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ADVANCING BINATIONAL COOPERATION IN TRANSBOUNDARY AQUIFER MANAGEMENT ON THE U.S.-MEXICO BORDER

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Introduction

In a region of few substantial rivers and a mean precipitation that varies between 21 inches and 5 inches annually it is hardly unusual that groundwater should be a staple in the water budgets of cities and farms alike, or that it would be vital for maintaining the region's ecological resources. Where such the geo-hydrology of such a region is bisected by an international boundary it is hardly unusual that conflicts should and do arise as these resources are appropriated by different national communities. What is, perhaps, unusual is that in a time of greater dependence on groundwater resources and greater understanding of its centrality in the life and progress of this region's resident society that it should remain poorly managed, even neglected from the view of the affected dependencies. And this, unfortunately, describes the situation on the U.S.-Mexican border.

The importance of groundwater to the border economy has long been understood and has certainly grown as surface supplies have dwindled in the face of rapidly growing populations. Throughout the border region it is easy to find communities that are wholly or nearly dependent on groundwater for their water supply.¹ Columbus, New Mexico depends wholly on groundwater as does its Mexican sister city, Palomas, Chihuahua. Douglas, Arizona is whole dependent on groundwater and so, too, is Bisbee, Naco, and Lukeville (Gringo Pass). Even communities astride the border's major river systems rely heavily on groundwater. El Paso, for instance, has until recently sought 80 percent of its water supply from Hueco Bolson, a large subsurface lake straddling the international border. Further down the Rio Bravo, Presidio and Ojinaga depend mostly on groundwater, as does Del Rio, Texas. In the lower Colorado river region, 80 percent of the communities and farms in the Mexicali Valley rely on groundwater. Suffice to say that groundwater has assumed a role and importance that is critical to the survival and improvement of the border region.²

As groundwater has taken on a larger role in the water economy of the region the basic

¹. Stephen P. Mumme, *Minute 242 and Beyond: Challenges and Opportunities for Managing Transboundary Groundwater on the Mexico-U.S. Border*, 40 *Natural Resources J.* 341-378 (2000).

². Alfonso Cortez-Lara and Maria Rosa Garcia-Acevedo, *The Lining of the All-American Canal: The Forgotten Voices*, 40 *Natural Resources J.* 272 (2000).

truth is our institutions have not caught up. We are today operating in an institutional environment heavily predicated on an older set of operating assumptions that remain out of sync with modern conceptions of sustainable development and water management. The situation is complicated by the international boundary and the abutment of two rather different socio-economic and administrative approaches to national water management. At this international level our current institutional arrangements remain heavily focused on the allocation and management of surface water and relatively inflexible in addressing a growing range of water management needs that include the management of shared aquifers the reach and breadth of the border. This reality is reflected in a growing number of actual or potential binational conflicts related to groundwater in the border area.³

While the prospect for settling these disputes in a cooperative manner remains clouded it is certainly true that the heightened visibility of these issues coupled to the urgent need for secure water supply has changed the situation somewhat over the past decade. To better understand the chances for advancing binational cooperation in this area it is necessary to consider the enduring impediments to binational cooperation as well as the emerging opportunities for progress in this area. In the pages that follow this paper provides a brief background on binational relations in this area and surveys the present status quo. It then reviews the critical constraints and opportunities influencing binational cooperation on transboundary groundwater problems. The paper concludes by identifying some situations and approaches with promise of generating greater binational cooperation on transboundary aquifer management in this decade.

Binational Cooperation on Transboundary Groundwater: Minute 242 and its Aftermath

The institutional marker for tracking binational progress in managing border groundwater aquifers is certainly the International Boundary and Water Commission's Minute 242, struck in August 1983.⁴ Some discussion of this minute is necessary as it both responds to and sets a frame of expectations for binational cooperation in groundwater management that is with us to this day.

The origins of Minute 242, of course, lie in the U.S.-Mexican crisis over salinity of the Colorado River, a crisis, or conflict that endured more than a decade from 1961 to eventual settlement in 1973. Between 1965 and 1973, to compensate for the degraded Colorado River treaty water received from the United States, Mexican farmers drilled nearly 600 wells for

³. Mumme, *supra* note 1.

⁴. See Int'l Boundary & Water Comm'n, *Minute 242: Permanent and Definitive Solution to the International Problem of the Salinity of the Colorado River*, 15 NAT. RESOURCES J. 2, 2-9 (1975) [hereinafter *Minute 242*].

agricultural purposes in the Mexicali valley and San Luis Rio Colorado mesa.⁵ Mexican pumping on the San Luis mesa alarmed U.S. farmers south of Yuma, Arizona who were similarly dependent on groundwater—owing to the known aquifer gradient favoring Mexico. As negotiators finalized a settlement on salinity in 1973 they thought it wise to incorporate a moratorium on new groundwater development in the area and seize the opportunity to address a well recognized lacunae in the landmark 1944 Water Treaty that apportions water between the two countries in the Colorado and Rio Grande river basins.

Thus, in addition to its better known impact on the management of salinity in the Colorado river, Minute 242 became and remains the only bilateral agreement directly addressing the management of groundwater underlying the international boundary. The minute has a number of interesting features that are set out in Resolutions 5 and 6.⁶

- Resolution 5 requires that “each country shall limit pumping of groundwaters in its territory within five miles (eight kilometers) of the Arizona-Sonora boundary near San Luis to 160,000 acre-feet (197,358,000 cubic meters) annually.
- Resolution 6 stipulates that “With the objective of avoiding future problems, the United States and Mexico shall consult with each other prior to undertaking any new development of either the surface or the groundwater resources, or undertaking substantial modifications of present developments, in its own territory in the border area that might adversely affect the other country.”
- Resolution 5 arguably implies a commitment on the part of the two countries to seek to achieve “a comprehensive agreement on groundwater in the border areas . . .” The Resolution’s lead sentence begins with the conditional phrase, “Pending the conclusion by the Governments of the United States and Mexico of a comprehensive agreement on groundwater in the border areas . . .”

In the matter of groundwater management Minute 242 remains a highly controversial agreement. Aside from the fact that Minute 242 remains the only binational agreement regulating groundwater pumping at a specific location within a specific aquifer in the border area, it commits the two countries to consultation on new groundwater development in shared aquifers borderwide and contains the tantalizing promise of a binational effort spearheaded by the federal governments to attain a generalized bilateral agreement on the management of share aquifers. A number of aspects of this agreement warrant some further comment.

First and perhaps foremost, the development of the Minute 242's commitment on groundwater lacked the level of political support that was necessary to move forward in this

⁵. Evan R. Ward, BORDER OASIS 96 (2003).

⁶. op.cit., Int’l Boundary and Water Comm’n, *Minute 242*.

policy area. There is ample reason to suppose the agreement was widely viewed by the U.S. Colorado River basin states as an infringement on state authority to regulate groundwater within their respective borders.⁷ Colorado's governor expressed these sentiments at the time.⁸ The agreement's chief U.S. negotiator, Herbert Brownell, presented the represented the groundwater amendment to Congress as essentially non-binding.⁹ Even Arizona authorities, who certainly signed on to the pumping limit at San Luis, were known to have resisted negotiating with Mexico on groundwater, lobbying successfully instead for a major well-field in Yuma County just outside the agreed upon geographical limit.¹⁰ While there were certainly some pressures from Mexico and from certain quarters of the agricultural and scholarly community in the U.S. to consider addressing groundwater management on the border, in general we can say with authority there was no great enthusiasm for this undertaking by most U.S. water stakeholders in basin or the border area. If anything, it was irksome to many that a link to groundwater had been drawn to the 1944 Treaty and that a precedent might have been set by regulating groundwater in one specific region of the border.¹¹

Second, it doubtful that the minute was intended to apply comprehensively to groundwater quality even though its larger operational context and principal clauses are related to Colorado River salinity. It is certainly true that the diplomatic record refers to the problem of water quality only as related to salinity.¹² Resolutions 5 and 6 center on the problem of apportionment, though nothing in the minute restricts the governments from consulting on development threatening the quality of groundwater stock or addressing the problem in a future binational agreement.

