow of water into the Great Lakes, to take one example, comes from groundwater discharged directly into the Lakes as well as from streams fed by groundwater, which flow into the Lakes. A lowering of water tables through excessive pumping thus reduces the flow of water into the Great Lakes. In the case of Lake Michigan and Lake Erie, there are areas where excessive pumping has reversed the flow so that lake water is actually being drawn upon to replenish groundwater reserves. Groundwater basins do not necessarily coincide with surface basins; for example groundwater used in Wisconsin could be discharged into the Mississippi basin even though it would otherwise have served to maintain the water level in Lake Michigan.

Elsewhere along the border, to take another example, it is now known that groundwater originating in the US Rockies feeds into Lake Winnipeg.

Boundary waters mandate and need for co-operation

It follows that the IJC should continue to interpret the 1909 Boundary Waters Treaty as covering groundwater use which can affect boundary waters, including aquifers which straddle the border. This would be a natural development to reflect our evolving understanding of the factors affecting boundary waters. There is thus no need to face the difficulties which might be involved in reopening a Treaty which has served well the interests of both Canada and the United States.

Annex 16 of the Great Lakes Water Quality Agreement recognizes that groundwater pollution can also find its way into boundary surface waters. Conversely, when surface water replenishes groundwater through wetlands, it serves to reduce pollution when the groundwater eventually feeds into surface water. The IJC has drawn attention to the pollution risks entailed when water drains directly from city streets into the Great Lakes rather than being directed to areas where it could replenish groundwater.

Although the water problems along the US-Mexican border are much different than those along the US-Canadian border, Canada should keep a watching brief on how groundwater issues are handled between Mexico and the United States, as well as any emerging international consensus regarding such issues, so that we shall be aware of any lessons to be learnt or precedents to be drawn upon.

There is a need for the Canadian and US governments, and the states and provinces involved, to adopt compatible legal principles and policies regarding groundwater use, maintenance of water tables, protection of the environment and measures to prevent pollution. This will be difficult and there is a temptation to postpone grappling with the issues. This could be a formula for disaster as can be seen in the experience of other countries, for example, the over-pumping of ground water for agriculture in India and Pakistan and the dramatic lowering of Lake Chapala in Mexico due both to irrigation and the needs of the City of Guadalajara. The effects of groundwater depletion take time to be recognized and resolution of problems can then be more difficult both technically and politically.

Canadian Framework for Collaboration on Groundwater

Canada has lagged behind the United States in assessing groundwater resources and controlling their use. The number of players involved and issues of jurisdiction make it difficult to formulate a national strategy, or ensure adequate funding. At the federal level technical expertise is centered in Natural Resources Canada and Environment Canada, which maintain close contact with their provincial counterparts. Provinces issue permits for water taking from aquifers, but the criteria vary across the country's provincial counterparts. Provinces issue permits for water-taking from aquifers, but the criteria vary across the country. Municipalities, NGOs, universities, First Nations and private land owners all have a stake in groundwater issues.

The National Ad Hoc Committee on Groundwater has produced an excellent Canadian Framework for Collaboration on Groundwater to identify priorities which must be addressed. It is not clear, however, whether this will be sufficient to ensure that the various stakeholders will separately or collectively take the required action. The Program on Water Issues at the Munk Centre for International Studies has produced valuable work on groundwater issues in Ontario, as has the United States Geological Survey (USGS) with regard to the US groundwater information within the Great Lakes basin. Because of Walkerton, the Ontario government is updating provincial policies relating to groundwater protection and utilization. Despite the work being undertaken, the IJC's call for "unified, consistent mapping of boundary and transboundary hydrogeological units" in the Great Lakes region, and for measuring the role and use of groundwater, has not yet received an adequate response from Canadian authorities.

Even less attention and study has been devoted to groundwater issues elsewhere along the Canada-United States border. Diego Rivera of the Geological Survey of Canada has stressed the huge knowledge gaps in Canada about groundwater, including: the amount and quality of groundwater stored in Canadian aquifers and their sustainable yield and role in ecosystem functioning; groundwater supply and use (rate of pumping, lack of groundwater meters); dynamics of groundwater-surface water interactions; recharge rates of aquifers; long-term data and sustained monitoring of groundwater levels and groundwater quality.

The worst case scenarios on global warming could result in tremendous pressures being placed on available freshwater resources. 30% of Canadians already draw on groundwater for their domestic needs. It would be feckless for Canada not to plug the knowledge gaps as fast as is technically feasible.

