

L'eau en Amérique du Nord :
facteur de coopération, outil de développement
ou enjeu de conflit ?

Les actes du colloque organisé par l'Institut Québécois des hautes études
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TRANSBOUNDARY WATER RESOURCE ISSUES ON THE U.S.-MEXICO BORDER: Challenges and Opportunities in the 21st Century¹

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The beginning of the 21st century sees the U.S.-Mexico borderlands facing a range of water resource management challenges. These challenges include balancing increasing demands for water with limited water supplies in an arid region, reconciling upstream versus downstream riparian demands and uses of surface water, managing the overdraft of aquifers (especially in regions of sole source aquifer supply), and dealing with a host of water quality issues, both as regards surface water and groundwater. In this paper, I provide a brief overview of the U.S.-Mexico border region, detail several specific regional water resource management challenges, introduce a “basins perspective” to water resource management, and discuss several different approaches to these challenges and their potential to advance solution of relevant issues. I close the paper with a brief discussion of areas for future investigation.

Introduction to the area of investigation

The U.S.-Mexico border region is an arid to semi-arid region that sees variable levels of precipitation. Coastal areas near San Diego, California experience 25-38 cm (10-15”) of rain a year, whereas arid regions of the Imperial Valley in California may receive less than 12,5 cm (5”) of rain a year. The region also experiences long term periods of below average precipitation through drought cycles that greatly impact the ability of surface water reservoirs to provide adequate water supply to urban and agricultural areas. Water resource management in the borderlands is especially difficult owing to the binational nature of the region; different laws, policies, institutions, and management regimes exist in the U.S. and Mexican parts of the region, making

coordinated management of water resources challenging at best, and problematic at worst.

Against this backdrop of an arid region experiencing dramatic drought processes and events, the challenges facing the border region are driven by disproportionate population growth rates relative to the interiors of both nations; related to this is a widening economic asymmetry. Border population as a whole, currently at about 13 million, is expected to reach 19.5 million by 2020 and to double its current size by 2033 (Peach and Williams 2003). Most of the growth is occurring in the urban areas known as “twin cities”² that exist on the border. Many of these twin cities co-occur in or adjacent to binational watersheds, a point that will be

² I would like to acknowledge the efforts extended by Dr. Frédéric Lasserre and Ms. Isabelle Jette (Département de Géographie and Institut des Hautes Études Internationales) at Université Laval and other staff and faculty at Université Laval that organized and hosted the conference at which this paper was originally presented, “Water in the Americas: Confrontation, Co-operation or Solidarity?” I would also like to acknowledge the efforts of Dr. Elly Hermon, Associate Researcher at Institut Québécois des Études Internationales at Université Laval. In discussions after the conference, Dr. Hermon was very helpful in developing the ideas for future areas of research noted near the end of the paper.

²Twin cities are inter-related urban areas that are spatially contiguous to each other on both sides of the international border. Population estimates indicate that upwards of 90% of the people that live on the border reside in these twin cities (Ham-Chande and Weeks 1992 and Peach and Williams 2003).

explored in greater detail a bit later this paper. In addition, population growth rates in both Mexican and U.S. twin cities are more than double the national average in the respective countries. Migration to the region adds to the intrinsic demographic momentum sustained by the U.S.-Mexican border region's relatively young population.

Formal and Functional Geographic Perspectives

From a formal geographic viewpoint, the U.S.-Mexico borderlands can be viewed both as a formal region and as a functional region, perspectives that offer considerable insight into applied water resource management challenges. Based on the La Paz Agreement of 1983, the area 100 kilometers north and south of the international border between the U.S. and Mexico is considered the formal and official border region by the U.S. and Mexican governments, as detailed in figure 1 (United States of America and the United Mexican States 1983). This regional definition is also reinforced by later bilateral U.S. and Mexican environmental agreements, including the Integrated Border Environmental Program (USEPA and SEDUE 1991), Border XXI/Frontera XXI³ (USEPA 1996), and the most recent Border 2012/Frontera 2012 U.S.-Mexico Environmental Program (USEPA and SEMARNAT 2003). Within this formal region, various U.S., Mexican, and binational programs and agencies engage in a range of water resource management activities of importance to the region.