Third, there are few terms of reference that apply to the implementation of the agreement. The 1944 Water Treaty itself is distinctive for its lack of referent terms. Minute 242 as such contains no terms of reference defining concepts in the text. The concept of "border areas," for

⁷. See, comment's by Ival Goslin, Executive Director of the Upper Colorado River Commission, as quoted in Dean E. Mann, *Politics in the United States and the Salinity Problem of the Colorado River*, 15 *Natural Resources J.* 215 (1975).

⁸. Ival Goslin, *Colorado River Development*, in *VALUES AND CHOICES IN THE DEVELOPMENT OF THE COLORADO RIVER BASIN* 18, 56-57 (Dean F. Peterson & A. Berry Crawford, eds., 1978).

⁹. Ward, *BORDER OASIS*, 135.

¹⁰. *Ibid.*

¹¹. Goslin, in Mann, *supra* note 7.

¹². See, for instance, Steve Zamora to Mark B. Feldman, Confidential Memorandum, Legal Interpretation of the Term "From Any and All Sources" in the 1944 Water Treaty with Mexico. NACP, RG 59, POL 33-1 (August 27, 1971).

instance, is undefined. Are we to assume it means eight kilometers either side of the international line? Or should we apply a more contemporary bureaucratic definition of the border area as 100 kilometers either side of the border? Or might it be acceptable to define the border on a watershed, or aquifer, basis? The simple truth is there is no binational operational agreement on this term or any others. What, for instance, are we to make of the obligation to “consult”? What does this entail?

In short, aside from a few particulars, in the area of groundwater, Minute 242 was politically ahead of its time. Since the agreement was struck the two governments have paid something more than lip service to groundwater aspects of the agreement, informing each other of groundwater related development in the lower Colorado River region, on the Santa Cruz River, and in the El Paso-Cd. Juarez area and other locations. A few cautious feelers have been put forward since the mid-1990's on the question of exploring groundwater agreements in certain areas but these efforts were not pursued.¹³ The one concrete accomplishment that might be attributed to the authority of Minute 242—though no further formal action has entered the IBWC’s official ledger to this effect—is recent support for aquifer analysis and data sharing that has been driven, in part, by the institutional momentum and sustainable development imperative of the Border XXI Program and its recent successor, Border 2012. I will have more to say of this later in the paper.

In sum, if we narrowly examine what the governments have accomplished under Minute 242 in the last 30 years we see negligible progress towards sustainable management of transboundary groundwater aquifers. What the federal governments have largely done for three decades is steadfastly defend their sovereign right to exploit the resource through the operant legal regimes that apply in the relevant administrative zones where the aquifers lie. This reality has contributed to a race to the bottom in various localities along the border. The reasons for this sorry state of affairs are various but rooted mainly in the decentralization of the water law and administration in the U.S. and the concomitant political difficulty of regulating private utilization of these supplies in the absence of a serious threat to urban water supply or at least the perception of such. To better understand this predicament is helpful to look at the principal constraints on binational management of transboundary groundwater.

Constraints on the Binational Management of Groundwater Resources

Binational cooperation on managing shared aquifers confronts a range of serious constraints that continue to restrict federal initiative in this policy area. These limitations or obstacles can be generally categorized as legal, political, diplomatic, economic, and hydrological

¹³. Arturo Herrera, interview with Stephen Mumme, Cd. Juarez, Chihuahua (May 29, 2002).

in nature.

Legal constraints. Historically, the legal barrier to managing transboundary groundwater has been quite high. In both Mexico and the U.S., groundwater may legally be claimed as property and much of the groundwater found in our transboundary aquifers is owned individuals rights holders. How rights are claimed and regulated, however, varies considerably from country to country and, in the U.S., from state to state. Mexico still follows a centralized regime in water management that allows the government to legally assert an interest in the proprietary use of groundwater resources.¹⁴ While groundwater ownership is appurtenant to ownership of overlying property and owners are otherwise free to use the water as they see fit subject to an obligation not to injure other parties, the utilization of groundwater may be legally regulated by the Mexican state. Under the authority of the Mexican constitution's famous Article 27 and Mexico's National Water Law, inclusive of its most recent version enacted this year, the federal government, acting through the National Water Commission, may designate groundwater protection areas and regulate their use.¹⁵ Proprietors may challenge administrative decisions but appear to be in a comparatively weak position to do so given the strong presumption in favor of federal administration. Recent changes in Mexican national law actually reinforce federal authority over groundwater ownership and extraction while otherwise promoting a more decentralized approach to water management than in the past that gives states greater voice in regional water policy.¹⁶

In the U.S., however, legal administration of groundwater is decentralized, situated at the state level. All four U.S. border states, Texas, New Mexico, Arizona, and California, operate under different groundwater management regimes, though an underlying constant in border states' legal practice has been to grant broad latitude to individual proprietors to exploit the resource. A brief description for each state's legal system follows below.

Texas's legal regime remains the most permissive, essentially attaching groundwater, unless otherwise specified, to the ownership of overlying property and allowing unfettered extraction of groundwater unless an adjoining proprietor is able to establish damage arising from such pumping. While state law authorizes the Texas Water Commission to regulate groundwater, the agency has been loathe to do so in the face of adverse court decisions questioning its regulatory authority.¹⁷ The exception here is those localities that have taken advantage of recent state conservation legislation authorizing the establishment of voluntary groundwater conservancy districts.¹⁸ The TWC has consequently functioned as more of a

¹⁴. MEX. CONST. art. 27 (amended 1983); *Ley Nacional de Aguas*, 1992, revised 2004.

¹⁵. *Ley Nacional de Aguas*, 1992, revised 2004.

¹⁶. *Ibid.*

¹⁷. M. Diane Barber, *The Legal Dilemma of Groundwater Under the Integrated Environmental Plan for the Mexican-United States Border Area*, 24 St. Mary's L. J. 676 (1993).

¹⁸. *Ibid.*, 678.

facilitator for local areas considering such initiatives. Because the districts are voluntary, in the absence of further legislation defining groundwater rights and practices the system provides considerable latitude for private challenge to conservancy district regulatory actions.¹⁹

New Mexico law establishes groundwater as public property to be utilized subject to the doctrine of prior appropriation which requires substantiation of a pattern of beneficial use. Groundwater permits are issued by the State Engineer conferring a legal right to groundwater utilization that may be sold or otherwise transferred provided a beneficial use is maintained.²⁰ New Mexico is also unique among the border states in that state courts have established a hydrological connectivity between groundwater and surface water.²¹

Arizona has long used the doctrine of reasonable use that allows an overlying property owner to use the water beneath the land so long as it is used beneficially and reasonably as determined by the court when and if disputes should arise among co-adjacent owners.²² It also follows a general statute, the Arizona Groundwater Management Act, adopted in 1980. This law establishes four Active Management Areas intended to help conserve groundwater in each area. Each area is required to establish a groundwater management plan.²³ Groundwater pumping in these areas is measured. Existing irrigation is protected but any new irrigation development is prohibited and extant pumpers are encouraged to consider use modifications that conserve groundwater.²⁴

California, in contrast, does not have a general law regulating groundwater use and relies mainly on correlative rights doctrine supplemented by various other doctrines for adjudicating disputes on extraction.²⁵ Under this practice the overlying landowner retains a proprietary right to groundwater contingent on others' rights to use the same aquifer. The principle of prior appropriation is used if extracted water is not used on the overlying land and the principle of mutual prescription may be employed in situations of overdraft.²⁶ Like Texas, California permits

¹⁹ .

