Paola Aguirre

Water Infrastructure Beyond Borders: The Rio Grande-Bravo

The Rio Grande-Bravo[1] is the most significant watershed shared by the United States and Mexico, covering nearly 500,000 square kilometres across seven states, its watercourses touching ten major cities of between 50,000 and four million inhabitants. This watershed connects Santa Fe, New Mexico to Monterrey, Nuevo León. These two are hardly sister border cities, yet they share something in common: they both belong to the Rio Grande-Bravo watershed.

Water enables and constrains the way cities are designed and developed, and that which flows throughout the Rio Grande-Bravo has been the cause of numerous confrontations, not only between the US and Mexico, but also between states in both countries. But what if a common challenge—such as the supply, management, and conservation of water—could bring the cities of this region together? Indeed, the scale of and demand for water infrastructure necessitates a more integrated approach, especially as twenty-first-century cities are increasingly being challenged to perform more efficiently and act smarter in the way they invest in their resources.

It is fundamental to understand the issues of water systems in relationship to urban areas. Rapid urbanization across the border region, as well as high rates of industrialization, has exponentially increased the demand for water resources in a territory where the abundance of water is not necessarily a given. The population in the region has grown four times since the mid-1900s, currently at 12.5 million people, and is projected to double by 2050.[2] With this expected population growth, cities need to change their consumer role and be more responsible with their use of water. What if ecological features such as watersheds were to begin to define regional management sites instead of political boundaries?

Urban areas such as El Paso-Juárez, where manufacturing is the main economic driver, are rapidly depleting their water resources. The challenge has become such that the Bolsón del Hueco, **a largely non-renewable aquifer and the current main source of water for El Paso and Juárez, is expected to run dry by 2020, as will the** Bolsón de Mesilla, **a secondary aquifer for the sister cities.[3] Both cities are at a crossroads in terms of redefining their future water sources: El Paso—with greater financial resources provided by Texan oil—has already focused its investments in a non-seawater desalination plant. Juárez, on the other hand, has decided to explore more groundwater options to the west, and dig new wells. Even**

Map of North American water networks with the Great Lakes/ St. Lawrence (US-Canada) and the Rio Grande-Bravo (US-Mexico) watersheds highlighted. These are the two largest shared basins among the three nations.

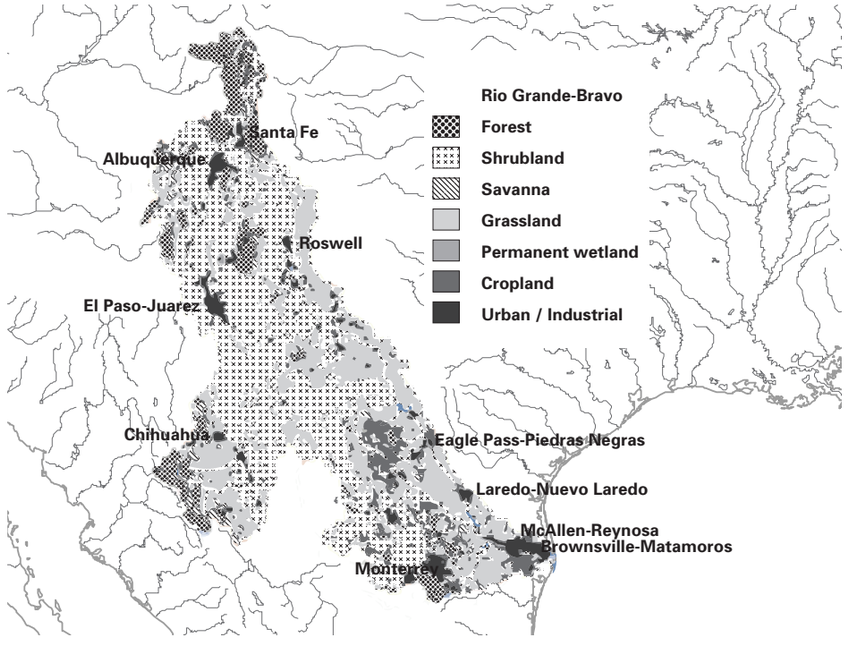
Paola Aguirre

though El Paso and Juárez have a very strong economic and social synergy, both cities are investing separately in water infrastructure projects to secure their future, in many cases duplicating efforts. What if a shared vision of how to address this challenge could bring these two cities together and establish a new model of binational collaboration?

