

**OPINION**

# The path towards groundwater management in the borderlands of Mexico and Texas

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**Abstract**

Binational efforts to understand, assess, and manage shared groundwater resources on the Mexico-Texas border are limited and politically sensitive. On the Mexico side, long-standing centralized groundwater governance structures have created institutional barriers at the local level to the expansion of knowledge and cooperation over these transboundary resources. On the Texas side, property rights related to groundwater resources limit the scope of options available for cooperative management of cross-border aquifers. In order to develop more effective cross-border relations and enhance knowledge, cooperative management, and sustainability of the region's shared aquifers, stakeholders in the border between Mexico and Texas should pursue local and regional arrangements that focus primarily on water quality and environmental issues. Additionally, in order for the results of local efforts to be permanent and sustainable, they must consider the more formal, long-term cooperative models that tend to have stronger systemic impacts and funding commitments. In addition, stakeholders and officials must make a better effort to educate the public on the science and facts in order to avoid past experiences where fear and political lobbying scuttled viable and promising cooperative efforts.

This article is categorized under:

Engineering Water &gt; Planning Water

Human Water &gt; Water Governance

**KEYWORDS**

groundwater, management, Mexico, Texas, transboundary

## 1 | INTRODUCTION

Recent research has shown that between 50 and 60% of the area overlying the hydrogeological units shared between northeastern Mexico (Chihuahua, Coahuila, Nuevo Leon and Tamaulipas) and Texas, contains good aquifer potential with good water quality conditions (Sanchez, Rodriguez, & Tortajada, 2018). From the approximately 33 transboundary hydrogeological formations identified in the region, only four have received binational recognition and, therefore, funding and prioritization by both countries: the Mesilla/Conejos-Medanos Aquifer, the Hueco-Bolson/Valle de Juarez Aquifer, the Edwards Aquifer and the Gulf Coast/BRB (Bajo Rio Bravo) Aquifer. The rest of the area remains largely ignored, or not valued for its groundwater potential. While population on both sides are withdrawing groundwater from these transboundary aquifers, most assume that the cross-border nature and flow of groundwater is somebody else's concern, or a matter that does not necessarily require the same level of attention as surface water. The conceptualization of groundwater as an unseen and therefore a potentially

never-ending resource, coupled with limited data and research, as well as other pressing border priorities capturing the attention of the citizenry and governments (e.g., security and immigration), has resulted in an unsustainable situation for the region's transboundary groundwater resources.

With the exhaustion of surface water as an option for future water demand, particularly in the Rio Grande basin, as well as climate change and population growth trends that have challenged the highly surface water-dependent agricultural sector on both sides of the border, over the last decade transboundary aquifers traversing the Mexico–Texas border have generated growing interest by federal institutions on the Mexico side, and state and federal institutions on the Texas side. Notwithstanding this attention, binational efforts to understand, assess, and manage shared groundwater resources remain limited, sporadic, and politically sensitive. On the Mexico side, long-standing centralized groundwater governance structures, as well as a presumption that the International Boundary and Water Commission-Mexico Section (CILA) is the de facto authority for all waters shared with the United States (groundwater included), have created institutional barriers at the local and regional levels to the expansion of knowledge of and cooperation over these transboundary resources. On the Texas side, a highly decentralized rights system in which landowners own underlying groundwater, as well as local use governed by 100 Groundwater Conservation Districts and 16 Regional Planning Groups, complicate the scope of options available for cooperative management of cross-border aquifers. Nevertheless, interest in the topic continues to grow as flourishing populations and expanding economies continue to burden existing freshwater resources, especially among the numerous sister cities found along the frontier, many of which are entirely dependent on groundwater (Sanchez & Eckstein, 2019).

A recent survey assessing the perceptions and opinions of a modest sample of stakeholders in the region offers new insights into how water resources, and groundwater specifically, are perceived along the Mexico–Texas frontier. The survey attempts to address three main questions related to current uses and conditions of groundwater in the region: (a) where will the water come from and how its extraction could affect the other side of the border; (b) who will receive the priority among nations and among users; and (c) how will this scarce resource be managed over time to ensure availability and sustainability for future population on both sides of the border. The results of the survey are based on responses of 44 stakeholders representing federal/binational authorities, state and city officials from both sides of the border, as well as agricultural users (*ejidos* on the Mexico side), private industry, nongovernmental organizations, and academics/experts in the region. The answers provide ideas for groundwater management alternatives, institutional needs, and potential strategies for binational cooperation. Moreover, they provide guidance on the priority concerns for the region, as well as what options might be most successful in addressing those concerns. The assessment focused on the following: transboundary cooperation experiences and efforts, feasibility and likelihood of binational agreements at the national and sub-national levels, management perspectives and preferences, elements for change and success of management alternatives, and possible management and cooperation models. The results of the survey offer significant findings (see Sanchez and Eckstein, 2019 for the complete study).