The U.S.-Mexico border region can also be examined as a functional region. Woodard and Durall (1996) offer the U.S.-Mexico border region as a hydro-region defined by the shared watersheds along the border (see figure 2 for detail of this perspective). This concept of a hydro-region can be extended to include the watershed or basin framework that has seen considerable utility in both domestic and international contexts. The United States Environmental Protection

Agency (USEPA 1991) offered the watershed as a specific bio-regional tool by which this regionalization may occur, and Foster (1984) recognized that natural resource issues and management challenges often occur in transboundary settings. He further argued that successful management of natural resources needs to occur within the ecological regions involved. Research by the National Academy of Sciences (1968) used this approach in the Colorado River Basin to expand the range of resource use options pursued by U.S. government agencies in managing large scale water projects. More recently, the National Research Council (1999) has advanced the watershed perspective as a comprehensive mechanism by which water resource management in the U.S. can be conducted.

This watershed context has been applied in international contexts as well, and this context has particular salience to this research paper. The International Joint Commission, a binational Canadian-U.S. advisory body, has used this approach for resolution of water quality issues in the Great Lakes Basin along the U.S.-Canadian border. The Commission actually elevated this position to a policy statement in the Agreement on Great Lakes Water Quality, 1978, when they argued "restoration and enhancement of the boundary waters cannot be achieved independently of other parts of the Great Lakes Ecosystem with which these waters interact" (Canada and the United States of America 1978: introduction).



Figure 1. Formal region of the U.S.-Mexico border as defined by the USEPA and SEDUE (1991).

³ The Border XXI Framework Document is the official blueprint developed by the U.S. and Mexican federal governments in the mid 1990s for environmental protection and sustainable development along the U.S. Mexico Border. The USEPA and SEMARNAP offered this plan in 1996 to improve on some of the shortcomings of the La Paz Agreement and the Integrated Border Environmental Plan, the previous binational mechanism advanced to build upon the La Paz Agreement (USEPA 1996). It has since "sunsetted" and been replaced by the recent Border 2012/Frontera 2012 U.S.-Mexico Environmental Program.