Additional research and planning

While work is required on all Canadian groundwater resources, a high priority should be accorded to those along the Canadian-US border. We must know whether transboundary aquifers are in fact being drawn down, or domestic aquifers depleted, affecting flows in boundary surface waters. The 1909 Boundary Waters Treaty provides a framework, but no arrangements between Canada and the United States on cross-border aquifers can work without the full co-operation of the provinces and states, which exercise domestic jurisdiction over groundwater, and the involvement of municipalities is also needed.

In addition to further research and mapping, there is a need for those responsible for groundwater to conduct an educational program directed at both political leaders and the public. At the present rate, it would probably take fifty years or more to map Canadian groundwater resources. This is a reflection of the inadequate priority that has been given to groundwater by all levels of government in Canada. Without such awareness, funds for research will not be forthcoming, nor will there be sufficient support for tighter regulation of ground-water use. This should include higher prices on both private and municipal use of groundwater, and measures to protect remaining wetlands

To quote Natural Resources Canada, "To wisely manage and protect our overall water resources, we have to know how much groundwater we have, how and where it is stored, and how it moves through the ground". Unfortunately, recognition of the importance of groundwater by the technical experts has not yet been reflected at the political and public level. We are concerned that Canada will be at a disadvantage in dealing with the United States if our database and policy formulation is weaker than theirs for groundwater resources along our common border.

CLIMATE CHANGE AND VARIABILITY

Despite some uncertainties, a strong balance of evidence suggests that human activity is a significant contributor to the climate change which is under way. While regional impacts are expected to be variable, the International Panel on Climate Change (IPCC) estimates a significant rise in temperatures worldwide (1.8 to 6.3 degrees Fahrenheit)

over the current century and a consequent rise in sea levels (6 inches to 3 feet). A recent report from the Arctic Climate Impact Assessment supports earlier studies that indicate that impacts are likely to be most severe in the polar regions.

Climate models for the Canada-United States border area suggest, among other things, the following:

- warmer conditions leading to more precipitation falling as rain than as snow; less snow cover and shorter duration of snow and ice cover; earlier snow melt and more run-off in winter. Glaciers in the Rockies are already receding significantly;
- lower summer and autumn flows in the many transboundary rivers and streams crossing the border between the Great Lakes and the Rockies, with the greatest drying occurring near the border;
- increased frequency of flooding, with long dry periods punctuated by intense bursts of precipitation, and consequent soil erosion and sediment transport;
- with warming and reduced flow, increased build-up of some toxic substances and sediments, with significant adverse consequences for water quality.

And perhaps most dramatic and significant:

- lowering of Great Lakes water levels by up to a metre or more, with adverse impacts on shipping and hydro-power, quite apart from the ecological impacts, such as reductions in habitat, and the social impacts. This lowering could be superimposed on the already significant historic variability of the levels of the Great Lakes, which are highly sensitive to climate variability.

The implications of the expected impacts of climate change and variability on Canada-United States water relations include the following:

- dramatic increases in demand for replacement water to compensate for decreasing aquifer supplies in the US Great Plains, unless there is a radical change in irrigation practices and water pricing;
- request for re-negotiation of water apportionment commitments for many transboundary rivers.

In the Great Lakes area in particular, climate change and variability, depending on the frequency and magnitude of the extremes, will add to the existing stresses on the system and may lead to:

- water pollution increase, due to less dilution and increased run-off from farmland and cities. This could give rise to demands for changed agricultural practices and urban wastewater management, with potentially severe political and cost implications, especially if coupled with demands for “harmonization” of practices in jurisdictions on both sides of the Great Lakes;

- possible re-negotiation of the Niagara River power-sharing agreement, taking into account declining flows in the Niagara River.

Despite significant difference of views in both countries as to the causes of climate change, Canada and the United States should seek consensus on the implications of climate change and variability for the two countries, and particularly for the transboundary waters. A degree of uncertainty about some of the precise effects of climate change and variability should not be taken as an excuse not to act now to reduce man-made contributions to global warming. This is a lesson which should have been learned from our “acid rain” experience.

Canada and the United States should recognize that even if vigorous action is taken now to reduce the main man-made contributions to climate change, the improvements will be slow in coming. Therefore, governments should for the short and medium term examine the costs and benefits of various measures of adaptation to the results of climate change and variability, and be prepared to implement them taking into account opportunity costs. Particularly for the transboundary waters, the two governments should make every effort to agree on the most appropriate adaptive measures and to implement them in a compatible fashion.