## 2 | BINDING OR NONBINDING ARRANGEMENTS?

First, most survey participants agreed that there is a genuine need for a binational instrument as a means for assuring the sound long-term management of transboundary groundwater resources along the border region. However, the majority of stakeholders also believed that before undertaking any attempt to manage groundwater resources across the entire border, a series of local and regional models for groundwater management should be explored. According to these interviewees, short-term local or regional approaches are preferable as they are likely to be more practical and achievable. The ad hoc feature of local approaches is believed to be more representative of the local concerns and needs of a particular region/aquifer than a border-wide approach, which tends to be limited in scope and at a narrower scale. For these stakeholders, it appears that success is defined in relation to the ease of implementing an arrangement and not having to deal with the complexities of bureaucratic (especially federal) agencies. However, a majority of survey participants also indicated that success could be measured by whether an informal arrangement eventually progressed into a formal, bilateral agreement that involved federal institutions on both sides of the border.

The definition of success according to stakeholders varied depending on what their preference was in terms of achievement. Although regional and local cooperative efforts were highly rated among stakeholders, they also recognized that the nonbinding feature of these arrangements could limit the scope, scale, and sustainability of those arrangements. In contrast, they perceived formal binding agreements, as complicated as they are, to have more long-term and systemic impacts. The key elements that seem to be driving the preferences between local nonbinding arrangements and formal border-wide agreements are institutional involvement, funding commitment, and political will at the binational level. All three elements are present in a formal agreement, but limited at a local level arrangement.

Notwithstanding, individual local personalities or local leaders were also mentioned as a key “success” element for local scale arrangements. According to the results of the survey, local arrangements were reported to be significantly more achievable than formal efforts if they were championed by a local leader (Sanchez & Eckstein, 2019). However, compared to formal agreements, stakeholders also recognized that the nature of those local arrangements can limit their ability to mature and persist into long-term commitments beyond the political terms of appointed local officials.

### 3 | WATER QUALITY AND ENVIRONMENTAL CONCERNS: THE DRIVERS

Second, stakeholders participating in the survey indicated that water quality, rather than water quantity, is the main driver of transboundary cooperation and communication efforts in the region. This perception seems to follow the global trend for greater concern for, and therefore investment in, water quality issues over water quantity concerns (Biswas, Braga, Rodriguez, & Tortajada, 2006; ILO, UNCTAD, UNDESA, & WTO, 2015; United Nations, 2014; World Health Organization, 2013). Interviewees referred to health concerns and environmental issues (such as salinity levels, invasive species, and the restoration of the Colorado River Delta) as justification for their focus on water quality. Moreover, they suggested that cooperative strategies in the Mexico–Texas border region were more likely to succeed if they addressed water quality concerns related to groundwater and environmental issues. Many of them, in fact, recommended against pursuing water quantity issues (Academic P, 2018; City Official B, 2018; NGO C, 2018), “at least not at the beginning” (State Official H, 2018).

Water quality, as a common denominator to drive binational cooperation, was also noted by Sanchez and Eckstein (2017) who reviewed how the 10 border-states manage their groundwater resources particularly in their corresponding border areas and also described the states' recorded efforts to cooperate among themselves. One example of a successful cooperative effort, initially driven by water quality and environmental concerns and that indirectly dealt with groundwater resources as a primary or secondary priority, is the binational water treatment plant in Nogales. The plant was constructed as a result of public health concerns associated with the lack of treatment of water discharged into the Santa Cruz River, which crosses from Sonora into Arizona and returns to the Mexico side as treated effluent. Another example of successful cooperation focusing on water quality is Minute 242, which was implemented in the 1970s and is the only formal binational instrument that addresses some kind of groundwater management in the Yuma Valley region. It was developed by the International Boundary and Water Commission as a result of strong political pressure by Mexican farmers suffering from high levels of salinity in the Colorado River water deliveries coming from the US side. This instrument imposed groundwater extraction limits within 5 miles of the border between Arizona and Sonora. Recently, Mexico and the United States signed yet another agreement addressing water quality, Minute 319, through which for the first time, stakeholders from both sides of the border agreed to deliver water from the Colorado River (in the form of pulse flows) to restore the surface–groundwater dependent ecosystem located in the delta of the Colorado River on the Mexico side. Ongoing efforts, such as the treatment of effluent discharged into the Tijuana River on the Mexico side that crosses into San Diego affecting natural estuaries on its way to the ocean, is also an example of how environmental and water quality concerns have driven cooperative efforts in the binational water agenda.

### 4 | THE POWER OF THE UNKNOWN

Third, the survey reveals that fear is often used as a political tool against efforts to intervene with the status quo of groundwater use. Interviewees related various examples in which projects were halted or denied based on perceived realities and inaccurate information rather than on science-based facts. In particular, the survey suggests that existing structures, especially the private water rights system in Texas and federally managed water rights regime in Mexico, are prioritized and protected through lobbying, mischaracterization, misunderstanding, and distribution of incomplete information. For example, efforts to construct small reservoirs on the Rio Grande for water supply and irrigation in Brownsville and Laredo were rejected by Conagua on the grounds that they would increase groundwater levels across the border in Mexico. Yet, both times, no technical studies were ever prepared to substantiate those assertions. They were rejected simply on the basis of fear and misunderstanding (Sanchez & Eckstein, 2019). As a result, the status quo reigns over groundwater use in the region as fears support maintaining the status of regulation (or lack of regulation).

