

Comparative Approaches to Governance and Management of Water Resources in North America

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Résumé de l'article

Dans l'ère post-Nafta, le Canada, le Mexique et les États-Unis font face à un problème de gestion de l'eau. Ces défis, incluant la demande croissante de l'eau et les problèmes de gestion des écosystèmes, tentent : de balancer les demandes des États riverains en amont et en aval, de faire face à l'extraction des eaux souterraines et de la potentielle découverte d'aquifères partagés (surtout dans les endroits où il n'y a qu'une seule source aquifère) et finalement de faire face aux problèmes persistants de la qualité de l'eau. Nous couvrons dans cet article une vue d'ensemble des problèmes mentionnés ci-haut, le contexte nord-américain et une révision de l'expérience des différentes régions nord-américaines principalement en examinant les frontières Américano-canadiennes et Américano-mexicaine en recherchant des visions qui peuvent être utiles à l'autre. Il s'agit d'une version mise à jour d'un document que nous avons présenté à l'Université Laval en 2005, en s'appuyant sur une expérience plus récente.

COMPARATIVE APPROACHES TO GOVERNANCE AND MANAGEMENT OF WATER RESOURCES IN NORTH AMERICA

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Résumé : Dans l'ère post-Nafta, le Canada, le Mexique et les États-Unis font face à un problème de gestion de l'eau. Ces défis, incluant la demande croissante de l'eau et les problèmes de gestion des écosystèmes, tentent : de balancer les demandes des États riverains en amont et en aval, de faire face à l'extraction des eaux souterraines et de la potentielle découverte d'aquifères partagés (surtout dans les endroits où il n'y a qu'une seule source aquifère) et finalement de faire face aux problèmes persistants de la qualité de l'eau. Nous couvrirons dans cet article une vue d'ensemble des problèmes mentionnés ci-haut, le contexte nord-américain et une révision de l'expérience des différentes régions nord-américaines principalement en examinant les frontières Américano-canadiennes et Américano-mexicaine en recherchant des visions qui peuvent être utiles à l'autre. Il s'agit d'une version mise à jour d'un document que nous avons présenté à l'Université Laval en 2005, en s'appuyant sur une expérience plus récente.

Mots-clefs : Gestion, eau, binationale, États-Unis, Canada, Mexique, gouvernance, environnement

Abstract : In the post NAFTA era, Canada, Mexico, and the United States face a range of water resource management issues. These challenges include meeting increasing demands for water while also dealing with ecosystem management issues, attempting to balance the demands of riparian states in both upstream and downstream contexts, dealing with the extraction of groundwater and the potential overdraft of shared aquifers (especially in sole source aquifer areas), and coping with persistent water quality issues. In this paper, I provide an overview of the above issues and the North American context and review the experience of different regions in North America, specifically examining the U.S.-Canada and U.S.-Mexico border region and seeking insights from one region that may be useful in the other region. As such, this is an updated version of a paper that I presented at Laval University in 2005, drawing on more recent experience.

Keywords: Binational, water, resource management, United-States, Canada, Mexico, border, environment, governance.

Research context and background

North America possesses major differences in physical geography, population distribution, and culture. Three different nations exist in the continent, all exercising varying degrees of political autonomy as they seek to manage a wide array of water. The North American continent also possesses two different spatial contexts, the arid region of the US-Mexico borderlands and the humid region of the Canada-US borderlands. Although these regions possess different physical, human, and political geographies, comparative analyses of water resource management issues in these border regions can be highly

instructive to researchers in each region.

Transboundary water resources and watersheds are very challenging to manage, generating numerous management issues that are frequently not resolved through unilateral means. Despite the differences in physical and human geography we see in North America, water resource management challenges the three nations face share some similarities that inform the discussion in this article. In many cases extensive water resources are located at considerable distance from population and urban areas that generate demand for water resources, and this spatial mismatch generates considerable challenges in meeting these demands. Interbasin transfer schemes are developed as a means to meeting these challenges, yet a range of barriers and obstacles exist related to political autonomy, environmental quality, and equity across regions.

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A particularly relevant example of political autonomy concerns related to water transfers is found in the Canadian province of Quebec, yielding "Bill 27, An Act to Affirm the Collective Nature of Water Resources and Provide for Increased Water Resource Protection that was passed in 2009 by the Parliament of Quebec." (Quebec Parliament, 2009). As noted in the explanatory notes of this legislation, water resources are considered part of the heritage of Quebec, and transfers of water resources out of Quebec are prohibited. This instance clearly demonstrates the potential conflicts of large scale water transfers to meet water resource demand in North America. Similar instances of these dynamics may be found in numerous other basins in the U.S., Mexico, and Canada.

