

1944 Water Treaty Between Mexico and the United States: *Present Situation and Future Potential*

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ABSTRACT

Historically and culturally, water has always been considered to be a critical issue in Mexico-USA agenda. Along the 3 140-km border between Mexico and the United States, there is intense competition over the adequate availability of water. Water uses in urban border areas have continued to increase exponentially due to steadily increasing levels of population growth. Rapid industrialisation and urbanisation have resulted in more intensive patterns of water consumption and use. Agricultural water demands continue to be high. Mexico and the United States have established institutions and agreements to manage and protect rivers in the border region. The Treaty between Mexico and the United States for the Utilisation of Waters of the Colorado and Tijuana Rivers and of the Rio Grande was signed in 1944. With the turn of the century, the growing urban centers along the Rio Grande (Rio Bravo), where the river becomes the international boundary, started increasingly to depend on groundwater. This situation was not specifically addressed in the 1944 Treaty, especially as groundwater use at that time was not so significant.

Keywords: 1. water management, 2. request, 3. bilateral treaty 4. border region, 5. Rio Bravo.

RESUMEN

El manejo y distribución del agua en la frontera ha sido, históricamente, uno de los temas controvertibles en la relación México-Estados Unidos. Desde 1945 a la fecha, la población se ha cuadruplicado en esta región fronteriza de más de 2 000 millas (más de 3 000 kilómetros). Debido a que esta zona presenta un escaso nivel de precipitación pluvial, con el paso de los años, los centros urbanos a lo largo de esta franja fronteriza han tenido que depender del río Bravo y de depósitos subterráneos para poder satisfacer la creciente demanda de agua. Esta situación ha rebasado las disposiciones establecidas en el Tratado Internacional de Límites y Aguas entre México y Estados Unidos, instrumento que desde 1944 se ha encargado de la utilización de las aguas del río Colorado, río Tijuana y río Bravo en la frontera entre estos dos países. La actual demanda de agua en esta zona y las condiciones poco claras establecidas por el tratado en términos de sequía extrema han provocado que el manejo y la sobreexplotación de los acuíferos se hayan convertido en punto focal de las discusión binacional que conmina a reflexionar acerca de los términos del tratado de 1944.

Palabras clave: 1. manejo del agua, 2. demanda, 3. tratado bilateral, 4. región fronteriza, 5. Rio Bravo.

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INTRODUCTION

This paper draws attention to serious water-related issues and the importance and limitations of the 1944 Water Treaty as a legal framework for the border region. Because much of the 3 140-Kilometer (Km) boundary between Mexico and the United States passes through regions with water shortages, there has been intense competition over obtaining an adequate supply of water for municipal, industrial, and agricultural use. Water users in the twin cities located in the semiarid region of the U. S.-Mexican borderlands, in recent decades, have placed increasing demands on water availability because of the population growth rate.

In both the United States and Mexico, historical trends have shown faster growth rates in the border region than in the two nations as a whole. Since 1945, twin cities along the border have quadrupled in terms of population. In 1950, for example, the combined population of the eleven largest Mexican border municipalities was 1 056 000. By 1980, that figure had risen by almost 400%. In 1900, one in 18 U. S. residents lived in a border state, which increased to about one in five by 1995.

Growth on the Mexican side has been even more explosive. In 1990, one in 10 Mexicans lived in a border state, figure that became one in six only five years later. By 1995, almost 10.6 million people lived in the counties and *municipios* around the international boundary, with 5.8 million on the U. S. and 4.8 million on the Mexican side. Water demand in these urban border areas has increased exponentially due to steadily increasing levels of economic activities.

The increasing economic activities and migration have already contributed to serious problems in the border communities in terms of sustainable water use and availability. Higher population, increasing industrialization, especially from maquiladoras (after the Spanish word *maquila* meaning a mill or a processing facility), have increased employment opportunities, which in turn has accelerated migration rates. On the Mexican side of the border the adverse impacts of the maquiladora industry are now visible, especially in terms of water requirements and the disposal of inadequately treated wastewater. Paying over 5 billion pesos in monthly wages, the *maquiladora* industry has become essential to the Mexican economy.