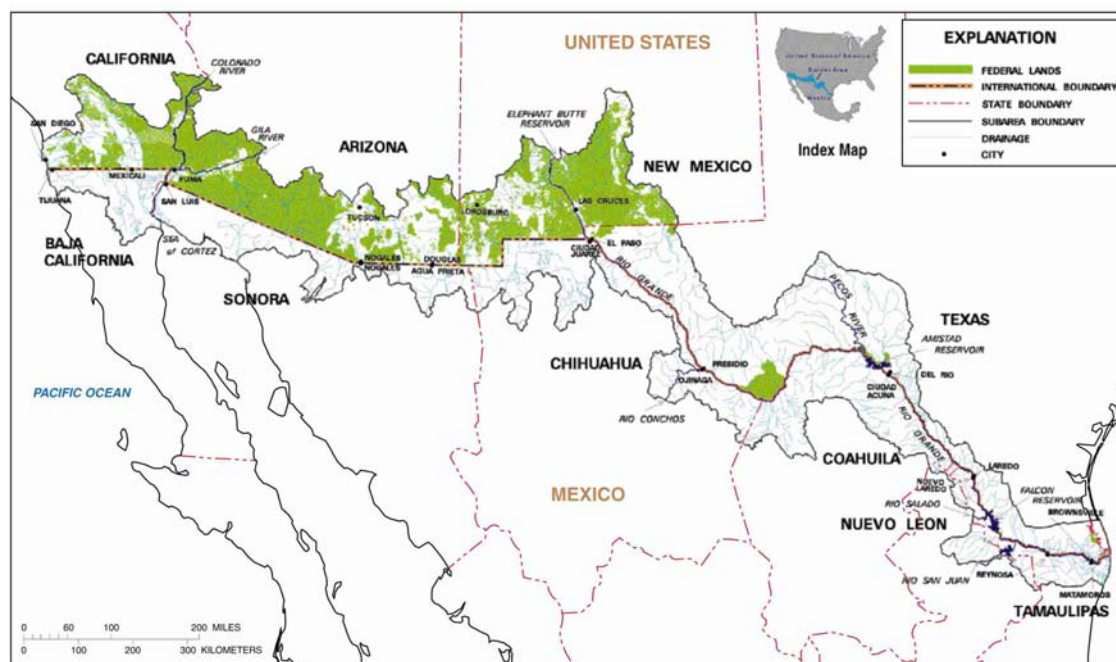


Figure 2. Hydroregionalization of the U.S.-Mexico Border (Woodard and Durrall 1996).

An even more salient example of an international application of watershed approaches was examined in an article by Brown and Mumme (2000) in which possibilities for a binational watershed council or *consejo de cuenca* were explored. The 1997 Border XXI Implementation Plans specifically called for integrated watershed planning and management in border watersheds (USEPA 1997). Previous to these USEPA efforts, Mexico's National Water Law (La Ley de Aguas Nacionales-LAN) specifically called for the development of *consejos de cuencas* to serve the many users of hydrologic resources, to establish hydrologic infrastructure, and to preserve water resources in the targeted basins (CNA 1992 and 1997). Mexico's LAN only addresses domestic basin councils in Mexico; however, this research by Brown and Mumme (2000) suggests that *consejos* may have binational utility.

Water Resource Management Challenges

Water Supply Issues

As introduced above, arid regions like the U.S.-Mexico border that are experiencing rapid population growth also face the scarcity of water resources needed for present and future demands. This scarcity can be defined from a supply side perspective as Falkenmark (1991) has done. Previous research by

Postel (1992) indicates that much of this water scarcity occurs in arid regions like the U.S.-Mexico border where population growth places demands on water supplies that cannot be met in a sustainable manner. This challenge can also be seen from a macro level through looking at water supplies and demands for the entire border region as various Good Neighbor Environmental Board (GNEB)⁴ annual reports have done (GNEB 2000 and 2005a).

We see similar challenges when we change the scale of analysis and look at specific twin city regions such as the Paso del Norte region within which El Paso, Texas and Ciudad Juárez, Mexico lie. As municipal and industrial demands have increased, regional groundwater resources are seeing increased extraction, with accompanying water quality and quantity concerns (Hetrick 1989). Due to increasing salinity and declining groundwater levels, serious shortages are expected in the near future, yet estimates of the

⁴ "The Good Neighbor Environment Board is an independent federal advisory committee whose mission is to advise the President and Congress of the United States on good neighbor practices along the U.S. border with Mexico. Its recommendations are focused on environmental infrastructure needs within the U.S. states contiguous to Mexico" (GNEB 2005b, introduction).

nature of these shortages are quite variable. According to some estimates, at El Paso's historic rates of withdrawal, potable water in the Hueco Bolson will be exhausted by the year 2025 (El Paso Water Utilities Public Service Board 2002). More recent research done within the El Paso Water Utility Hydrogeology Section indicates that this estimate was based on questionable assumptions, did not take into account recent conservation actions in the region, and did not take into account "induced recharge" that has been recently documented by isotope data and analysis (Hutchison 2003). Pumping in the Ciudad Juárez portion of the Hueco Bolson, where overall less fresh water is available, is almost double that of pumping in El Paso. Past estimates have indicated that Ciudad Juárez may experience a major deficit in the Hueco Bolson by as early as 2004 (Gutierrez 2000), yet current research is still examining groundwater availability in this portion of the Hueco Bolson. As a means of coping with regional water resource scarcity, water providers throughout the region are looking for means to extend the limited groundwater reserves, utilize surface water, and seek alternate supplies.