Management of water resources in North America is also complicated by environmental considerations that have arisen in the last 40 years, specifically, instream uses of surface water bodies, "the environment" as a stakeholder, and a widely shared need to manage water quality. Numerous federal, state, and provincial management frameworks have been developed to address these concerns. The transboundary dynamic of water resource use and management introduced above adds a further set of complications, and the manner by which these institutions interact across borders offers considerable challenges and opportunities.

Research approach and questions posed

In the last 20 years, much interest has been expressed in exploring a North American perspective to environmental issues. Specifically, The North American Center for Transboundary Studies (NACTS) at Arizona State University, The Association for Canadian Studies in the United States (ACSUS), and various research units within Laval University have held a series of events to explore issues of governance and environmental management in North America. A particularly interesting challenge in this discussion has been how to link a "science" perspective to public policy efforts to manage water resources in North America. Specific questions I pose in this paper include:

- What are the important components of "science driven policy" that can inform the challenges we face in North America?
- What are the major management frameworks by which the three nations seek to manage water resources

domestically, how do these frameworks impact binational water resource management, and what lessons can be drawn from these experiences?

- What are fruitful areas of future research, how may they be advanced, and how may potential outcomes of this work inform water resource management in North America?

Policy, science, and their intersection

A useful starting point to examine the interaction of science and policy is to look at the foundations of each term, then explore how these concepts may be linked. Policy is the manner by which elements of political interaction are structured, and policy builds on this concept of structure, defined as a course of action that guides decisions towards achieving a particular goal or outcome (Merriam Webster 2009). I argue that environmental policy is a course of action that will guide decisions designed to better manage the environment and natural resources.

What role can science play in the development and implementation of policy? "Pure science" is the systematic acquisition of knowledge leading to the understanding of the physical and social world. "Applied science" is science that helps us answer specific pressing questions, usually impacting the human equation. The systematic acquisition of *problem specific knowledge* to help answer pressing questions of environmental management is helpful in informing the discussion of water resource policy in the North American context.

The basin perspective

A useful context for applied environmental analysis is a watershed, defined by the United States Environmental Protection Agency as "a geographic region within which water, sediments and dissolved materials drain into a common outlet -- a point on a larger stream, a lake, an underlying aquifer, or an ocean" (USEPA 1996). How can we link this watershed/ecosystem approach to the "problemsphere" of water resource management in North America? Much research has been done in both border regions concerning binational watershed management, offering both a strong regional context and a valid science-based approach to the challenges introduced earlier in the paper. Environment Canada has been particularly effective in this area through advancing integrated watershed

management (Environment Canada 2010), and Mexico has also advocated the watershed as a regional focus of water resource management through the development of watershed councils (*consejos de cuencas*) in The Law of National Waters (Comisión Nacional del Agua 1997).

Domestic management frameworks in the U.S., Mexico, and Canada

Prior to examining binational water resource management, it is useful to briefly review the domestic management frameworks that exist in the U.S., Mexico and Canada. In the U.S., responsibility for water resources management can best be seen as a partnership between the federal and state government. The Clean Water Act states management of water quality is considered a national interest and responsibility, and this act establishes a framework of regulations and practices by which pollution is controlled and water quality is protected (USEPA 2010). The federal government also has responsibility for the development and management of large water resource development projects and navigable stream management through the U.S. Bureau of Reclamation and the U.S. Army Corps of Engineers. However, the active management of surface water and groundwater is left largely to the states, a fact that complicates regional water resource management, especially in a binational context, where the federal government has authority.

The situation in Mexico is much different. The Mexican Constitution and The Law of National Waters establish that all water resources are federally owned, and the federal government is to manage these resources. La Comisión Nacional del Agua (CNA) is the agency charged with water resource management, and The Law of National Waters mandates how CNA does this work (CNA 1999). This calls for the establishment of *consejos de cuencas* or watershed councils to regionally manage water resources (CNA 1997). As such, *consejos* have potential to manage water sources across competing interests and to facilitate the resolution of resulting conflicts. A range of state agencies have also become more active in the last 20 years, and this is consistent with the overall process of decentralization that is occurring in Mexico (Brown and Mumme 2000 and 2001). Responsibility for binational issues rests with the federal government through a mix of agencies.