²⁰ . Barber, *op. cit.*, 675.

²¹ . Ibid.; Micha Gisser, Economic Aspects of Water in New Mexico 2. Rio Grande Foundation (www.riograndefoundation.org)(2004).

²² . Ibid, 671.

²³ . Ibid. 670, 671.

²⁴ . Ibid., 671.

²⁵ . Ibid., 668.

²⁶ . Ibid., 669.

local water districts to establish safe yield limits and regulate groundwater withdrawals. Such districts have been used to regulate use and recharge groundwater pools.²⁷

In sum, the decentralization of groundwater management at the state level is a serious impediment to bilateral groundwater management initiative. Not only are the four border states jealous of their state sovereignty and legal traditions affecting groundwater extraction and use, the actual practices various substantially, complicating the development of any uniform approach to groundwater regulation at the binational level. In the U.S., federal initiative, insofar as it may be found, operates mainly through national statutes on sanitation and pollution, the Federal Water Pollution Control Act Amendments, the Water Quality Act, Safe Drinking Water Act, Clean Water Act, and National Environmental Protection Act, to name the most prominent of these statutes. These laws are not insignificant pieces of the regulatory picture affecting groundwater but thus far have been used with little effect in prodding states to consider exploring the utility of binational cooperation in managing common groundwater resources.

Political-Diplomatic Constraints. The decentralization of groundwater law and management within the U.S. federal system is further associated with substantial state political influence in the crafting of federal law and administrative practice in national water policy. Political scientists studying U.S. water politics have long noted this tendency. The crafting of federal water policy remains arguably the most decentralized sphere of U.S. national policy making. By one scholar's count at least 70 different congressional committees and sub-committees now influence federal water policy development.²⁸ Federal agencies heavily vested in water policy, the U.S. Bureau of Reclamation, for instance, are often viewed as dependencies of Congress, administrative agencies that are disproportionately dependent on congressional oversight in matters of both budget and policy.²⁹

This reality is certainly evident in the politics of the principal federal agency charged with administering binational treaty commitments with Mexico pertaining to water and taking the diplomatic lead in seeking solutions to binational water disputes. Established under authority of the 1944 U.S.-Mexico Water Treaty, the International Boundary and Water Commission's United States Section has historically functioned as a virtual congressional agency.³⁰ Technically, the agency is a part of the Department of State. Since 1945 it maintains an IBWC Liaison Officer in the Office of Mexican Affairs, runs its budget through the Department and looks to State formally for executive approval of its administrative acts. Its

²⁷. Ibid., 668.

²⁸. Walter Rosenbaum, ENVIRONMENTAL POLITICS & POLICY 66 (2002).

²⁹. Arthur Maass--

³⁰. Stephen P. Mumme and Scott T. Moore, *Agency Autonomy in Transboundary Resources Management: The United States' Section of the International Boundary and Water Commission, United States and Mexico*. 30 Natural Resources J. (1990).

Commissioner under treaty enjoys the diplomatic rank of ambassador.³¹ From a strictly political perspective, however, it is still heavily dependent on the support of the U.S. border and basin states that comprise its operational constituency. The U.S. Section remains officially autonomous of State for purposes of personnel and operational management. Its appropriations run through a House Appropriations Committee sub-committee that historically defers to border state interests in the agency's authorizations. The simple reality is that with the four border states commanding 96 seats in the U.S. House of Representatives no sitting U.S. president is particular anxious to mount a challenge on border water issues. Politically it is only a slight exaggeration to claim that where water is concerned, border state sovereignty is national sovereignty at the White House.

The political-diplomatic reality is such that the IBWC-US Section should not be expected to take the initiative in developing proposals for transboundary groundwater agreements in the absence of clear support from the affected U.S. state or states. Each border state has, in effect, an operational veto on the U.S. Section's initiative with the singular exception that the U.S. Commissioner has treaty authority to exchange information with his Mexican counterpart and, since Minute 242, an obligation to report those U.S. developments that would likely affect groundwater extraction in Mexico within the eight kilometer border strip

The situation is politically different in Mexico where the Mexican Commission, the Comision Internacional de Limites y Aguas (CILA), operates under the thumb of the Mexican Foreign Ministry. Since Mexico's greater democratization in 2000, Mexican governors and elected representatives have become more assertive in expressing an interest in water policies affecting their states but water policy is still highly centralized and border water matters are sufficiently nationally visible to require a substantial executive interest in their resolution. If the Mexican Commissioner is able to convince Mexico's the Foreign Ministry of the value of a overture to the United States, and if the proposal passes muster at Mexico's sub-cabinet on water, loosely consisting of the Environmental Secretariat's National Water Commission, the Secretariat of Agriculture, the Mexican Treasury Secretariat, and presidential staff, then the Mexican Commissioner may be authorized to proceed. In an interview in 2002, however, the Mexican Commissioner noted that Mexico has only made one such proposal to the U.S. and this was limited to a request to negotiate a particular groundwater dispute, that involving the All-American Canal in the lower Colorado River region of California.³² Mexico's caution here is likely related to its perception of the high stakes involved in groundwater matters, the potential politicization of these issues, a desire to maintain favorable relations with the U.S., and its understanding of the limitations of the U.S. executive in this policy area.

³¹. Treaty with Mexico Respecting Utilization of Waters of the Colorado and Tijuana Rivers and of the Rio Grande, Feb. 3, 1944, 59 Stat. 1219 (1945), T.S. No. 994 (effective November 8, 1945)[hereinafter cited as 1944 Water Treaty].

³². Arturo Herrera, *supra* note 13.

The political and diplomatic constraints, then, are set by the general decentralization of water policy in the U.S. and the difficulty of generating the political support of the border states that is most certainly prerequisite to any serious exploration of a transboundary groundwater agreement. While Mexico is certainly in a better position to advance a federal interest in such an agreement, its reserve in doing so seems conditioned on both an understanding of the political difficulty of moving forward in the U.S., the liability to a Mexican president should any initiative come to naught, and a broader interest in maintaining favorable relations with the U.S.

Economic Constraints. At least some of the constraints limiting binational cooperation on managing transboundary groundwater aquifers are economic in nature. Most water economists would argue that market forces are an important influence on institutional practices in water management. Price is a critical element here. Where prices are low there is apt to be little awareness of scarcity and limited interest in conservation of existing supply whether the source be above or beneath the surface. An economist would argue that an awareness of scarcity is the essential precondition for any earnest impulse toward the cooperative management of a common pool resource like groundwater. Until recently, perhaps even now, these economists would argue that the price of water in the border region has simply been too low to drive a sense of urgency amongst water managers and the public at large, domestically or binationally.

Information is another critical element. Not only is information necessary to gauge prices, the difficulty of acquiring information contributes to the transaction cost that add to the cost of purchasing water from different sources. So long as cheaper supplies may be had there is little incentive to acquire further information or pay greater transaction costs.