To imagine a more collaborative future of border cities we must understand what layers of the past have enabled (or disabled) the present condition. We must understand the territorial features of this watershed, as well as the complexity of governance of the region and its urban areas. This brief overview aims to highlight key aspects that could represent areas for further exploration and rethinking water resources for the future of cities in this region according to a more integrated and sustainable approach.

Understanding Water in a Comprehensive Way: An Overview of the Rio Grande-Bravo Watershed's Management

The relationship and negotiation between the US and Mexico with regard to the Rio Grande-Bravo began over a century ago. The agreements from the Bi-national Convention of 1889 were replaced by the 1944 Water Distribution Treaty, which additionally established the International Boundary and Water Commission (IBWC). The primary purpose of the treaty and agency was to allocate, negotiate, and manage surface boundary waters, focused on the Rio Grande-Bravo; additionally, it established "preferential attention to the solution of all sanitary problems."[4] Since surface water had been the focus and main source for the communities within this watershed, ground water was not included in the terms of the 1944 Treaty, and it was not until 1973 that these issues



Map of the ecosystems along the Rio Grande-Bravo watershed
Source: P. Aguirre, with information from the Watersheds of the World, WRI

were partially addressed by the IBWC. Unfortunately, the IBWC has not fully and effectively addressed water disposal, transport, water and air pollution, or the over-pumping of groundwater.

The focus of the IBWC has been concentrated on the control, regulation, and management of water resources, and the consideration of future sources has been inadequately addressed, compared to other issues. In 1994, 50 years later, when the North American Free Trade Agreement (NAFTA) took effect, the pressure on the IBWC's role was augmented given the significant increase of water demand due both to population growth and the massive rise of the manufacturing industry. Fortunately enough, the 1944 Treaty included an innovative

International Boundary Water Commission (IBWC) plate on the Paso del Norte Bridge in El Paso-Juárez (P. Aguirre)

feature that turned out to be its main strength: it allows amendments known as "minutes" to address new issues not considered in the original Treaty. These minutes are still subject to the approval of both governments, but without the need to re-negotiate the entire treaty. It is a flexible and binational legal mechanism, and has great potential to advance the agenda of the IBWC.

A few years after the implementation of NAFTA, in 1997, the US-Mexico Foundation for Science identified water-related problems as a crucial binational topic, and organized the first workshop on the issue with the participation of public and academic institutions from both countries. These have continued to take place now under the leadership of the US-Mexico Border Environmental Health Work Group, organized by the US Environmental Protection Agency (EPA), though the focus is on control as opposed to integration. The group is currently active and engages with themes and initiatives are surrounding the topics of air pollution, the use of pesticides, and human and wildlife health.[5] Water security is a constant issue in these binational conversations, and thematic efforts have been taken simultaneously through different agencies and organizations. However, the integration of these efforts under a comprehensive vision continues to be an urgent task.

The Challenge of Continued Urban Growth within the Border Region Increases Pressure on Water Resources and the Quality of Ecological Systems

A major challenge for the advancement of an agenda concerning the Rio Grande-Bravo watershed is the continued search for water resources separated from its enabling ecological systems. Within the terms of NAFTA, the North American Agreement on Environmental Cooperation (NAAEC) was also signed, which established the Commission for Environmental Cooperation (CEC) to address and advance cooperation among the three countries regarding environmental issues related to the new economic agreement.[6] While NAAEC explicitly describes matters of waste management, pollution, endangered species, and data gathering analysis, among others, the issue of water and the relationship and/or collaboration of CEC with IBCW is not clearly designated.