These instances of water scarcity have also driven a series of regional water conflicts along the border. Persistent drought in the Río Conchos sub-region of the Río Grande basin over the last several years and the manner by which Mexico has utilized the waters of the Río Conchos have caused Mexico to amass a major water debt in meeting its obligations to the U.S. under the 1944 Water Treaty. Texas farmers allege that Mexico should be operating its reservoirs to meet international demand, while Mexican interests argue these demands cannot be met in the current situation they argue is one of "extraordinary drought." Under Minute 308, The International Boundary and Water Commission and la Comisión Internacional de Límites y Aguas have agreed to host a binational meeting of water experts and users from the U.S. and Mexico to advance sustainable management of the Río Grande/Río Bravo Basin (USIBWC 2002). The Summit, originally scheduled for February 2005, has been delayed. It is now scheduled for November of 2005, and drought management of the type needed to resolve the conflict in the Conchos Basin is the focus of the Summit.

Water quality issues

Given the scarcity of water resources along the border, the fragile nature of the region's physical environment, and the increasing demand across sectors, numerous water quality issues face the region. When examining groundwater resources, risks to

water quality are posed by over extraction of groundwater, which in turn leads to the extraction of brackish groundwater at depth as freshwater resources are depleted; this is a risk the Paso del Norte region faces, as discussed above (El Paso Water Utilities Public Service Board 2002 and Hutchison 2003). Groundwater resources are also at risk from leaking septic tanks and leach fields in rural areas of the borderlands that lack centralized wastewater collection, treatment, and disposal facilities (Perez 2005). In addition, leaking underground storage tanks of fuel products and other chemicals substances can pose risks to aquifers as these chemicals are transmitted through groundwater aquifers and yield contaminated groundwater plumes. The City of Las Cruces, New Mexico is currently facing challenges from such a situation that has resulted in a portion of the City's well field being designated a Superfund site by the U.S. Environmental Protection Agency (Environmental Defense 2005).

Risks to surface water quality are predominantly due to the lack of adequate wastewater collection, treatment, and disposal facilities in border twin cities, and the accidental or deliberate discharge of inadequately treated or untreated effluent into receiving surface water bodies in the region. Many of the twin cities of the region face these challenges, and some of the more extensively documented cases involve the twin cities of San Diego/Tijuana, Ambos Nogales, and El Paso/Ciudad Juárez (Brown 1999 and 2000, Lyndon B. Johnson School of Public Affairs, 1999). The impacts of inadequate or poorly maintained wastewater systems in the Mexican portions of these twin cities include impairment of stream ecosystems, potential risks to human health and welfare, and marked reductions in the quality of life of the residents in these twin cities.

Approaches to water resource management challenges

Bilateral approaches

The nature of border watersheds as shared regions has historically argued for approaches whereby governmental units and non-governmental organizations in the U.S. and Mexico have worked in a bilateral manner to advance solutions to regional water resource management issues. The International Boundary and Water Commission/la Comisión Internacional de Límites y Aguas is a bilateral organization composed of two sections that reside in the respective foreign ministries of Mexico and the U.S. (IBWC 2005). According to the 1944 Water

Treaty, the IBWC/CILA has political primacy for all boundary and border water management issues (United States of America and the United Mexican States 1944), and the respective sections work together to advance solutions to these issues as they arise through the development and implementation of IBWC/CILA Minutes.⁵

More recently, the IBWC and CILA have cooperated on the establishment and implementation of several initiatives designed to focus on specific regional water resource management challenges. Minute 294 establishes a Facilities Planning Program that focuses on water infrastructure deficiencies in the Ambos Nogales region, and two facets of this minute offer important ideas towards innovation of cross-border water-related planning. This Minute specifically says the IBWC/CILA “shall establish a binational team of technical experts in wastewater matters from competent agencies of each country” (USIBWC 1995, p.2); this mechanism advances a formal binational, yet regionally grounded, technical mechanism towards problem resolution. The Minute also calls for local planning priorities to be included in the planning process, and local capacity and information sharing to be advanced.

Minute 301 explores the feasibility of a shared aqueduct in the San Diego/Tijuana region and similarly specifies that a community driven planning mechanism be developed that is linked with a binational technical committee under IBWC/CILA coordination (USIBWC 1999). This coordination is also linked to la Comisión Nacional del Agua (the national water commission in Mexico) and the San Diego County Water Authority, raising the potential for regional cooperation that reaches across the border and across levels of government. A more recent IBWC/CILA Minute to explore the role of some form of binational technical group is Minute 306, which advances a conceptual framework for studying the ecology of the Colorado River Delta. This Minute proposes a binational technical task force as a tool for planning and also works to create a forum to link

governmental agencies conducting the technical work with other stakeholders in a formal mechanism (USIBWC 2000).