The domestic management framework for water resources in Canada shares similarities to the U.S. and Mexico, yet it

also differs considerably. As a federation of provinces and territories, Canada advances water resource management through actions of federal, provincial, and territorial governments. The active management of water resources is within the formal constitutional authority of the province in question, and management in the territories is shared between territorial governments and Indian and Northern Affairs Canada. Specific responsibilities managed by the provincial and territorial governments include development of water management and hydroelectric infrastructure, and pollution control. The federal role in Canada is largely restricted to management of oceans and fishery resources, navigation, First Nations issues, and the international context (Environment Canada 2010b).

The U.S.-Mexico experience

Most resource management issues in the U.S.-Mexico border region occur in twin cities that lie either within or adjacent to a binational watershed. Accordingly, the watershed approach offers considerable utility in the U.S.-Mexico borderlands; Woodard and Durall (1996) developed a hydroregionalization of the U.S.-Mexico border based on this concept (Figure 1 depicts this regionalization). Challenges facing the region include providing adequate water supplies, managing wastewater, management of shared water resources, and the lack of a groundwater management mechanism. An extensive water resource management framework has developed over the last 125 years, and considerable progress has been made on many water quality and quantity issues that the two nations face (Brown 2005). Examining some of the more recent binational efforts aid in understanding what efforts have been effective and why.

The Southwest Consortium for Environmental Research and Policy (SCERP) is a USEPA-funded effort among U.S. and Mexican universities to support binational environmental research efforts and is a very good example of "science informed policy" that was discussed earlier in this paper. SCERP has supported numerous water resource research efforts in the last 20 years that have employed a basin or watershed perspective in shared U.S.-Mexico basins. In the Tijuana River Watershed, several research projects have examined water resource vulnerability and related indicators within a watershed framework (SCERP 2009), demonstrating the utility of binational research teams and a watershed perspective.



Figure 1. Hydroregionalization of the US-Mexico border region. Woodard and Durall 1996.

Working with other U.S. and Mexican agencies, the United States Geological Survey (USGS) has developed the U.S.-Mexico Border Environmental Health Initiative (BEHI) to study the interactions between human health, environmental factors, population growth, and economic development (USGS 2010). BEHI researchers have developed a geospatial database of human health and environmental variables of the borderlands region and serve these data on the Web. (Figure 2 depicts the USGS study area). BEHI research also includes interactions between contaminant levels, human health, and wildlife species in border watersheds (USGS 2010). The successful outcomes of this research reflect a long standing commitment of USGS staff to conduct collaborative research.

The International Boundary and Water Commission¹ meets with stakeholders and shares information with border residents through IBWC Citizens Forums in five subregions; issues discussed include water quality concerns related to IBWC wastewater treatment plants, flood risk, and the operation of regional water resource management projects. To date, these efforts have been successful in sharing information, but this author has long argued they also have two major shortcomings. First, they are solely U.S. domestic

¹ The International Boundary and Water Commission is a binational water resource and boundary management institution that was established through the 1944 Water Treaty between the U.S. and Mexico. As such, it has a U.S. Section, the USIBWC, and the Mexican section, La Comisión Internacional de Límites y Aguas (CILA).

efforts of the U.S. section of the IBWC, with little formal involvement of the Mexican section, CILA, or other Mexican agencies. Secondly, the Forums are established solely as information sharing mechanisms; little opportunity is afforded for regional collaboration or decision making, efforts that are consistent with the idea of watershed councils. Other efforts by the IBWC have been more successful at region specific technical collaboration, but the border wide regional effort of the Citizens Forums has seen limited success.²

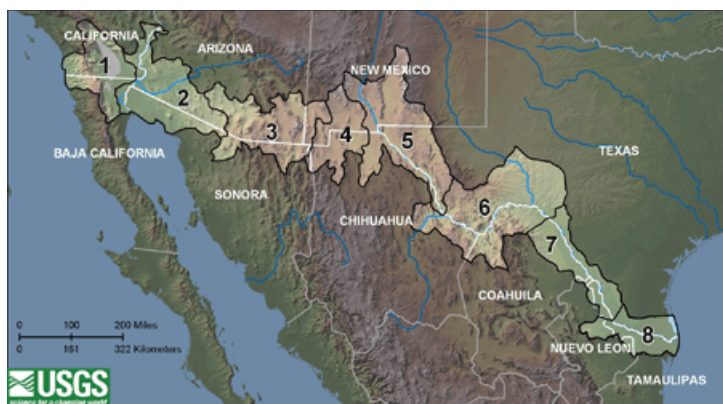


Figure 2. Area of investigation for the USGS Border Environmental Health Initiative (USGS 2010)