If we look at these variables as they are manifest at the border we can begin to understand why the two countries have had limited interest in greater cooperation on groundwater. At the present time upwards of 80 percent of all border area water is consumed by agricultural on both sides of the border.³³ While agricultural water prices vary along the U.S. reach of the international boundary it has been almost uniformly true that water has been cheap with prices held low by federal and state subsidies. In California's Imperial Valley, the largest claimant and arguably the greatest single beneficiary of the complex domestic and international agreements allocated Colorado River water, the average cost per acre-foot of field water delivered is currently just below 15 dollars.³⁴ In Arizona, where prices have been influenced by the Central Arizona Project, CAP irrigation is more expensive, selling for nearly 80 dollars an

³³. Stephen P. Mumme and Ismael Aguilar Barajas, *Managing Border Water to the Year 2020: The Challenge of Sustainable Development*, THE U.S.-MEXICAN BORDER ENVIRONMENT, BINATIONAL WATER MANAGEMENT PLANNING 58 (Suzanne Michel, ed., 2003).

³⁴. University of California Cooperative Extension, Imperial Valley. Imperial Valley Agriculture (<http://commserv.ucdavis.edu/CEImperial/overview.htm>).

acre-foot.³⁵ Municipal-industrial water controlled by urban water districts normally requires more treatment and fetches higher prices, yet until recently El Paso still paid the El Paso County Water Improvement District as little as 15 dollars an acre-foot for Rio Grande river water.³⁶ Proprietary groundwater is even less expensive. Proprietors essentially use water at the cost of lift and conveyance. In South Texas, depending on the utility source, groundwater pumpers effectively pay between six and nine dollars an acre-foot with no limit on their ability to pump under Texas' permissive law of capture.³⁷ The situation is similar in New Mexico where one water economist claims that "owners of domestic wells treat water as a free good."³⁸

Such low prices for raw water tend to reduce demand for institutional mechanisms requiring a higher level of social regulation in managing water resources. Insofar as needs can be easily satisfied through ready access to abundant supply coupled with low transaction costs, social demand for more complex management mechanisms is lessened.

Lack of adequate information is also impedes binational cooperation. It is still true that little is known concerning the available supply, quality, and fluid dynamics of transboundary aquifers. As a resource, the information costs associated with groundwater are high. Groundwater analysis and modeling is not only expensive but the science remains inexact.³⁹ Until the mid-nineties, neither the U.S. Geological Survey, the IBWC's U.S. Section, or most state agencies had seriously studied groundwater characteristics in the border area with the possible exception of the El Paso region along the Rio Grande and the lower Colorado River aquifer in the All American Canal zone. While various studies had been made by USGS and U.S. state water authorities—New Mexico has been quite active, for instance—these studies were not and in most case are still not considered reliable measures of water stock or flow at the international border. Mexican studies were similarly sporadic, non-comprehensive, and inconclusive. Both countries were reluctant to share their best data on joint aquifers and unwilling to engage in joint research and data gathering.

From an economic point of view, then, a critical element is wanting for understanding the value of transboundary groundwater or placing a price on the resource. Much of what was claimed about transboundary groundwater over the last half century remained highly speculative.

³⁵. Central Arizona Project, Delivery Rates for Various Classes of Service (www.cap-az.com) (2004).

³⁶. David Crowder, *Water-ration plan may be considered*, EL PASO TIMES B-1 (August 3, 2000).

³⁷. David Eaton,

³⁸. Gisser, *supra* note 21.

³⁹. Robert Glennon, WATER FOLLIES 30-31, 210 (2002).

The Texas State Water Plan in the 1970's projected a 50 year supply of groundwater for the El Paso region based on extraction rates, demand projections, and what was known of groundwater availability in the important Hueco and Mesilla bolsons, but this was an educated guess given what was then known of the aquifer.⁴⁰ Even less was known of other locations.

Taken as a set, these various constraints, legal, political-diplomatic, and economic, still pose a considerable deterrent to binational cooperation on transboundary groundwater management. And yet they may not be insurmountable. Some recent developments in the international arena and the border area are beginning to offset these longstanding constraints. These developments suggest that the longstanding binational impasse on managing transboundary aquifers may yet be resolved in a cooperative fashion.

Emerging Opportunities for Binational Cooperation

In little more than a decade a number of important developments in the border area have begun to challenge the longstanding resistance to binational cooperation on transboundary groundwater. These trends include the rapid urbanization of the border region and the reallocation of water supplies, the threat posed by prolonged drought, the recent elevation of water issues on the binational agenda, and the emergence of new institutions and practices for managing water in the border area. While none of these developments in itself should be considered decisive in producing a diplomatic breakthrough in this issue-area, we are witnessing a shift in outlook that may well lead to new cooperative initiatives in managing transboundary aquifers.

Urbanization and Changing Demand for Water. Urban development in the U.S.-Mexico border region continues to outpace national trends in both countries and this fact is the most critical social indicator influencing water demand. Between 1980 and 1995 the population of U.S. border counties rose by 45 percent, the population of Mexico's border adjacent municipios rose by 60 percent.⁴¹ Conservative estimates predict a 39 percent increase in U.S. county population between 2000 and 2020 and an 85 percent increase for Mexican municipios in the same interval.⁴² Mexican border water consumption is expected to double in this interval, based on demographic growth and per capita consumptive use trends.⁴³

⁴⁰. Texas Water Development Board, *Water for Texas* (1977).

⁴¹. James Peach and James Williams, *Population and Economic Dynamics on the U.S.-Mexican Border: Past, Present, and Future Trends*, THE U.S.-MEXICAN BORDER ENVIRONMENT: A ROAD MAP TO A SUSTAINABLE 2020, 37-73. (P. Ganster, ed., 2000).

⁴². *Ibid.*, 53.

⁴³. Mumme and Aguilar, *supra* note 33, 58.

These trends are hiking up urban water prices and driving transfers of agricultural water to municipalities all along the border. El Paso County recently negotiated a deal with the city that charges 193 dollars an acre foot for Rio Grande water.⁴⁴ In San Diego, the county water authority now delivers Colorado River water purchased from the Metropolitan Water District water to consumers at 565 dollars per acre-foot.⁴⁵ In South Texas, irrigators now actively market water to local municipalities responding to the greater market value of urban water.⁴⁶ As prices rise so does incentive to cooperate in managing scarce water resources. It hardly comes as any surprise that incipient demand for better binational cooperation on groundwater has emerged in metropolitan zones along the border where water is scarce and prices have begun to rise dramatically.

Water Quality. Environmental cooperation since NAFTA has given greater priority to the problem of water quality in the border region, drawing attention to the critical link between pollution and groundwater contamination. Beginning with the Integrated Border Environmental Plan in 1992, the environmental ministries identified groundwater contamination as one of the critical issues needing further study in the border region.⁴⁷ The Border XXI Program that followed sustained this emphasis. The new Border Environment Cooperation Commission (BECC) further emphasized the protection of potable water supply in border communities, financing projects that took pollution prevention into account. In 1993 the IBWC undertook a landmark study of the water quality of the Rio Grande river that signaled a new level of binational cooperation in monitoring water quality in concert with the national and state environmental authorities.⁴⁸ In response to environmental concerns, it has since gathered data on groundwater quality in proceeding with development of a transboundary groundwater database.⁴⁹ This heightened awareness of the importance of managing transboundary groundwater

⁴⁴. Crowder, *supra* note 36.

⁴⁵. Suzanne Michel, Personal correspondence with Stephen Mumme, June 10, 2004.

⁴⁶. Environmental Defense, Texas Living Waters Project, Water Marketing, Issue Paper No. 3 (n.d.).

⁴⁷. U.S. Environmental Protection Agency, Integrated Environmental Plan for the Mexican-U.S. Border Area (First Stage, 1992-1994), A92-171.toc, (1992); Barber, *supra* note 17.