Moreover, as interviewees explained, the lack of trust in people and data across the border can be a barrier even to the most logical and reasonable proposals (Sanchez & Eckstein, 2019). Data are limited because of a lack of research on the topic, and data availability is limited by the lack of sharing mechanisms driven by unproven fears. The fact that there is no legal instrument governing transboundary groundwater resources between both countries has created an environment of speculation and

political sensitivity where the current condition is a much better option than any other known and unknown possibilities for groundwater management in the border region.

In addition, the survey suggests that along the Mexico–US border, there appears to be political momentum and institutional recognition at local and federal levels for the need to address transboundary aquifers in the border-states dependent on the Colorado River, but less on those reliant on the Rio Grande. However, interest in the topic is growing at the federal institutional level in both countries (Federal Official T, 2017). Although existing cooperation efforts have been limited mostly to data sharing, joint data collection, communications, and the development of modeling tools for common use at the local scale (primarily for the Hueco Bolson and Mesilla Bolson) driven by water contamination threats and groundwater dependency, these efforts exemplify the growing interest along the Mexico–US border to address joint transboundary aquifer use. Current US funding under the Transboundary Aquifer Assessment Program is also a sign of the rising interest in the topic (United States–Mexico Transboundary Aquifer Assessment Act, 2006). Additionally, the increasing demand for groundwater in the region for irrigation, domestic use, and oil and gas development, particularly in the eastern section of the frontier, has imposed additional pressures on the already over-allocated aquifers redirecting the attention to those underdeveloped groundwater areas located precisely on shared groundwater basins. The unregulated use of transboundary groundwater resources increases the level of vulnerability and risk for border communities and cities that rely on groundwater for economic and social sustainability. Surprisingly, as noted above, survey participants did not prioritize the development and implementation of a structured legal framework to regulate transboundary groundwater resources at a border-wide level. Instead, the study results propose a path towards cooperation that focuses on local or regional, nonbinding arrangements. Perhaps the nonbinding approach at the local scale and with a narrow scope can promote more reliance on trust and consistent cooperation, shared risks, and win–win scenarios as compared to those commitments imposed by formal legal instruments that can restrict the development of creativity and ability to adapt to changing circumstances. This is an intriguing argument that requires verification through future research.

## 5 | CONCLUSION

Given growing scarcity and increasing demand for water, as well as lack of adequate data and research on transboundary aquifers in the border region, something must be done to address the need for better groundwater management along the frontier. Based on the results of the survey, in order to make progress in this area, officials and stakeholders along the border should pursue informal local and regional arrangements that promote cross-border relations, cooperation, and trust, and that enhance knowledge, management, and sustainability of the region's shared aquifers. In parallel, and in order to secure the maturity and permanence of local initiatives, these efforts also must consider the more formal, long-term cooperation models that tend to have greater systemic impacts and funding commitments, regardless of their binding nature. In addition, efforts along the frontier should focus on water quality issues, as water pollution and public health appear to be more prominent and actionable concerns across the region's communities. Fourth, stakeholders and officials must make a better effort to educate the public on the science and facts of the region's groundwater resources in order to avoid past experiences where fear and political lobbying scuttled viable and promising cooperative efforts.

Lastly, water issues are always local. Even transboundary water issues are parochial, albeit at the transboundary level. Therefore, efforts to manage these resources should be pursued and implemented at the local and regional levels, either as formal agreements or informal arrangements. This would provide legitimacy for management options as stakeholders and local leaderships would be involved in the decision-making process, which can provide an environment of trust among cross-border committees and communities that are naturally connected by geography, history, culture, and common socio-economic patterns. This argument follows the concept of *transboundariness* (Sanchez & Eckstein, 2017) which, in addition to hydrogeological linkages, seeks to identify local and aquifer-specific socio-economic variables as part of the transboundary nature of the aquifer, and measure their relevance in the prioritization process at the binational level.

Transboundary groundwater management in the borderlands between Mexico and the United States continues to be a pending issue in the binational agenda between the two nations. However, it cannot be ignored forever. Small steps have been recorded, and some ideas for the path forward have been offered. The negotiation process will be as complicated as the uniqueness and complexities of the aquifers, but whatever path is followed, there are a couple of things that are and will still be present in any discussion: where is the water going to come from; who receives the priority; and how will this sacred resource be managed over time to ensure availability and sustainability for future population on both sides of the border.

## CONFLICT OF INTEREST

The authors have declared no conflicts of interest for this article.

## AUTHOR CONTRIBUTIONS

**Rosario Sanchez:** Data curation; formal analysis; investigation; methodology; resources; supervision; validation; writing-original draft; writing-review and editing. **Gabriel Eckstein:** conceptualization; formal analysis; writing-review and editing.

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## FURTHER READING

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