The last example of U.S.-Mexico collaborative environmental work to be discussed is that of the Good Neighbor Environmental Board (GNEB). The GNEB was established through the Enterprise for the Americas Initiative Act that was passed in 1992 as a means of providing the U.S. Congress and President with specific technical advice and input into border environmental infrastructure issues (GNEB 2010). Although this effort is a U.S. domestic advisory mechanism, the Board has worked collaboratively with Mexican citizens to conduct research in support of annual reports and comment letters that are sent to the U.S. President and high ranking members of Congress.

Annual reports have discussed water resources management, human health, air pollution, border security,

and environmental protection concerns in the post 911 era and provide topic specific research and data to members of Congress, the Administration, and their staff. Comment letters focus on more immediately pressing and sometime controversial issues and have discussed management and funding of the Border Environmental Cooperation Commission and the North American Development Bank, critical assessment of border security infrastructure, and enhanced Mexican participation in Board activities. The most recent comment letter discussed the "border fence," and discourse with members of the Department of Homeland Security indicate the Board's message and concerns are being heard by important members of the Obama Administration.

What lessons can be taken from the U.S.-Mexico experience that can inform the North American perspective? First, successful efforts require an early and ongoing commitment to collaborative, binational work. The outcomes of efforts by SCERP and USGS clearly demonstrate this finding, one that the GNEB and IBWC are working hard to advance. Second, many members of binational research teams have worked together for years, and these personal connections and relationships are key in advancing this work. Third, effective binational environmental research and management require substantial, sustained financial commitments. The USGS BEHI effort was adequately funded for several years; this supported compilation and fusion of geospatial data and collaborative research. Conversely, SCERP has received much less stable funding in the last five years, negatively impacting the ability of SCERP researchers to continue their work. Sustained funding has been even more problematic during the global economic downturn, a situation likely to continue for the foreseeable future. The last point to draw from the U.S.-Mexico experience is the productive nature of university researchers. Work done by SCERP is largely conducted by researchers at member universities, and the GNEB, IBWC Citizen Forums, and the USGS efforts have benefitted from support, interest, and hard work of university partners.

The U.S.-Canada experience

Although Canada is very well endowed with water resources, the northern U.S. and Canada face similar challenges as Mexico in meeting demand for adequate and safe water resources. With only .5% of the world's

² See Brown (2005) for details on these efforts at region specific technical collaboration.

population, Canada enjoys 7% of the world's accessible freshwater supply (Environment Canada 2010c), yet the spatial mismatch between the location of population and water resources generates challenges for Canada in meeting demand for water. This situation sees considerable regional variability, but various sub-regions of the U.S.-Canada border face challenges in this regard. Water quality issues are also evident, as urbanization, population increase, and industrial, municipal, and agricultural demands generate impacts on water quality.

A brief review of the history of binational water resource management between the U.S. and Canada is a useful starting point for this discussion. The Boundary Waters Treaty of 1909 established the International Joint Commission (IJC) as a binational institution with primary responsibility for managing the shared waters in the Great Lakes and boundary river systems. Each country has three commissioners and its own section with technical staff, who are responsible for interpreting and following the Treaty and resolving relevant disputes, *not* simply representing the interests of their own countries (IJC 1909), a departure from many international affairs posts and institutions.

In 1972, the U.S. and Canada signed the Great Lakes Water Quality Agreement, with the goal to renew the commitment of each country to work together to protect water quality, *through an ecosystems perspective* (emphasis added). Specifically, the Agreement establishes a series of general and specific objectives; lays out research programs and standards; and outlines the responsibilities, authorities, and functions of the IJC. The Agreement was amended by a Protocol in 1987 that established timetables by which programs were implemented, changing technologies were addressed, and accountability was reinforced (IJC 1972). Taken in concert, the Agreement and Protocol guide much of the ecosystem based work of the IJC.