INVASION OF AQUATIC ALIEN SPECIES

The deliberate or inadvertent introduction of non-native species into any ecosystem runs the risk of loss of bio-diversity, as well as of damage, often severe and irreversible, to native species. This is particularly the case where there are no natural predators or ecological conditions to keep the non-native species in check,

This general rule applies to the Canadian-US boundary waters. For example, since the 19th century, but more rapidly since the opening of the St. Lawrence Seaway to ocean-going vessels in 1959, about 170 non-indigenous species have become established in the Great Lakes, to the detriment of biological integrity. Some of the most notorious alien species are sea lampreys, zebra mussels, quagga mussels and goby fish. Many have done serious damage to native fisheries. The more recent ones have been introduced primarily through the dumping of ballast water from ocean-going vessels coming from other continents.

The damage is economic as well as environmental. In the Great Lakes, costs for treatment and control of zebra mussels run to several billion dollars annually. Control, assessment and research on sea lamprey, which devastated lake trout populations, cost \$13.5 million in 2001. These costs are largely borne by local communities, utilities and industry rather than by those who create the problem.

In 2004 the International Maritime Organization (IMO) adopted a convention for the control of ballast water, but even under the best of scenarios it will take years to come into force. Meanwhile, non-native species continue to arrive. Some progress has been made in Canada and the United States in addressing the ecological and economic costs of aquatic alien invasive species, but measures to date have not been 100% effective, in part because they have not addressed the totality of the problem.

The introduction of non-native species into ecosystems is also of concern in water basins other than the Great Lakes. The proposed Garrison Diversion, which would link the Missouri watershed and the Hudson Bay drainage system, has been vigorously resisted by Canada because of the potential damage to the Red River and to fish in Lake Winnipeg. An equally worrying situation is to be found in the current plans of North Dakota to divert the waters of Devils Lake into a tributary of the Red River. This could degrade the quality of Lake Winnipeg and possibly introduce dangerous alien aquatic species into the Hudson Bay drainage system.

More than ten years ago, the Canadian Government committed itself to the prevention, control or eradication of invasive species, but they continue to be introduced. There has not been an adequate analysis of the potentially most harmful species, and less than adequate leadership and coordination of the several departments and agencies which have specific responsibilities. Implementation has been slow for even agreed actions which should be taken. The failure of proper preventive action inevitably means a greater cost for controlling pests and repairing damage caused by invaders.

There have been repeated warnings and recommendations from the IJC and the Great Lakes community. In spite of this, jurisdictions in both countries have not devoted sufficient research and energy to understanding the full dimensions of the problem of alien species, not only resulting from ballast handling but also from other possible sources such as commercial aquaculture. Nor have they explored fully economic penalties and incentives, and better management practices, for those who are causing the problem and should face the liability. As the IJC has stated, current regulations, guidelines and practices are not sufficient to prevent the further introduction and spread of alien invasive species.

Action should be taken by the Canadian and US governments to develop bi-national standards to address more completely the prevention of the invasion of alien species, and the most appropriate means for implementing these standards. They should make mandatory the existing voluntary guidelines for ballast water management, and ensure their strict enforcement. There should also be economic incentives to encourage shippers to improve their practices, and increased funding of research on ballast water treatment.

Given the sensitivity and exposure of the Great Lakes, a specific regional approach should be taken rather than relying on the general provisions of the IMO Convention. In addition, more attention should be paid to other potential invaders such as Asian carp and snakehead fish.

Advantage should be taken of the experience of the IJC, which has reported extensively on the problem in its 10th (2000), 11th (2002) and 12th (2004) Biennial Reports on Great Lakes Water Quality.

THE COMMERCIALIZATION OF WATER

Much of the discussion in recent years of transborder water policy issues, and most of the emotion of those discussions, has dealt with the possibility that Canada could find itself in a position where it has no choice but to agree to massive exports or bulk inter-

basin transfers of water, particularly to the United States. The argument has usually turned upon whether commercialization, or commodification, of water could result from Canada's international trade obligations.

Water is already, to some extent, commercialized. Bottled water has become a major industry and the product is both exported from and imported into Canada. Equally, water plays an important role in many industrial processes. Finally, the production of the agricultural commodities Canada exports is made possible only by the use of large quantities of water, often supplied by irrigation. For example, it is estimated that it requires 1000 tons of water to produce one ton of wheat.

It is important to recognize that the provisions of trade agreements, whether those agreements fall under the World Trade Organization (WTO), the Canada-United States Free Trade Agreement (FTA), or the North America Free Trade Agreement (NAFTA), deal with the movement of goods. Water, in its natural state and from a strictly economic point of view, is a resource like minerals or forests, not a produced good. It is for this reason that the existing trade in bottled water, a product, establishes no precedents with respect to water in its natural state. Resources in Canada, until they are exploited, fall under the jurisdiction of the Crown, whether at the federal or provincial level. Sovereign states, Canada included, have the right to lay down the rules under which resources are to be exploited. As long as these rules are equitable, non-discriminatory and known in advance of the granting of exploitation licences, international agreements are silent on what rules and conditions may be required by the jurisdiction concerned.