⁴⁸. IBWC, United States Section. Binational Study Regarding the Presence of Toxic Substances in the Rio Grande/Rio Bravo and its Tributaries Along the Boundary Portion Between the United States and Mexico, Final Report (September 1994); William A. Wilcox, *Mexico and the United States: The Trans-Boundary Water Quality Issues that Lie Ahead*, Western Water Law 137 (1999).

⁴⁹. IBWC, Transboundary Aquifers and Binational Groundwater Database of El Paso/Cd. Juarez Area, A Binational Publication (January 1998).

to safeguard urban water supply has broadened the scope of debate on groundwater management at the border.

Severe, Prolonged Drought. Drought has afflicted the border region now for more than a decade in most locations and is expected to persist in both the Colorado and Rio Grande River basins. The spectre of drought in the two major river basins serving the border region has already provoked institutional responses that accentuate public attention to the importance of groundwater and groundwater management in the border area. In general, groundwater is seen as a hedge against scarcity. Texas' 2002 State Water Plan identifies drought a critical factor defining the need for further conservation and wise water use and points to groundwater as the key source of water augmentation in response to water scarcity.⁵⁰ On the Rio Conchos, a major tributary of the Rio Grande river, Mexican irrigation districts have stepped up drilling and development of groundwater, reducing runoff to downstream communities in Mexico and the U.S.⁵¹ Municipalities like El Paso are looking to develop major inter-basin transfers from remote well-fields to augment their water supply.⁵² On the Colorado river where a host of conservation measures are now being implemented in response to drought groundwater stock is being both recovered and augmented. The lining of the All-American canal, for instance, is intended to recover water now lost to Mexico while other aquifers in the basin are targeted for recharge, infusion, and the banking of any surplus surface water as may come available.⁵³

⁵⁰. Texas Water Development Board, *WATER FOR TEXAS*, 2002, 72 (January 2002).

⁵¹. Mary E. Kelly, *The Rio Conchos: A Preliminary Overview*. Texas Center for Policy Studies (January 2001). Available at TCPS website (www.texascenter.org).

⁵². Gary Scharrer, *Plan would sell Texans their own water*, *EL PASO TIMES* (November 2, 2003); Ralph Blumenthal, *West Texans Sizzle Over a Plan to Sell Their Water*, *NEW YORK TIMES* (December 11, 2003).

⁵³. U.S. Bureau of Reclamation, *Final Environmental Impact Statement, Colorado River Interim Surplus Criteria* (December 2000); U.S. Bureau of Reclamation, *Draft Environmental Impact Report: All-American Canal Lining Report* (1991).

This heightened emphasis on groundwater recovery as a response to drought has not directly affected binational water management discussions beyond the case of the All-American canal but is certainly a factor on the minds of rural and municipal water managers border-wide. Drought complicates the problem of demographic growth for water provision and adds to the urgency of securing a reliable supply. It is now an important force behind a more intensive search for alternative water sources from a menu of options that includes groundwater extraction, storage, blending, reuse, desalinization, and importation or any combination of these. It is in this sense that drought presents an opportunity for innovative thinking concerning transboundary groundwater management.

The Institutional Context for Binational Water Management. Institutional change may well be the most important contextual factor shaping the prospects for cooperation on transboundary groundwater. In little more than a decade the institutional milieu has markedly changed on the border. These changes include both new organizations and new approaches to managing shared water resources. They have also nurtured new advocacy groups, greater public participation, and growing support for further reform of water management practices on both sides of the border. This changing context has several aspects. It is evident in the establishment of new management institutions and advisory groups with water management mandates. It is evident in the reshaping of established institutions like the IBWC. It is seen in the incorporation of a broader range of participants and stakeholders in border water discussions and policy development. And it is seen in the development of new models for binational cooperation at the subnational level.

Binational Institutions, Old and New. At the binational level our institutional approach to managing common water resources has been dominated since 1945 by the International Boundary and Water Commission, supplemented after 1983 by a framework for discussion and deliberation set out in the La Paz Agreement. The IBWC, operating under the authority of the 1944 U.S.-Mexican Water Treaty, was given responsibility for implementing and interpreting the water and boundary treaties in force between the two countries with the consent of the governments.⁵⁴ Its brief had mainly to do with monitoring and enforcing the rules for allocating the water of the Rio Grande and Colorado rivers and, secondarily, with designing solutions for border sanitation problems. Its jurisdiction was highly circumscribed, limited to matters affecting the boundary as such. It operated as a diplomatic agency, defensive, insular, secretive, and responsive to a privileged constituency of interests and actors, in the U.S. consisting mainly of government agencies, irrigation districts, and utilities. This system had and still has many limitations, not the least of which are its limited jurisdiction, range of functions, and public procedures.⁵⁵ When the IBWC proved unable to tackle an emerging range of water quality

⁵⁴. 1944 Water Treaty, *supra* note 31.

⁵⁵. Stephen P. Mumme, *Innovation and Reform in Transboundary Resources Management: A Critical Look at the International Boundary and Water Commission, United States and Mexico*, 33 NATURAL RESOURCES J. 93-120 (1993).

problems, the La Paz Agreement came about as a binational response to these limitations. Under this arrangement the two countries meet annually in formal session and more often in informal workgroups to discuss binational environmental problems, including those that are water related, and endeavor to find solutions or at least monitor developments to such a time that more effective action is needed.⁵⁶ The IBWC was acknowledged by the La Paz Agreement as the lead agency for the two governments in transboundary water matters.⁵⁷

While these arrangements successfully addressed some binational water problems they were widely viewed in the border community as inadequate responses to a growing range of water supply and water quality needs. When negotiations on the North American Free Trade Agreement commenced, environmentalists and municipalities seized the opportunity to press the governments to do more to protect the border environment. The governments responded in three ways, first by beefing up the La Paz Agreement, second, by establishing institutional tandem of the Border Environment Cooperation Commission and the North American Development Bank, and third, by creating the North American Commission for Environmental Cooperation. Each of these developments added important institutional capacity for addressing binational water disputes.

The process of strengthening the La Paz Agreement has been an ongoing effort, beginning with the short-lived Integrated Border Environmental Plan, succeeded by the Border XXI Program, and replaced in 2002 by the new Border 2012 Program.⁵⁸ While space does not permit a fuller discussion of the details of these successive binational programs they have in common two important features that should be known. First, starting with the IBEP, the governments through their respective environmental ministries adopted the language of sustainable development as a rationale and a purpose of binational cooperation for environmental protection. While this may be easily criticized as empty rhetoric, it is not. The language of sustainable development, following its articulation at the international level at the Rio Summit and elsewhere, is associated with a further commitment to procedural transparency, to administrative decentralization, and public participation. It is also associated with a new commitment to indicators and measurement, to integrative policy analysis, to the enforcement of applicable rules and procedures and, in the case of water, to an embrace of watershed management principles. None of this is stated explicitly in the La Paz Agreement. Second, the governments committed additional resources to supporting the program, reflecting a modestly

⁵⁶. Agreement on Cooperation for the Protection and Improvement of the Environment in the Border Area, Aug. 14, 1983, U.S.-Mex, T.I.A.S. No. 10,827 [hereinafter referred to as the La Paz Agreement].

⁵⁷. Ibid.