Since the mid-1800s, the Rio Grande-Bravo has marked the boundary between Mexico and the US from the twin cities of El Paso and Ciudad Juárez to the Gulf of Mexico; it has also been intensely transformed, especially in urban areas. The ecosystems along this watershed are dominated by scrubland, grassland, and savannah, which account for 80 percent of the

Paola Aguirre

land area. Forest covers about 7.5 percent of the basin, located in a few areas: to the north in south-central Colorado; the south-central region of New Mexico, in close proximity to the town of Alamogordo-Ruidoso; and in the southwestern part of the State of Chihuahua, adjacent to the Sierra Madre Occidental. Urban areas represent 6 percent, and agricultural land 5 percent, concentrated in the north-central areas of the States of Coahuila and Tamaulipas.[7] The urban land features ten main cities/metropolitan areas (with population in parentheses):

1. Roswell, NM (50,000)
2. Santa Fe, NM (150,000)
3. Eagle Pass, TX – Piedras Negras, COAH (250,000)
4. Chihuahua, CHIH (850,000)
5. Albuquerque, NM (900,000)
6. Laredo, TX – Nuevo Laredo, TAM (900,000)
7. Brownsville, TX – Matamoros, TAM (1,150,000)
8. McAllen, TX – Reynosa, TAM (1,700,000)
9. El Paso, TX – Ciudad Juárez, CHIH (2,500,000)
10. Monterrey, NL (4,000,000)

About 13 million people live in this watershed area; one of the largest and fastest growing metropolitan areas is El Paso-Juárez, which has undergone both major population and economic changes since NAFTA. The rise of manufacturing industries in the area has naturally played a considerable role in escalating the rate of water consumption.[8]

Over the last decade, and especially after the activation of NAFTA, the synergy between US-Mexico border cities has increased exponentially. Multiple strategies and innovative technologies have been, and continue to be, explored to increase efficiency in border control concerning transportation and people. However, since 9/11 and the subsequent adoption of strict new border controls—essentially sealing off and

Rio Grande-Bravo channelized condition (P. Aguirre)

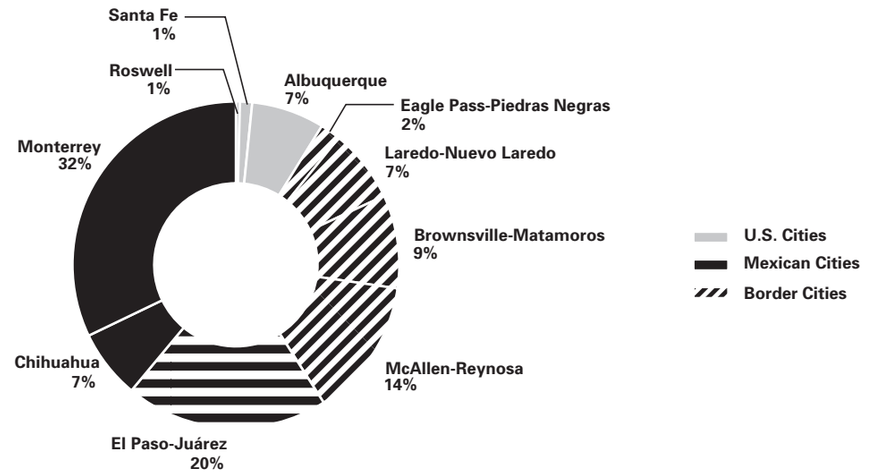
containing Mexico from the US—environmental and natural systems have been severely affected.

> El Paso-Juárez demonstrates the need for cities in the Rio Grande-Bravo watershed to rethink urban development to ensure sustainable access to water

Even though water quality and supply are major topics within watershed planning discussions,[9] the Rio Grande-Bravo continues to be treated as the backyard for both cities. The canalization of the river, a project that began in the 1930s, has been a civil engineering response to the twentieth-century priorities of sanitation, flood control, and water storage.[10] However, concrete walls and flanking roads along the watercourse allow water to run the fastest way possible out of the urban areas, narrowing the function of the river to water conveyance, and blocking several natural systems from flowing for miles and miles.