Trade agreements are also silent on the production of goods. If Canada were to conclude that it did have sufficient water resources to permit commercial exports, no current trade agreement obligations would require Canada actually to convert those resources into a commercially-exportable product. As a trade expert told us, "trade rules deal with dead fish, not live ones". For water resources, as for fishery resources, Canada can set the conditions under which water, as a good, might be produced.

In reality, it appears from our examination that, when the economics of export are taken into account, the possibility of bulk commercial exports of water has been exaggerated. Work done some years ago by the Department of the Environment indicated that, at a time when irrigation water was available in the US Southwest at between \$75 and \$100 per acre-foot (the quantity of water required to cover one acre one-foot deep), water piped from the north of Canada could not have been delivered for under \$1000 per acre-foot. Similarly, it was pointed out to us that a proposal by which water from a fresh water lake in Newfoundland, a short distance from ocean access, would have been shipped abroad by tanker was found to be uneconomic, given the prices at which alternate sources of water were available.

Nevertheless, economic conditions can change over time. Although there are no signs that this would occur in the foreseeable future, there could be moves to constrain the current excessive per capita consumption of water in North America by increasing the prices, at which water is supplied, to levels reflecting the real cost of obtaining and delivering water to consumers. Bulk commercial exploitation of water for domestic use or export might then become economic. It would be at that point, when water was moving as a product on a commercial basis between basins within Canada or across Canadian borders, that trade rules would become relevant.

The rules of international agreements relating to the movement of goods consist of a number of negative proscriptions, for example, no discrimination among suppliers from different countries, and no favouritism in the treatment of domestic goods over imported ones. Once goods begin to move in international trade, nations have only limited circumstances in which they can interfere with such movements. An important example is the long-standing provision, originating in the General Agreement on Tariffs and Trade (GATT), allowing signatory nations to restrict trade to protect human, animal or plant life, i.e., for environmental reasons. Under the WTO agreements, that provision is constrained by a requirement that such restrictions must be supported by scientific evidence. Generally, however, export quotas are not permissible.

The foregoing discussion begs the policy question of whether bulk exports of water should ever be allowed. An attempt, albeit an imprecise one, could be made to establish future Canadian needs as a means of estimating whether we may have an exportable "surplus" of water. Even this, however, does not factor in the likelihood of a changing supply available, nor that from the perspective of the varied ecosystems which waters support, no water is "surplus". This issue quickly resolves into a discussion about water as essential to human life and whether, as such, it should be treated differently than other natural resources.

For these economic and broader policy considerations, it is highly unlikely that bulk water exports will be contemplated in the near future. Nevertheless, conditions could change in such a way as to make such exports potentially viable and a matter for serious consideration. It would be prudent for the federal and provincial governments to consider, well in advance, the appropriate terms and conditions for water exports, including the conditions related to meeting the full costs of exploitation and transportation.

LARGE-SCALE WITHDRAWALS AND DIVERSIONS OF WATER

Major engineering works to dam and divert rivers for the purposes of hydro-electric generation and irrigation of farmland, have been a characteristic of the North American landscape throughout the 20th century. In more recent decades, questions have been raised about the adverse environmental effects of such activities and, more particularly, about the economic justification for providing state-subsidized water for agriculture. The days of major dam-building, at least for agricultural purposes, may well be over. Nevertheless, the possibility of large-scale diversions of water to drought-prone areas of the continent, especially the US Southwest where aquifer levels are falling rapidly, continues to raise concerns in Canada as to whether Canadians can afford to do without large portions of this vital resource. It is heightened by the recognition that, for example, only about 1% of the water of the Great Lakes is in fact a renewable, replenishable resource, the rest being the inherited result of the last Ice Age.

There have for many years been several significant diversions into and out of the Great Lakes, and a number of smaller ones. The three most significant diversions are: two into Lake Superior from the James Bay basin, both dating from the World War II years and related to hydro-electric generation (Long Lac, Ontario at 45 cubic meters per second (cms), and Ogoki, Ontario at 113 cms); and the third, the Chicago Diversion out of Lake Michigan dating from 1900 (at 91 cms).

Over the years many proposals have been floated for taking water from “water-rich” parts of Canada to “water-poor” parts of the United States, particularly the US Southwest. There will no doubt be further such proposals. In accordance with the provisions of the 1909 Boundary Waters Treaty, any diversions of boundary waters affecting their natural level or flow in the other country require an agreement between Canada and the United States or the approval of the IJC. Recent Canadian legislation, in the form of an amendment to the International Boundary Waters Treaty Act, prohibits new bulk removals from the Canadian boundary waters and tributaries of the Great Lakes-St. Lawrence basin, and comparable actions have been taken by Ontario and Quebec.