A parallel effort at exploring outreach capabilities for the Commission is the establishment of domestic Citizens Forums that operate in five different regions of the border (El Paso/Ciudad Juárez, San Diego/Tijuana, southeast Arizona, the Colorado River Delta, and the Lower Rio Grande Valley). The Citizens Forums are domestic U.S mechanisms designed to bring together citizens from various communities to facilitate the two-way exchange of information between Commission staff and the public on issues of regional importance (USIBWC 2003). This effort reflects an ongoing commitment of the Commission to operate in a more open and participatory manner that arose from past litigation with environmental organizations and the addition of new IBWC staff members (Spener 2003).

The recent IBWC experience reveals some ideas of interest in discussing water resource management on the U.S.-Mexico border. First, different forms of regional institution building have occurred and been formalized through the various binational technical committees that have been formed through IBWC/CILA Minutes. These efforts are largely problem and region-specific, and the narrowness of their focus appears to aid in their success. Second, a more pro-active approach that what was seen in the past is being advanced by the IBWC in the general area of public outreach through their border-wide Citizens Forums, although it is still a bit early to determine how effective these forums are towards problem resolution.

The last question to be posed in the discussion of the IBWC/CILA is to what degree la Comisión Internacional de Límites y Agua, the Mexican Section of this binational institution, is advancing similar efforts. Mexican Commissioner Arturo Herrera (2002) has shared his perspectives in this area and introduced the concept of binational teams of technical consultants to develop binational technical capacity in various parts of the border. Commissioner Herrera also discussed the enhancement of inter-institutional cooperation among Mexican agencies, coordination of genuine community development activities, continued decentralization of Mexican government agencies, and improved bilateral cooperation across and along the border. At present, it is not clear to what degree these efforts may directly link to ongoing activities being advanced by the IBWC; this question is one can be examined in future research efforts.

⁵ Formal agreements of binational policy negotiated between the U.S. and Mexican sections of the IBWC are known as IBWC Minutes. These Minutes are less formal and rigid than treaties between sovereign states, yet they act as binding agreements between the U.S. and Mexico on issues concerning water distribution, water quality or boundary disputes. They tend to be fairly short in length and lay out general actions agreed upon by representatives from both sections to solve the relevant problem (Brown 2003).

Another important bilateral organization relevant to water resource management on the border is the Border Environment Cooperation Commission (BECC). The BECC was formed under the side agreements to the North American Free Trade Agreement (NAFTA), with the intent to “help preserve, protect, and enhance the environment of the border region in order to advance the well being of the people of the United States and Mexico” (United States of America and the United Mexican States 1993). To advance this goal, the BECC was developed with joint U.S.-Mexican representation and given three inter-related charges:

- To provide technical support to local and regional efforts to build infrastructure that can improve U.S.- Mexico border environmental quality,
- To analyze the economic and technical feasibility of proposed projects, and
- To certify projects for funding by the second of the institutions to arise from the NAFTA debate, the North American Development Bank (NADBank).

An important facet of the BECC is the degree to which and the manner by which a more open, participatory, and transparent policy and decision making process was advanced. In an early review of the BECC experience, Varady et al. (1996) explored to what degree the BECC was able to maintain a high level of community involvement in reviewing potential projects for BECC certification, while also attempting to respond to the needs of regional stakeholders. Varady et al. (1996) formally evaluated the BECC’s performance in the areas of binationality, public participation, and its adherence to certification criteria, and the results can be best characterized as “mixed, yet improving.” Many informed researchers saw the BECC as ranking well on binationality, and questions are even posed if BECC could reach past its formal mandate to facilitate projects beyond a strict interpretation of infrastructure improvements. However, early interactions with the public were not as open as promised in early public statements. The BECC has scored relatively well concerning openness and transparency, yet certain voices have remained critical of the degree to which the BECC was open in the review, certification, and technical support of projects.