An ecosystem-based approach to water quality work was linked with integrated water resource management through the drafting and release of the 1998 IJC Letters of Reference. In these letters, the Canadian and U.S. governments requested the IJC to conduct research into establishing international watershed boards, with an emphasis on operational details of the structure, membership, and terms (United States of America and Government of Canada 1998). These letters clearly endorse the proposal "to establish international watershed boards

that would adopt an integrated ecosystem approach to transboundary environmental issues" (United States of America and Government of Canada 1998, p. 1). In doing so, the U.S. and Canadian federal government advocated science-based binational policy for water resource management.

The IJC is not the only binational U.S.-Canada institution to advocate such an approach. In 2002, the Commission on Environmental Cooperation (CEC) hosted a workshop entitled, "Public Workshop on Freshwater Issues in North America" in which the CEC issued recommendations consistent with the 1998 IJC Letters of Reference (CEC 2002). Among the research options discussed, structures for effective transboundary integrated water management were examined. Discussion at the CEC workshop also extended to asking how the IJC and IBWC might contribute to such an outcome. All parties to the conference supported efforts to "cooperate on joint approaches or lessons learned," the heart of joint, binational management efforts in transboundary contexts (CEC 2002).

What has been happening on the ground that may offer lessons learned for the North American context? The International Red River Board and Red River Basin Commission are notable endeavours towards coordinated, binational, integrated water management on the US-Canada border. The International Red River Board is an IJC driven Board that combined the ongoing activities and membership of the International Souris-Red Rivers Engineering Board and the International Red River Pollution Board to advance pollution control and water apportionment activities (IJC 2001). Specifically, the Board is to assist the IJC in dealing with conflicts related to water quality in the basin, "through the application of best available science and knowledge of the aquatic ecosystem of the basin and an awareness of the needs, expectations and capabilities of residents of the Red River basin" (IJC 2001, p. 1). This is highly consistent with science-based policy introduced earlier in the paper.

Another organization working in the basin is the Red River Basin Commission (RRBC), a not-for-profit group that seeks to bring together state, local, provincial and First Nations governments to better manage the basin's natural resources. The RRBC was formed in 2002 when the Red River Basin Board, The International Coalition, and the Red River Water Resources Council joined together to advance

shared goals. In 2005, the Commission developed the Red River Basin Natural Resources Framework Plan, setting out 13 goals in the areas of water quality protection, flood management, water supply provision, and conservation of wildlife and fish. (Red River Basin Commission 2010). This locally driven effort is a binational watershed approach consistent with the 1998 Letters of Reference calling for integrated basin.

What lessons can be taken from the U.S.-Canada experience that can inform the North American perspective? An important insight is the progressive and proactive manner by which the IJC has advanced a science based ecosystem approach to managing shared waters on the U.S.-Canada border. This perspective was established as early as 1972 in the Great Lakes Water Quality Agreement and was reinforced through the 1998 Letters of Reference calling for the development of international watershed boards. As was introduced in the 2002 CEC workshop, such a perspective may have considerable utility in the U.S.-Mexico border region that faces somewhat similar challenges. Discussion now turns to other ideas for future research.

Areas for future work

In this paper, some early “lessons learned” from two binational regions in North America have been identified; future work to build on this work should examine the following:

- What is the more recent experience in the Red River Basin that was examined in some detail in this paper and how have the policy initiatives that have been proposed progressed?
- What of groundwater resources? An important binational aquifer that meets the water needs of approximately 60,000 people exists in the Abbotsford/Sumas Aquifer region shared by Washington and British Columbia (Norman and Melious 2004), offering a study area with a specific focus on groundwater resources. Within this region, several regional initiatives interact with efforts of the IJC, offering an interesting multi-scale framework of analysis.
- How might the potential for lessons learned in one border region be extended to the other region, specifically:

- How can a science based policy approach consistent with the ecosystem and watershed perspective employed by the IJC be advanced in the U.S.-Mexico border region?
- What impediments impair the functional enhancement of various institutions involved, and how may these barriers be reduced?
- If such a perspective would be proposed on the US-Mexico border region, what model(s) may fit in this region (extension of US IBWC Citizens Forums, a science advisory board, or some other configuration)?

Closing comments

Although the human and physical geography of North America varies greatly across the three nations that exist on the continent, a comparative examination of binational water resource management and policy provides some interesting and useful insights. Important elements of the regional management frameworks that exist in the U.S.-Mexico and U.S.-Canada borderlands have been identified and examined, with some preliminary ideas presented towards how lessons learned in one region may be of use and interest in the other border region. Ideas for future research efforts that can build on the work described in this paper are offered as the foundation for such a future research agenda.

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