Quite apart from these governmental decisions, it is our opinion that major diversion proposals are likely to continue to founder on economic grounds (see also the previous section on the Commercialization of Water). The cost of infrastructure required to channel and pump the water over vast distances would deliver the water at prohibitively high prices, probably higher than cities would be willing to pay and far higher than farmers could afford to pay. With the waning enthusiasm of governments to provide water to agricultural users, through local and regional infrastructure, at far less than cost, it is highly unlikely that governments would be willing to subsidize water brought from great distances.

As one of the experts with whom we spoke put it, there is not a shortage of water in the US Southwest but, rather, a failure to place the real price on water. As governments slowly move towards charging users the real cost of the delivery of water, there will be economic pressures leading to serious conservation measures by industry, municipalities and agriculture. Governments at all levels would, therefore, be well advised to move more quickly towards conservation measures pulled by price, not merely pushed by exhortation.

Annex 2001

A matter of more immediate concern should be the current proposals by the eight Great Lakes states and two provinces to deal with the withdrawal of Great Lakes waters to municipalities in the Great Lakes states but outside the basin itself. One of these municipalities, Wausheska, Wisconsin, is only 12 kms. from Lake Michigan but outside the basin. The US federal 1986 Water Resources Development Act (amended in 2000) requires the unanimous agreement of the governors of all Great Lakes states for new diversions to take place. This provision is a deterrent to diversions as unanimous consent might not be easy to obtain, but the US legislation obviously does not provide for Canadian involvement.

The current proposals for withdrawals are set out in the draft implementing agreements for the so-called Annex 2001 of the Great Lakes Charter, and are now the subject of public debate. Various concerns have been expressed with respect to the draft proposals by, among many others, the US State Department, the state of Michigan and the province of Ontario. These raise such questions as to whether the draft proposals may be in conflict with existing legislation and policies, and whether there would be a derogation of existing water rights and a departure from the principles set out in Annex 2001 itself. A particularly trenchant and comprehensive case critical of the proposals has

recently been made by the US Sierra Club and the Sierra Club of Canada in a press release entitled “Protect Our Great Lakes from Sale or Diversion!”

Our own concern derives from the lack of precision as to how such diversions would be decided on an equitable basis, and from the strong possibility that, once agreed to for municipalities just outside the basin, there could be irresistible pressures to divert Great Lakes waters much farther afield. The cumulative effect could seriously deplete the water available for use by those within the basin. The whole proposition is at variance with the growing conviction among environmentalists and resource managers that there are serious disadvantages and dangers to allowing inter-basin transfers of water.

Responsible decision-making requires that these diversion proposals be examined on a sound legal and factual basis. Would they be permissible under the Boundary Waters Treaty? If agreed to for municipalities just outside the basin, would it be legally possible to refuse them for more distant applicants? What are the projected requirements for water of those living within the Great Lakes basin? Taking into account population and economic growth and possible savings through conservation, is there a “surplus” for export outside the basin? Only after these questions are examined can a responsible decision be taken.

CHALLENGES FOR GOVERNANCE

The basic problem

In Canada responsibility for fresh water management is shared by the federal, provincial/territorial and municipal governments and, in some cases, by aboriginal governments under self-government agreements. The federal government has responsibility and interests in cases where waters flow across the Canada-United States and interprovincial boundaries. Maintaining a strategic overview of Canadian interests at play in the Canada-United States water relationship poses a daunting challenge for the federal government, especially as a result of the great diversity of federal and provincial/state interests and responsibility centres. Moreover, there is significant asymmetry between the two countries with regard to the respective federal-provincial/state relationships and jurisdictional responsibilities. Without strong federal leadership and coordination, the fragmentation of jurisdictions and responsibilities could seriously undermine effective action by Canada in this crucial bilateral area.

The current situation and required action

The flow of water across the Canada-United States boundary is governed by an evolving number of bilateral treaties and agreements (see Annex 3). The key ones entered into at the federal level are the 1909 Boundary Waters Treaty establishing the International Joint Commission (IJC), and the 1978 Great Lakes Water Quality Agreement and amendments. The most important example of the many provincial-state management agreements and arrangements is the 1985 Great Lakes Charter, and its Annex 2001 dealing with withdrawals of water from the Great Lakes basin, signed by 8 governors and the premiers of Ontario and Quebec.

The governance structures for water policy in Canada lack a strong central authority able to bring coherence, focus and direction to this vital area. Moreover, notwithstanding the complexity of the issues at play, there has been a serious downsizing, particularly at the federal level, of human and financial resources, most seriously as regards scientific research and data monitoring/analysis, but also for policy formulation and coordination.