⁵⁸. U.S. Environmental Protection Agency, Border 2012: U.S.-Mexico Environmental Program, EPA-160-R-03-011 (May 5, 2003).

higher priority for these functions.⁵⁹

This elaboration of the La Paz Agreement is directly associated with the modest level of progress in binational groundwater management we have seen to date. Under the Border XXI Program the two governments agreed, with the selective cooperation of the IBWC and other federal and state agencies in both countries, to sponsor cooperative assessment of the Hueco and Mesilla Bolsons in the El Paso-Cd. Juarez region and the Santa Cruz River aquifer at Nogales. The first water quality assessment of the Mimbres aquifer at Columbus, New Mexico-Palomas, Chihuahua was also funded.⁶⁰ The La Paz initiatives have also been the catalyst for the creation of citizen based watershed advisory bodies border wide. Under the new Border 2012 Program, which is more decentralizing than its predecessor, new environmental task forces are being formed in particular zones with a brief, among other priorities, to target solutions to local watershed problems.⁶¹ These task forces are highly inclusive, incorporating municipalities, tribal governments, and non-governmental organizations as members and are open to the public for a broader base of public participation as they tackle water issues.⁶²

The Border Environment Cooperation Commission and the North American Development have added further capacity for addressing groundwater management at the border.⁶³ Established with NAFTA, the BECC-NADB duo were intended to support and facilitate the development of new water projects in the border area to include potable water and sanitation facilities and to do so in a manner that clearly advanced sustainable development in impacted communities.⁶⁴ In 2001 their operational mandate broadened to incorporate a wide range of environmental projects, extending to water conservation and pollution prevention.⁶⁵

⁵⁹. U.S. Environmental Protection Agency, Border XXI Program Framework Document, Appendix 4, EPA 160-R-96-003 (October 1996).

⁶⁰. U.S. Environmental Protection Agency, Compendium of EPA U.S.-Mexico Border Activities, EPA 160-B-99-003 (1999).

⁶¹. U.S. Environmental Protection Agency, Border 2012, *supra* note 58, 27-28.

⁶². *Ibid.*

⁶³. Agreement Between the Government of the United States of America and the Government of the United Mexican States Concerning the Establishment of a Border Environment Cooperation Commission and a North American Development Bank, Jan. 1, 1994, U.S.-Mex., T.I.A.S. No. 12, 516.

⁶⁴. Lenard Milich and Robert G. Varady, *Openness, Sustainability, and Public Participation: New Designs for Transboundary River Basin Institutions*, 8 J. Env't & Dev. 258, 292-93 (1999).

⁶⁵. Border Environment Cooperation Commission, BD-032/00, Resolution of the Board of Directors, Expansion of Projects to be Considered for Certification (December 2000). Available on the BECC/COCEF website (www.cocef.org).

These new facilities effectively allow the BECC to support and fund any useful water conservation or water quality project that would enhance groundwater protection and supply in the border area. While BECC has mainly supported domestic projects on one side of the border or the other, it has supported some binational water projects.⁶⁶ There is no reason in principle why it could not do so in support of a binational cooperative groundwater management program. Its sustainable development project approval criteria are particularly congenial to any project conceived and framed as advancing watershed management in the affected area.

Yet another institutional innovation is the Good Neighbor Environmental Board, established by Congress in 1991. GNEB was created as presidential advisory board housed within the U.S. Environmental Protection Agency whose mandate is to advise the U.S. government on important environmental concerns of the border community.⁶⁷ GNEB is comprised of government, private sector, and non-profit representatives from different regions of the border area and conducts public hearings on environmental matters in preparation of its annual report on the border environment. Though it a domestic and not a binational board its reports have been highly sensitive to Mexico and cross-border issues and the need to move the La Paz Agreement agenda forward. Since it published its first annual report in 1995 the GNEB has twice focused on water resources as a lead theme, first in 2001 and again in 2004. In its *Fifth Report*, GNEB explicitly endorsed a watershed management approach to border water management and supported thinking of groundwater and surface water in an integrated, conjunctive fashion.⁶⁸ While its policy recommendations are non-binding and strictly advisory it is fair to say that its views, by dint of its membership and degree of state and local participation, articulate to federal and state government policy actors and help define needs and set the agenda for further discussion and policy development. In this respect the GNEB's annual reports and policy recommendations represent a border-wide, consensus building perspective. The fact that GNEB tends to be ahead of the state policy curve but sensitive to state needs is an important aspect of legitimating reform initiatives.

The new institutions in binational water management and the focus on water through the lens of sustainable development has influenced the functioning of the IBWC. In the 1990's, acting on the recommendations of scholars, non-governmental advocacy groups, local governments, and its experience as an ex-officio member of the BECC Board of Directors, the

⁶⁶. BECC has assisted with the expansion of the Nogales International Wastewater Treatment Plan, the improvement of containment ponds at Naco, Sonora, and the construction of wastewater treatment plants at Nuevo Laredo, Cd. Juarez, various other locations on the border with international benefits. A list of these projects can be had at the BECC/COCEF website (www.cocef.org).

⁶⁷. Good Neighbor Environmental Board, *Fifth Report of the Good Neighbor Environmental Board*. EPA 130-R-02-001 (December 2001).

⁶⁸. *Ibid.*

IBWC's U.S. Section significantly beefed up its public relations and outreach capability.⁶⁹ Under U.S. Commissioner John Bernal the U.S. Section took the initiative of developing its first strategic plan. While that plan does not go as far the GNEB in endorsing a watershed management approach—IBWC, after all, is constrained by the 1944 Treaty—it does align the commission behind the principles of sustainable development and supports more public outreach and public participation in the Section's activities.⁷⁰ The Mexican Section has yet to go so far but it also considering a strategic planning approach that moves in this direction.⁷¹ It remains unclear just how much state and federal support the IBWC enjoys in this process, but the effort has certainly begun to alter the Commission's long-time reputation for insularity and lack of responsiveness to many local concerns.⁷²

An important consequence of these reforms is the mobilization of a wider range of participants and players in border water management. The border region has seen growth in environmental advocacy organizations in the past decade and this is true of both nations.⁷³ This is supplemented for formal advisory bodies that are organized on a local or watershed basis. The IBWC's U.S. Section has established at least six such bodies since 1999 and these bodies are found in most of the groundwater hot spots.⁷⁴ The Border 2012 Program is now composing site specific binational environmental task forces that tend to follow a watershed logic.⁷⁵ What is certain is the opportunities for public participation in watershed management in the border area have never been better and a greater range of stakeholders are now routinely involved in state and federal water policy discussions.

⁶⁹. John Bernal, Transcript of Proceedings, Water Summit 2002, May 30th, El Paso, Texas. Available from the office of Congressman Silvestre Reyes, U.S. House of Representatives, 16th District, El Paso, Texas.

⁷⁰. IBWC, United States Section, Strategic Plan. Available at the U.S. Section website (www.ibwc.state.gov).

⁷¹. Arturo Herrera, *supra* note 13.

⁷². Several such critical perspectives are found in Mumme, *supra* note 55; Helen Ingram and David R. White, *International Boundary and Water Commission: An Institutional Mismatch for Resolving Transboundary Water Problems*, 33 *Natural Resources J.* 153 (1993); Roberto Sanchez, *Public Participation and the IBWC: Challenges and Options*, 33 *Natural Resources J.* 283 (1993).

⁷³. *See*, Barbara Hogenboom, et. al. *CROSS-BORDER ACTIVISM AND ITS LIMITS* (2003).

⁷⁴. For a list of these new advisory bodies see the U.S. Section website (www.ibwc.state.gov).

⁷⁵. U.S. Environmental Protection Agency, *supra* note 58, 25-29.