For decades now, the Rio Grande-Bravo stopped being the main water source for El Paso-Juárez, and these cities now rely on the Bolsón del Hueco aquifer.[11] This aquifer contains about 12.5 million acre-feet of water, of which 60 percent is freshwater, and 30 percent is saline. A major issue for this water source is its low (5 percent) annual recharge rate, which contributes to its decline of 1.5–7m annually.

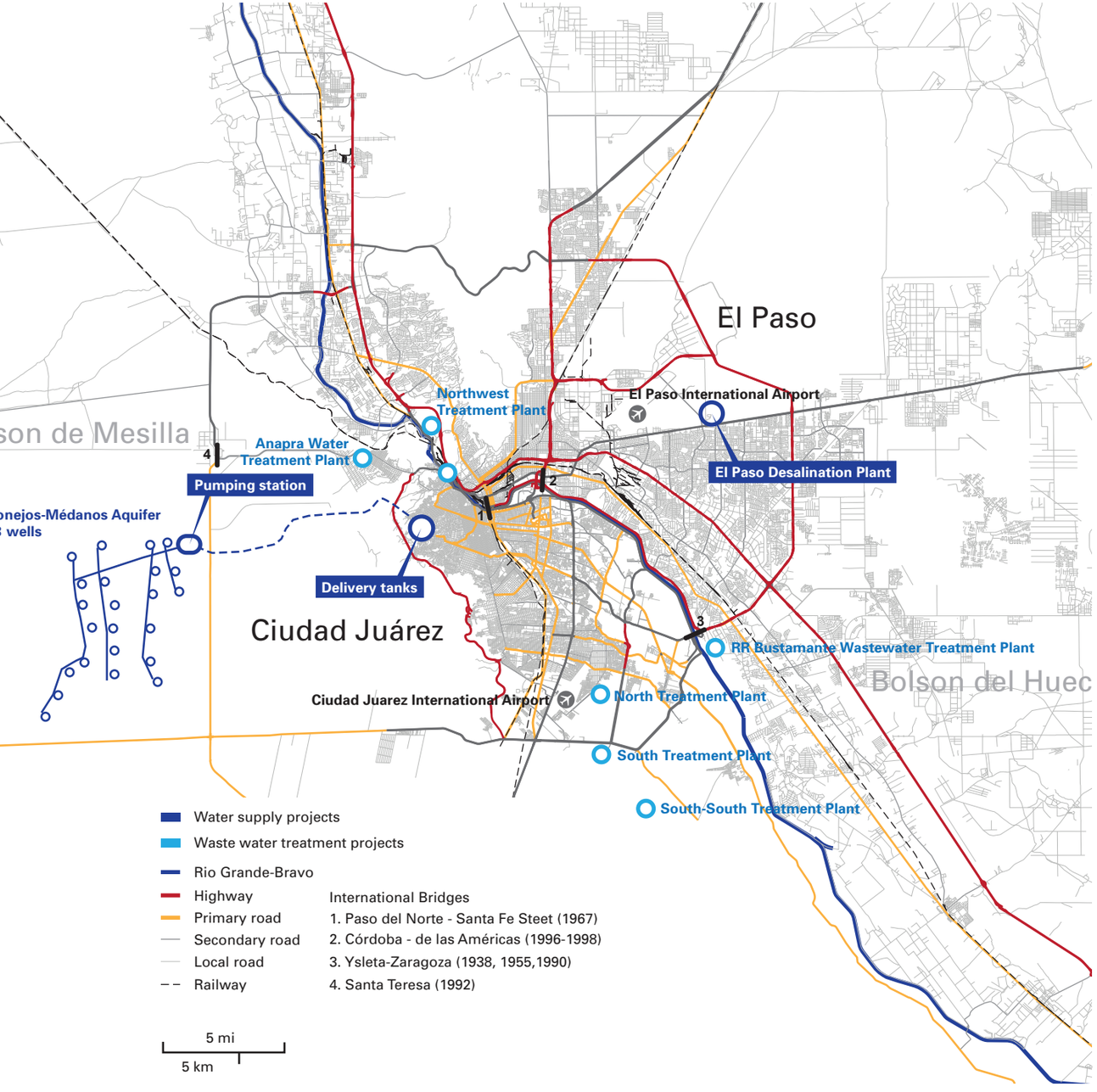
Even though the urgently needed future sources of water have yet to be identified, El Paso and Juárez are moving forward with water infrastructure investments, though not necessarily at the same pace of development, or with the same vision. Whereas Juárez is still addressing the construction of sanitation and waste-water treatment plants, and drilling more wells on the west side of the city (near Anapra), El Paso is directing its effort into desalination technologies. Ciudad Juárez currently manages 23 wells and 47 kilometres of water pipes for its water supply, and 25 kilometres of pipes to convey water from the Conejos-Médanos Aquifer (part of the Bolsón de Mesilla). El Paso began planning the large Kay Bailey Hutchison desalinization plant in the early 2000s in order to use the abundant though brackish groundwater in the area, and it started operations in 2007. There are consistent efforts and funding invested in these types of projects, which represent the greatest opportunity to engage in a long-term vision.