- The policy officials and technical experts dealing with water issues at Environment Canada and Natural Resources Canada, as well as those dealing specifically with Canada-United States water relations at Foreign Affairs Canada (FAC), are doing excellent work, but a major upgrading of priority and resources is required.
- At the federal level, Environment Canada chairs an interdepartmental committee on water issues on which some 20 departments and agencies are represented. A much higher priority and a more strategic focus should be given to the work of this committee. Moreover to give focus to Canada-United States water issues, the committee should have a key sub-committee on Canada-United States relations.
- The last federal water policy was issued in 1987. It is high time for an updated national policy, with input from the provinces, municipalities and the private sector. The policy should include mechanisms for ensuring that the policy is implemented and laws are enforced. Given the current unwieldy policy-making process, the policy should propose a rationalization of structures so that the process is streamlined under a more integrated federal focal point. A key aspect of this policy should be the Canada-United States water relations.
- The Canadian Council of Ministers of the Environment (CCME) considers water issues as contentious issues arise. The ministers, and officials co-ordinating the work of the CCME, should attach a higher priority to ensuring an integrated and more strategic federal, provincial and municipal approach to Canada-United States water policies and issues.
- The IJC, which reports to the Canadian Minister of Foreign Affairs and the US Secretary of State, continues to do exemplary work in fulfilling its quasi-judicial and reference functions on transboundary water management, but its human and financial resources should be strengthened. Building on the successes of the Great Lakes Water Quality Agreement, the IJC should move in stages to establish international watershed boards for other transboundary water basins, starting with the Red and St Croix river basins. The IJC should be encouraged to continue to carry out creatively its policy and regulatory roles. In the challenging period ahead, the IJC would benefit from more strategic direction from government.
- The trilateral NAFTA Commission for Environmental Cooperation (CEC) has been studying some aspects of Canada-United States and United States-Mexico water management. The IJC and CEC have approved a memorandum of understanding (MOU) to exchange information. It is essential for the IJC and CEC to coordinate their work programs so that the CEC, with its trilateral mandate, does not duplicate the bilateral mandate of the IJC.

CONCLUSIONS

In our view, there are in the short term few issues related to our shared water resources along the boundary between Canada and the United States which seriously threaten Canada-United States relations. There are, however, some water issues which could have a negative impact locally (e.g. Devils Lake on the North Dakota-Manitoba boundary, and water apportionment for Alberta-Montana rivers); and one which could have a serious regional impact (withdrawals of Great Lakes water for the use of municipalities just outside the Great Lakes basin). Any of these could escalate to the national level. There are also several which could raise serious tensions in the longer term if not addressed adequately now (water pricing and more rational water use, climate change, invasive alien species, control of toxic substances, and groundwater)

Particularly for these longer-term issues, we are concerned by several factors which have attracted our attention:

- There is an absence of clear focus and forceful leadership at the federal level in addressing, in all its complexity, the effective management of Canada's water, our most vital resource. This leaves the federal government ill prepared to lead the essential co-ordination with the provinces, which have the major say on how water is to be used and treated. These two combined reduce our ability to deal coherently and effectively with the Canada-United States boundary waters, despite the valiant work being done by the IJC.
- There has been in recent decades a serious erosion of the financial and human resources allocated at the federal level, and also at the provincial level, to scientific and economic research on water, as well as to the relevant data collection, monitoring and analysis. There has also been an erosion of the financial and human resources available for the coordination function and policy formulation. The complexity of water issues is such that paucity of knowledge and dedicated personnel run the risk of bad and/or wasteful policy decisions.
- The failure, in large measure, to take steps to establish the price of water at a level at least sufficient to cover the full cost of its treatment and distribution, and perhaps to reflect its scarcity value, has contributed to many of our problems – wasteful use of water by agriculture and industry, and equally wasteful use by individuals and institutions, with the associated inadequacies of municipal water infrastructure. In a 2001 report on Canada's environmental practices, the OECD commented: "In sum, there is a paradox in Canadian attitudes to water management. On the one hand, prohibition of bulk water removal underlines the high value put on water; on the other hand, there is a strong reluctance to recognize this value by allowing proper pricing that would enhance water conservation and allocation efficiency, and cover the cost of infrastructure."

The foregoing are general observations on Canada's management of its water resources. It should be apparent that unless we set our own house in order, we shall be ill-prepared to meet any US challenge with respect to boundary waters. If we are to negotiate successfully, we must have strong leadership, effective coordination, solid scientific knowledge and clear policy formulation.