These various changes in the context affecting binational cooperation on groundwater are not insignificant opportunities for advancing binational cooperation on groundwater. While they have not yet produced an actual agreement, they have drawn greater attention to the importance of managing border groundwater resources more wisely and enhanced the legitimacy of those arguing for binational management. They have improved the data base informing discussion at all levels of government, and generated new resources that can be deployed in addressing binational concerns. To put this in the theoretical language of common pool resources theory,⁷⁶ what the past decade has witnessed is the development of greater transparency and available knowledge of the resource, a growing basis of mutual understanding of the problem in the U.S. and Mexico, and gradual, if ever so slight movement towards constitutional agreement on what needs to be done and what should be done. It is this problem to which we now turn.

Taking the Next Step

In view of the enduring constraints on binational cooperation on transboundary aquifer management it would be overly optimistic to predict the two countries would strike a formal agreement any time soon of the sort contemplated in Minute 242. Property rights, subsidies and markets still dominate the utilization of this resource and these variables still weigh against a common, long-term, sustainable, and binational approach to groundwater management.

Even so, the context for considering binational management of this resource is certainly changing. What we should expect to see in response are selective efforts at institutional cooperation in particular transboundary aquifers where for one reason or another the basic constraints are less compelling in the face of arguments for binational cooperation. It stands to reason that we should expect a stronger incentive to cooperate where transboundary groundwater is a primary, possibly the sole, water source for the community and where in the face of development, drought, or other stressors, including pollution or the threat of pollution, it has become more scarce or less reliable as supply, and where reliable information confirms that trend, and where, in the absence of management, it may be exhausted, presenting a serious threat to the welfare of communities in both countries. Furthermore, it stands to reason that cooperation might be easier where there is some degree of coincidence in legal regimes governing groundwater ownership and utilization in the adjacent communities. It is also reasonable to suppose that where institutional history and convention have previously thwarted cooperation it is wise to start with small steps that build trust and experience with cooperation rather than moving aggressively to incorporate the highest level of institutional management at the binational level. And it is important to have models or examples of how such cooperation might be achieved.

⁷⁶. Elinor Ostrom, GOVERNING THE COMMONS, 31-40 (1990); J. Burger & M. Gochfeld, *The Tragedy of the Commons 30 Years Later*, 40 *Env't* 8 (1998).

If we look carefully at the 17 or more groundwater basins straddling the border we can see some communities that qualify on these measures.⁷⁷ El Paso and Cd. Juarez certainly share the element of scarcity and uncertainty, confronting declining groundwater tables, water transfers, and escalating prices for urban water supply. Both communities depend heavily on groundwater though both are now expanding their reliance on Rio Grande river water. The nature and extent of the resource is now much better known owing to a landmark cooperative study sponsored by the IBWC's U.S. Section and state and municipal agencies and additional research by non-profit and scholarly institutions under the aegis of the Border XXI Program and the work of a relatively young public-private task force on regional water problems.⁷⁸ Mexico's National Water Commission and Cd. Juarez's Junta Municipal de Aguas have shared their water development needs, plans, and some of the hydrological data with the United States. With urban expansion the threat of contamination of the Hueco and Mesilla Bolsons has increased and this is a public concern. The prospect of a cooperative agreement on groundwater here has been discussed for years but is taken more seriously by public officials in the last decade. The fact the Mesilla Bolson also extends to New Mexico is a complication but New Mexico is the only border state committed to safe yield management as a general rule of capture and could be expected to consider ways to cooperate in any local initiative. The sister cities also share the unique experience in North America of an operating binational cooperative arrangement for managing their common airshed, a system formalized in Annex 5 to the La Paz Agreement and conducted on a coordinate and semi-voluntary basis by both countries and financially supported by the BECC and NADB.⁷⁹ Though air and water are very different resources the experience generated in this area may be useful in various aspects, at the very least in designing consultative mechanisms for exchanging information.

The small communities of Columbus, New Mexico and Palomas, Chihuahua provide another example of an area where cooperation may soon emerge.⁸⁰ These communities share a common aquifer, the Mimbres river. Both have developed rapidly in the past decade as agricultural commerce, maquiladora expansion, retirement housing, even immigration policies have driven demographic growth. Owing to upstream pumping the Mimbres long ago ran dry

⁷⁷. For a list of these groundwater basins and a summary of the key characteristics see, Mumme, *supra* note 1, 363-78.

⁷⁸. IBWC, *supra* note 49; Paso del Norte Water Task Force, Water Planning in the Paso del Norte, Toward Regional Coordination (March 2001).

⁷⁹. Annex V to the Agreement Between the Government of the United States of America and the Government of the United Mexican States on Cooperation for the Protection and Improvement of the Environment in the Border Area, Agreement of Cooperation Between the Government of the United States of America and the United Mexican States Regarding International Transport of Urban Air Pollution (October 3, 1989).

⁸⁰. See, Elaine Hebard, *A Focus on a Binational Watershed with a View toward Fostering a Cross-Border Dialogue*, 40 *Natural Resources J.* 281 (2000).

and today the towns are wholly dependent on groundwater for municipal supply.⁸¹ Aquifer contamination is a serious threat.⁸² More is known of the aquifer in terms of supply and contamination owing to recent social and hydrological studies funded by the Border XXI Program⁸³. The two communities have a long history of cooperating on practical matters. New Mexico's approach to groundwater management comes closest of an border state to Mexican practice. And, importantly, this is one of the closed basins on the border not hydrologically linked to the Rio Grande or Colorado rivers.⁸⁴

Or we might look at the twin cities of Nogales on the Arizona-Sonora border. Both cities are hydrologically linked by the Santa Cruz river aquifer, an aquifer that feeds to the Gila River which, in turn, drains to the Colorado River.⁸⁵ Both are experiencing rapid urbanization and rising water demand due to the growth of the maquiladora industry and agricultural commerce. Both depend a hundred percent for municipal supply on groundwater⁸⁶—an initiative to run Central Arizona Project water to Nogales, Arizona remains stalled.⁸⁷ There is a significant threat of groundwater contamination in the aquifer.⁸⁸ Both have a long history of cooperation in water sanitation matters as Nogales was one of the original international wastewater treatment plants developed on the border by IBWC.⁸⁹ On the Arizona side, the aquifer is already designated an Active Management Area under the 1980 Arizona Groundwater Act.⁹⁰ In short, many of the conditions favoring cooperation are already present in this area.

⁸¹. Ibid, 303-308.

⁸². Ibid.; Gedi Cibas, et.al., *Ground Water Management in the Mimbres Basin; A Possible Model for the U.S.-Mexico Border Region* (unpublished, dated April 21, 2004).

⁸³. U.S. Environmental Protection Agency, *Compendium of EPA U.S.-Mexico Activities*, EPA 160-B-99-003 (1999).

⁸⁴. Cibas, op. cit.

⁸⁵. Barbara J. Morehouse, et. al., *The Implications of Sustained Drought for Transboundary Water Management in Nogales, Arizona, and Nogales, Sonora*, 40 *Natural Resources J.* 783 (2000).

⁸⁶. Ibid, 786, 789.

⁸⁷. Terry Sprouse, personal communication to Stephen Mumme.

⁸⁸. Terry Sprouse, *Water Quality and Water Quantity Issues on the Arizona-Mexico Border; History and Recent Actions*. Unpublished Manuscript (2004).

⁸⁹. Helen Ingram, et. al., *DIVIDED WATERS* (1995).

⁹⁰. Morehouse, et. al., *supra* note 85.