Population share in main cities of the Rio Grande-Bravo watershed

Paola Aguirre

Map of El Paso-Juárez Metropolitan Area with water supply and treatment projects



Conclusion: The opportunity for water infrastructure to act as a unifying element with which to address the future of cities

Since NAFTA's arrival, markets have opened new areas of exchange, economic flows have increased, and multiple transnational programs have been activated and/or unlocked. Still, despite the increased flow of commerce, political, social, and ecological tensions continue to exist. The border region between Mexico and the US has not been sufficiently re-imagined or mapped in a manner characteristic of a healthy and vibrant twenty-first-century border territory. On the contrary, this territory is commonly depicted merely as a "line" loaded with meanings and misconceptions that defer the potential for design; this only further exacerbates tensions.

Water and its relationship to the urban development model, particularly with ecological conservation and restoration as a vital theme, is gaining more attention and support in both national agendas, but it has been difficult to get municipal actors to work together. Combined and integrated infrastructure investments represent a great opportunity for El Paso-Juárez to demonstrate leadership and innovation in developing transnational solutions to address the challenges of contemporary urbanization. The pieces seem to be in place: past and ongoing infrastructure projects in the region with access to funding, the presence of multiple development organizations, and government support and research resources in both countries. What if the next signed agreement represented a shared, long-term, and holistic vision that connects the dots and truly encourages these cities to work as one?

Notes

1
Since the focus of this research is the unified thinking of water systems, the author has decided to call this River the Grande-Bravo, encompassing the names used in both countries: in the US, it is known as the Rio Grande and in Mexico, as the Rio Bravo.

2
Anabel Sanchez, "1944 Water Treaty between Mexico and the United States: Present Situation and Future Potentials," Frontera Norte 18, no. 36 (2006): 125–144.

3
Fernando Romero, Hyperborder: The Contemporary US-Mexico Border and Its Future, (Princeton: Princeton Architectural Press, 2008), 247.

4
1994, NAFTA Treaty, article 3 on the International Boundary Water Commission.

5
One can find a list of projects and publications at: http://www.epa.gov/icc/projects_publications.html.

6
North American Agreement on Environmental Cooperation, Part 3: The Commission for Environmental Cooperation, Articles 8, 9 and 10 (1993). http://www.cec.org.

7
Watersheds of the World, World Resources Institute, http://www.wri.org/publication/watersheds-of-the-world.

8
The population tripled in only 12 years (1994–2006), with an average growth rate of 3 percent. El Paso–Juárez Regional, Historic Population Summary, Development Services Department, Planning Division, City of El Paso.

9
Watershed Planning Discussion at the Binational Border Water Resources Summit, El Paso-Ciudad Juárez, September 2012.

10
Christopher Vigil, "The Canalization of the Rio Grande: A Brief History," New Mexico Journal of Science 46 (December 2012).

11
Zhuping Sheng, Robert Mace and Michael Fahy, "The Hueco Bolsón: An Aquifer at the Crossroads," Aquifers of West Texas, Texas Water Development Board (2001): 66–75.