It is obvious that, if there is to be an equitable sharing of the burden, Canada and the United States will have to tackle transboundary water problems with equal vigour and, to the greatest extent possible, in harmonized fashion. Federal, provincial, state and municipal governments, and the private sector, will have to cooperate more effectively in the management of water resources and the conservation of the natural environment. This is particularly necessary in the Great Lakes basin, where major policy, program and management efforts are required to cope with the effects of continuing economic growth and the sustained expansion of major urban areas.

With respect to more specific questions addressed in our paper, we summarize below the key observations and conclusions.

Water quality

For boundary waters and waters flowing across the boundary, as well as groundwater linked to these waters, jurisdictions in both countries should co-operate:

- to apply common standards for the treatment of animal wastes; and
- to apply common standards for up-graded municipal wastewater treatment; the cost of such up-graded water treatment should be included in the rates charged to users.

Governments should continue to limit, by legislation, regulation and firm and comprehensive enforcement, the release and if necessary use of substances harmful to the environment and human health.

In some instances, the regulatory instrument can be effectively augmented by economic instruments, such as imposing high charges on effluent and emission releases.

Groundwater

The 1909 Boundary Waters Treaty should continue to be interpreted to encompass groundwater since we now know that surface water and groundwater form part of a single hydrological system.

The Canadian and US Governments, and the states, provinces and municipalities involved, should adopt compatible legal principles and policies regarding groundwater use, groundwater replenishment and maintenance of water-table levels, and measures to prevent groundwater pollution which can affect boundary waters.

A timetable should be established for mapping Canadian groundwater resources in general, with priority given to mapping resources in the Great Lakes region and elsewhere along the border.

Federal authorities dealing with water issues should undertake an educational program on the importance of mapping and protecting groundwater resources directed at both political leaders and the public in order to encourage the adoption of necessary measures to protect groundwater resources by all levels of government.

Climate change

Despite significant differences of views in both countries as to the causes of climate change, Canada and the United States should seek consensus on the implications of climate change and variability for the two countries, and particularly for the transboundary waters

The two governments should for the short and medium term examine the costs and benefits of various measures of adaptation to the results of climate change and variability. Particularly for the transboundary waters, they should implement these measures in a compatible fashion.

Invasion of aquatic alien species

New non-native species continue to invade and threaten the boundary waters, particularly the Great Lakes. Jurisdictions in both countries have not devoted sufficient research and determination to understanding the full dimensions of the problem. The Canadian and US governments should develop bi-national standards and the most appropriate means for implementing them. This would include making mandatory the existing voluntary guidelines for ballast water and economic incentives for shippers to improve their practices. The IJC should be involved in this process. The IJC should also be given a specific ***reference to examine the drainage from Devils Lake into the Red River.***

The commercialization of water

While it is highly unlikely that bulk exports of water will be contemplated in the near future, it would be prudent for the federal and provincial governments to lay down strict conditions, including appropriate price conditions, under which such exports might be considered should circumstances change.

Current proposals for the withdrawal of water from the Great Lakes to provide for municipalities outside the basin

The Canadian and US governments should:

- Examine whether the withdrawals discussed in the proposed implementing agreements for Annex 2001 are permissible under the 1909 Boundary Waters Treaty;
- In cooperation with the states and provinces, attempt to establish the projected requirements for water of those living within the Great Lakes basin, taking into account expected population and economic growth as well as the savings to be effected through serious conservation measures; and
- Again in cooperation with the states and provinces, determine whether meeting the projected requirements within the basin and the needs of the Great lakes ecosystem would allow for diversions outside the basin, either to nearby or potentially to more distant municipalities.

Governments should call upon the IJC to assist them in this examination.

Governance

Our general observations on the longer-term issues related to the management of our water resources, set out at the beginning of these conclusions, are central to good governance. We specifically recommend:

- A major upgrading of priority and resources for federal officials and scientific experts dealing with water policies and issues, in general, and with Canada-United States water relations, in particular.
- A much higher priority and a more strategic focus should be given to the federal interdepartmental committee on water issues, including more emphasis on Canada-United States water issues
- An updated national water policy should be formulated, with input from the provinces, municipalities and the private sector, with a key element being Canada-United States water relations
- The Canadian Council of Ministers of the Environment (CCME) should attach a higher priority to ensuring an integrated and more strategic, federal, provincial and municipal approach to Canada-United States water issues.
- The Canadian government should work with the US government to strengthen the human and financial resources of the IJC, as well as the strategic direction it receives from both governments.
- Building on the successes of the Great Lakes Quality Agreement, the IJC should move in stages to establish IJC international watershed boards for other transboundary water basins, starting with the Red and St Croix river basins.

RECOMMENDATIONS

Three basic requirements must be met if we are to have better management of the transboundary water resources of Canada and the United States: leadership, governance and pricing.