The most recent efforts of the Border 2012 Project recently introduced by the USEPA and SEMARNAT appear to have built upon the BECC experience,

specifically in establishing a mandate for future work and the policy and organizational tools by which this work to be advanced. Mark Spalding’s 1996 declaration that the BECC process of democratization “may have a more lasting impact than any sewage treatment plant ever will” (Spalding 1996) may well prove to be true. Openness and transparency are important themes in effective transboundary water resources management.

The “basins perspective”

As introduced above, considerable research into binational water resource management deals with the watershed or basin perspective, and it is instructive to examine specific instances of how this perspective has been put to use “on the ground.” In the early 1990’s, a collaborative team of researchers at San Diego State University and el Colegio de la Frontera Norte developed the first binational seamless geographic information system (GIS) database of a shared watershed on the border, and this database has supported a wide range of applied research into water resource management in the region (Brown et al. 2005). Similar efforts were advanced by a collaborative team of researchers at the U.S. Department of Agriculture/Agricultural Research Service and the USEPA in the development of the San Pedro River Spatial Data Archive Project (Kepner et al. 2005). In 2000, The Hewlett Foundation provided a grant to the Paso del Norte Water Task Force that supported the development of a similar dataset in the Paso del Norte region, and this effort also produced a seamless GIS database of a shared binational watershed along the borderland (Kennedy, Granados, and Aldouri 2002). This limited review of literature clearly indicates that the watershed or basins perspective has provided considerable utility, at least within the technical GIS arena.

When discussion turns to how a basin or watershed perspective may inform binational water resource policy on the border, the concepts introduced earlier in this paper provide considerable insight. As noted earlier, both the U.S. and Mexico have employed a watershed approach to management of domestic water resources and watersheds with considerable success. Brown and Mumme (2000) and Brown (2002) have explored the potential for borrowing this concept for use in two binational contexts (the Tijuana River and Upper Santa Cruz River Basins). This work revealed a range of governmental and quasi-governmental options to advance such a perspective in various binational basins. However, considerable barriers are also present, and these include political impediments

to innovation within existing federal and state agencies in the U.S. and Mexico, the geographic realities of the regionalization of water resource management in Mexico and the U.S., longstanding socio-cultural and political elements that lead to cross border friction, and issues related to scale.

Limited experience in the Upper San Pedro Basin through research conducted by Browning-Aiken et al. (2002) is also instructive in examining the potential for binational basin approaches. Staff members of the Udall Center for Studies in Public Policy have worked extensively in this basin for the last several years. This work has facilitated a bottom-up coordination of various regional and local voices towards a holistic management regime of water resources. Similar socio-cultural and political issues as those identified in the Tijuana River and Upper Santa Cruz River Basins have posed challenges in the region, yet these experiences do point to considerable potential to advance a basin perspective in a binational context.

Recent experiences in the Paso del Norte region further inform the discussion of how a basin perspective can be linked with public participation in a non-governmental organization (NGO) framework to address binational water resource issues. During the 1980s, a protracted conflict emerged between the public water utility in El Paso, Texas and various governmental units in New Mexico over the purchase of water rights and the exportation of New Mexico groundwater to water users in Texas. After approximately 10 years of litigation, the parties to the dispute agreed to a settlement agreement that set regional conservation goals and called for a settlement commission (which later emerged as the New Mexico/Texas Water Commission - NMTWC) to explore options to “wheel” water currently controlled by Texas agricultural interests to the City of El Paso through proposed re-operation of the Rio Grande Project (Earle and Czerniak 1996). As these discussions unfolded, the NMTWC saw major environmental concerns emerging and established the Paso del Norte Watershed Council to address these concerns.