To be sure, there are other aquifers where cooperation is not so likely to prevail. The long-term dispute over lining the All-American Canal in the Imperial Valley is one of those cases where the stakes are high, 1944 Water Treaty questions are outstanding, the controversy remains highly visible and provocative, national sovereignty has been invoked, and regional water dynamics appear to work against binational cooperation.⁹¹ In the face of Mexican arguments to the contrary, the U.S. claims there is no hydrological connection between seepage from the treaty water channeled through the canal and the state of the Colorado River aquifer as it drains into Mexico, that U.S. surface water is rightfully severable from the groundwater system, and that the U.S. has no obligation beyond friendship and comity to mitigate any damage to Mexico caused by the loss of seepage from the AAC.⁹² Mexico, in turn, argues that the baseline groundwater conditions were never established before the canal was constructed, that groundwater was never formally divided (an indisputable claim) between the two countries, that the AAC may affect the hydrology and this should be carefully studied before drawing conclusions, that U.S. actions in the salinity crisis made Mexico more dependent on groundwater, that the U.S. failed to secure its seepage for more than half a century thus potentially relinquishing some of its right under the doctrine of equitable utilization international law, and that the U.S. is acting unilaterally to force a solution instead of proceeding in a more cooperative manner.⁹³ The two sides are now quite polarized on the issue and it is difficult to see this dispute being settled cooperatively.

As we consider the prospect for cooperation in transboundary groundwater management we should further consider that cooperation is more likely to emerge at the low end of the ladder of institutional complexity. In localities like Columbus-Palomas the possibility exists for informal cooperation between municipal water authorities for sustainable yield or greater conservation, or simply pollution prevention depending on local priorities, based on regular exchange of information and collaborative planning exercises resulting in coordinate management where decisions are non-binding but generally supported by a full range of stakeholders on both sides of the border. Such informal arrangements are certainly problematic where large appropriators in the aquifer are free to defect from the pact or refuse to engage in the

⁹¹. See, Douglas L. Hayes, *The All-American Canal Lining Project: A Catalyst for Rational and Comprehensive Groundwater Management on the United States-Mexico Border*, 31 *Natural Resources J.*, 803 (1991); Tom Waller, *Southern California Water Politics and U.S.-Mexican Relations: Lining the All-American Canal*, 7 *J. Borderlands Studies* 1 (1992); Albert E. Utton, *The Transfer of Water from an International Border Region: A Tale of Six Cities and the All-American Canal*, 16 *N.C. J. Int'l L. & Com. Reg.* 477, 489-90 (1991).

⁹². *Ibid*; see also, U.S. Bureau of Reclamation, *Draft Environmental Impact Report: All-American Canal Lining Report* (1991).

⁹³. Herrera, *supra* note 13; Vicente Sanchez, ed., *EL DEBATE EN LA FRONTERA NORTE SOBRE EL CANAL TODO AMERICANO* (2004).

management dialogue. Local planning decisions need to be compatible with existing and applicable domestic law and practice. Ideally, other levels of government should cooperate at least through a memorandum of understanding with local agency taking initiative. But it may be easier to move up the scale to more formal arrangements after informal cooperation has been initiated. The current move towards binational exchange of groundwater data certainly moves in this direction.

In conclusion, while the odds against an agreement on transboundary groundwater at the U.S-Mexico border remain high, there is reason to suppose that some form of systematic cooperation will emerge at various locations along the international boundary within this decade. The needs are there and the social and institutional circumstances are now more favorable for the emergence of cooperation in various locations along the border. The institutional scale of cooperation may be modest and the management aims more limited. But these initiatives should be supported by state and federal governments on both sides of the border. As they are successful it may be feasible to go to the next level and formalize these arrangements through La Paz annexes and IBWC minutes, or even consider developing a binational institutional mechanism that has at least some of the capabilities that professors Robert Hayton and Al Utton outlined in the Bellagio Draft Treaty on Transboundary Groundwater more than a decade ago.⁹⁴

⁹⁴. Robert Hayton and Albert E. Utton, *Transboundary Groundwaters: The Bellagio Draft Treaty*, 29 *Natural Resources J.* 663 (1989).

ADVANCING BINATIONAL
COOPERATION IN
TRANSBOUNDARY
GROUNDWATER
MANAGEMENT on the UNITED
STATES-MEXICO BORDER

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INTRODUCTION

- Groundwater critical resource for the border region.
- Many communities wholly dependent on groundwater:
 - Columbus-Palomas (New Mexico-Chihuahua)
 - Bisbee-Naco (Arizona-Sonora)
 - Ambos Nogales (Arizona-Sonora)
 - Sonoyta-Lukeville (Arizona-Sonora)
 - Ambos Tecate (California-Baja California)
- Binational Progress since Minute 242 is disappointing.

IBWC MINUTE 242

- Resolution 5: ‘each country shall limit pumping of groundwaters within its territory within 5 miles (8 kilometers) of the Arizona-Sonora boundary near San Luis to 160,000 acre-feet annually.’”
- Resolution 6: “the U.S. and Mexico shall consult with each other prior to undertaking any new development of either the surface or groundwater resources, or undertaking substantial modifications of present developments, in its own territory in the border area that might adversely affect the other country.”
- Resolution 5: implied commitment to seek to achieve: “a comprehensive agreement on groundwater in the border areas.”

MINUTE 242, PROBLEMS

- Lacked Political Support/Nonbinding
- Questionable whether meant to apply to quality aspects. No restriction but no specification either.
- No terms of reference defining “border areas”; near San Luis; “to consult”
- In essence, M. 242 is politically ahead of its time. It did, however, provide support for:
 - Information sharing
 - Data collection (in 1990's)
 - Informal discussions

CONSTRAINTS on BINATIONAL COOPERATION

- Legal
 - Different systems of national administration
 - Differences among U.S. states (TX, NM, AZ,CA)
- Political-Diplomatic
 - Political decentralization of U.S. water policy
 - State influence in Western water policy and the IBWC.
- Economic
 - Water prices
 - Lack of information on groundwater

OPPORTUNITIES for BINATIONAL COOPERATION

- Urbanization, rising water demand.
- Emphasis on water quality
- Problem of Severe, Sustained Drought
 - Heightened demand for groundwater
 - Innovative methods of using groundwater
 - Greater attention to protecting groundwater stock
- Changing Institutional Context
 - Strengthening the La Paz Agreement
 - Border Environment Cooperation Commission
 - Good Neighbor Environmental Board
 - IBWC/CILA changes
 - Summary—Common Pool Resources Theory:
 - » Greater knowledge and transparency
 - » Growing mutuality (values, sense of threats and benefits)
 - » Changing constitutionality (notion of what should be done)

BINATIONAL GNDWATER COOPERATION: Next Steps

- Cooperation likely to emerge where:
 - Groundwater sole source of supply for binational community.
 - Scarcity looms-backed by reliable data that are credible in both countries.
 - Coincidence or greater approximation of legal and administrative systems.
 - Where local, informal, and modest practical measures are reciprocally taken to conserve the total water supply.
 - Where institutional models are available.

Three Cases of EMERGING COOPERATION

<i>Localities// Criteria</i>	El Paso-Cd. Juarez	Columbus- Palomas	Ambos Nogales
Water source/ Basin type	80% groundwtr Linked basin	100% groundwtr Closed basin	100% groundwtr Linked basin
Looming scarcity	Exhaustion by 2025; contamination threats	Significant overdraft; high fluoride concentrations	US Aquifer stabilized; Mexico declining & wastewater reclamation threat to US
Legal aspect	Sharp contrast	Some similarities	Some similarities
Local steps & Models	Data sharing; consultation Air quality model/NGO involvement	Informal consultation/ NGO involvement	Binational quality studies; AMA data NGO involvement