Leadership: Canadian interests will be ill-served if the federal government does not give strong, clear leadership in all matters related to transboundary waters. It cannot sit back and leave those matters by default to be decided by provinces, states, municipalities or private interests. Canada and the United States should draw heavily on the mandate, experience and prestige of the IJC to assist them in resolving problems, but the federal governments must demonstrate strong leadership in order to enable the IJC to play its role. In Canada, federal leadership does not mean throwing around federal weight, but discussing straightforwardly and negotiating firmly with the provinces and others in order to establish Canadian positions prior to discussion and negotiation with the United States. We, therefore, call upon the federal government to give strong leadership in the water sector, and on all provincial and municipal governments to work co-operatively for mutually beneficial outcomes.

Governance: The resources for scientific understanding and policy formulation in the key departments, both federally and provincially, have been eroded over time, and must be re-built. The mechanisms for discussing and agreeing upon water policy interdepartmentally, and between the federal government and the provinces, appear to us to be complex and cumbersome. They should be streamlined and their subject-matter given greater priority by the federal government as a whole. Thought should be given to whether new mechanisms, such as a joint federal-provincial research capacity, are required. And it should never be forgotten that good governance requires not only good legislation and regulation based on sound policy, but also consistent and adequately resourced enforcement.

Pricing: We are convinced that the proper pricing of water is vital to its effective management, whether the consumer be industry, agriculture, the individual or public institutions. Proper pricing will also be the spur to significant conservation, which mere exhortation is unlikely to achieve. We, therefore, urge governments at all levels to move clearly and soon to establish a price for water which will cover all its costs – infrastructure and its maintenance and replacement; operating costs of treatment where required, and costs of distribution; wastewater treatment where applicable; research for new knowledge about water; and the costs of enforcement of regulations. If this were done throughout Canada, as well as in the United States, it would make a major contribution to the good management of transboundary water resources.

ANNEX 1

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ANNEX 2

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ANNEX 3

International Agreements and Important Legislation Relating to Transboundary Water

The oldest and most important bilateral agreement governing transboundary waters between Canada and the United States is the Boundary Waters Treaty of 1909. The Treaty's principles are the basis for the protection of the quantity and quality of the waters shared by the two countries. Mechanisms are provided to prevent and resolve disputes through the establishment of the International Joint Commission (IJC) as an impartial bilateral commission to oversee the implementation of the Treaty.

Following IJC studies and recommendations on specific boundary waters problems, there are 10 agreements on shared boundary waters and 28 water boards have been established to oversee the management of watersheds. One of the major agreements is the 1978 Great Lakes Water Quality Agreement and amendments. Although the Boundary Waters Treaty's primary focus is on water quantity, it has been empowered to deal with water quality through these additional agreements and their subsequent amendments.

Some of the numerous agreements pertaining to transboundary water basins are the following:

- Niagara Treaty of 1950, which governs the flow of the river for power and scenic purposes.
- Columbia River Treaty of 1961.
- Ramsar Convention of 1972 on Wetlands and Waterfowl Habitat.
- Souris River Water and Flood Control Agreement of 1989.
- U.N. Framework Convention on Climate Change of 1992.
- North American Agreement on Environmental Cooperation of 1993.

Sometimes neighbouring provinces and states have entered into arrangements for managing boundary water resources. The most widely known of these is the 1985 Charter and its Annex 2001 covering Ontario, Quebec and eight American states in the Great Lakes Basin. In the Atlantic area, New Brunswick and Maine have established the St. Croix Waterway Commission to manage their shared basin.

Federal Government legislation which affects, inter alia, transboundary waters, include:

- International Boundary Waters Treaty Act, 1911, as amended.
- Canada Waters Act, 1970.
- International Rivers Improvement Act, 1985.
- Fisheries Act, 1985.
- Navigable Waters Protection Act, 1985.

There are also relevant provincial acts such as the Ontario Water Resources Act and the Water Transfer and Taking Regulation Act, the Quebec Environmental Quality Act, the Water Resources Preservation Act, the Yukon Water Act, and the B.C. Columbia Basin Trust Act.

Although not strictly through international treaties or conventions, the IJC has, in many cases, fostered transboundary water management. Since 1912, the IJC has dealt with approximately 100 cases, generally divided equally between “applications” for specific projects and “references” from the two governments. Some examples of these relate to:

St. Croix River	Columbia River
St. Mary and Milk Rivers	Great Lakes Water Quality
Garrison Diversion	Rainy River
Skagit River	Lake of the Woods
Flathead River	

The legal framework for the management of the boundary waters quantity and quality is extensive and diverse, and will continue, undoubtedly, to expand in the future.