The mission of the Paso del Norte Watershed Council is to “investigate, develop, and recommend options for watershed planning and management and to explore how water-related resources can best be balanced to benefit the Rio Grande ecosystem and the interests of all watershed stakeholders” (PDNWC 2005, Purpose Statement). The Watershed Council was officially convened in Spring of 2001, and in the last four years, the Council has elected an Executive Committee,

drafted and accepted a set of bylaws and a strategic plan, established several sub-committees to deal with a range of education and outreach activities, raised the initial funds needed to hire staff, and initiated formal projects, including the development of a coordinated regional water resource database to serve Council members research needs (PDNWC 2005). The overarching thrust of Council activities is firmly centered on the environmental issues related to changes in how the Rio Grande is managed for water supply purposes, as stated in the Council’s Strategic Plan.

When we examine the specifics of how the Council has advanced these activities, several issues related to representation of interests and linkages to science, policy and stakeholders are worthy of note (Brown et al. 2002). Concerning representation of stakeholders, the Executive Committee of the Council enjoys active participation from a wide range of public agency and private citizen stakeholders from both Texas and New Mexico. Recent efforts to involve Mexican stakeholders have been somewhat fruitful, and building on this success is an ongoing area of interest for Council members. Council meetings are open to the public with the intent to foster the greatest level of participation that is possible from relevant stakeholders.

Concerning linkages to science, policy and stakeholder interests, the Watershed Council is supported by active participation of university scientists and policy researchers; these linkages are instrumental in connecting the work of the Council to “the science” of the issues at hand. The Council has also been successful in connecting to policy makers at several levels in various sub-regions of the basin, as members of city water utilities and federal agencies are active in the work of the Commission. The Council has been especially successful at addressing stakeholders with a particular focus on the “interests of the environment.” The concerns of environmental stakeholders’ are a priority of council activities, based on the founding mission of the Council, namely to balance environmental concerns with the operation of the river to meet economic development priorities. In the limited time it has been in existence, the Council has provided an open and participatory forum within which diverse voices attempt to reconcile these many interrelated concerns. As a compliment to the research efforts of the coordinated database project, the Council has also advanced outreach and education efforts through bilingual materials that share facets of regional watershed knowledge with a broad audience.

Future areas of research

The International Joint Commission (IJC) has a long history of binational water resource management on the U.S.-Canada border drawing on the watershed perspective, and this experience offers an interesting opportunity for comparative analysis. With respect to specific issues along the US-Canada border, the IJC Reference of 19 November 1998 (IJC 1998) and subsequent IJC documents support the establishment of watershed councils on the U.S.-Canada border. Several potential questions that could be posed in future research are clearly consistent with long term thinking of the IJC, as noted below:

- What are the main governmental and non-governmental institutions and schema that have developed in the two border regions of interest, how did they develop, and what has been the general experience of these institutions?
- What are the respective roles (including the potential for their expansion) of the regional binational water management structures at various levels? These levels include the international level involving watershed boards/councils advanced by the International Joint Commission (IJC) and the International Boundary and Water Commission (IBWC); various unilateral governmental management agencies in the US, Mexico, and Canada; and regional initiatives that have developed around specific water resources issues and water courses.
- What barriers or impediments have developed to impair the functional and spatial enhancement of various institutions, and what steps may be taken to reduce or eliminate these barriers?
- How can the experiences from one of our border regions of interest inform water resource management policy in the other border region?

The research approach and related research questions that I suggest above are consistent with suggestions and recommendations being made by fellow researchers, binational governmental and non-governmental organizations, and the general water resource research literature. These questions also deal with the issues that lie at the core of transboundary water resource management issues along the US-Canada and US-Mexico borders. Progress on answering these questions has the potential to improve

environmental quality and social welfare of residents of both of these border regions.

Closing comments

In this paper, I have introduced relevant water resource management challenges that exist on the U.S. Mexico border, presented a range of perspectives by which these challenges may be approached, and offered some ideas for future research within a comparative research framework. The challenges that the U.S.-Mexico border region faces in meeting numerous and often conflicting demands are considerable, yet the range of ideas and the level of innovation that various researchers offer to meet these challenges is clearly of a breadth and depth to make for most interesting future research efforts that will most likely illuminate the questions posed. Such “lessons learned” are the most useful outcomes of comparative studies, and I suggest that these insights could be of considerable usefulness in applied water resources management along the U.S-Mexico border.

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