According to El Paso Branch research, the *maquiladora* industry represents about 9 percent of Mexico's formal employment. It is Mexico's main source

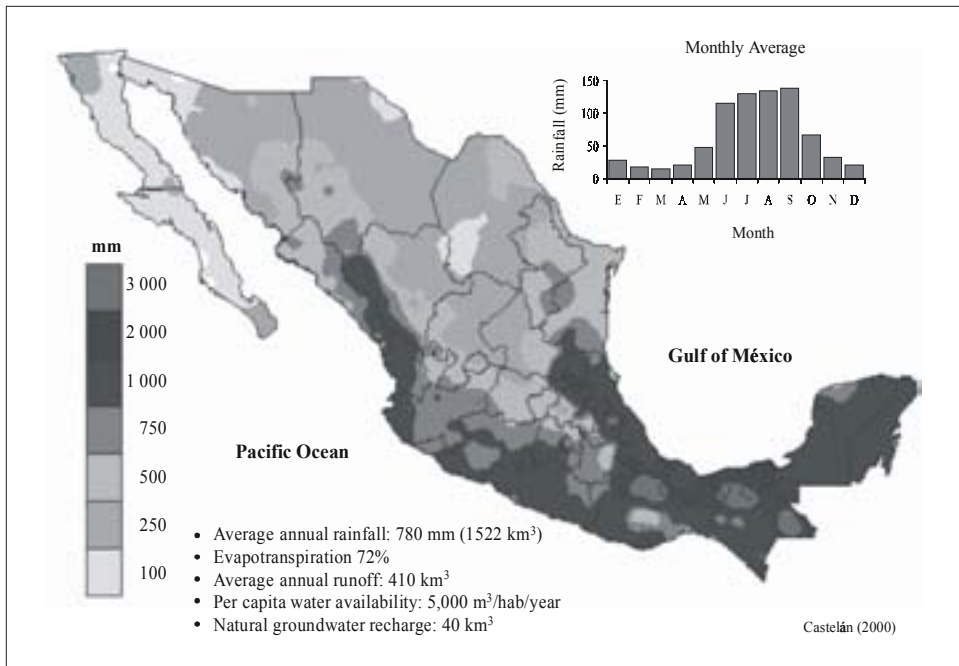


FIGURE 1. *Spatial Distribution of the Rainfall in Mexico (1941-2000)*

of foreign exchange—more than \$18 billion in 2003—and provides 55 percent of the country's manufacturing exports. In 2003, Mexico sent 91 percent of its exports to the United States and bought 62 percent of its total imports from the United States. The two largest U. S. exports to Mexico, electrical machinery and road vehicles, are also the most important U. S. imports from Mexico. These top imports from Mexico are the same goods that leave the U. S. as exports but return as assembled goods. Under the *maquiladora* scheme, equipment, machinery, supplies and raw materials can be temporarily imported into Mexico duty-free. Products are assembled and/or manufactured on the Mexican side and exported back to the United States for further processing and selling. The *maquiladora* link leaves Mexican and U. S. industrial production tightly bound to each other, with *maquiladoras* effectively operating as an extension of U. S. manufacturing into Mexico (Business Frontier, 2004).

As urbanization-industrialization further intensifies so will the demand for water resources to fulfill the increasing water demand. As population growth is expected to continue, so is the demand for water resources (Chávez, 2000).

The maquilas are allowed to use all the water that they need; while, *ejidos* and water societies in indigenous communities are denied permits to operate new wells and filtration plants. Also, some maquiladoras use enormous quantities of water for the “laundering” processes used to treat jeans.

For over a decade now rapid population growth, economic development and maquiladoras, have placed growing stress on existing water resources. Increased demand and limited supply have given rise to an array of conflicting interests: between agriculture and industry, economic development and environmental preservation, rural and urban areas, upstream and downstream users, and Texas and Mexico. Water resource management in this borderland is especially difficult owing to the binational nature of the region; different laws, policies, institutions, and management regimes existing in the U. S. and Mexican parts of the region, making co-ordinated management of water resources challenging at best, and problematic at worst.

The nature of border watersheds as shared regions has historically argued for approaches whereby governmental units in the United States and Mexico have worked in a bilateral manner to advance solutions to regional water resource management issues. In order to address this Mexico and the United States of America signed the 1944 Water Treaty and created The International Boundary and Water Commission (Comisión Internacional de Límites y Aguas), a bilateral organization composed of two sections that reside in the respective foreign ministries of Mexico and the U. S. (International Boundary and Water Commission, 2005). According to the 1944 Water Treaty, the IBWC/CILA has political primacy for all boundary and border water management issues (United States of America and Mexico, 1944), and the respective sections work together to advance solutions to these issues as they arise through the development and implementation of IBWC/CILA Minutes.

THE 1944 WATER TREATY BETWEEN MEXICO AND THE UNITED STATES: CROSS BORDER ALTERNATIVE

For over a century, the United States and Mexico, otherwise divided by history, culture, wealth, and a host of past antagonisms, have managed to find diplomatic, co-operative solutions to some of the most basic controversies in international affairs: the allocation of trans-boundary water, the division of

disputed territories, and the management of a range of problems arising from contiguous development along their common border (Mumme, 1993).

Although the larger bi-national relationship has often been defined by mutual suspicion and asymmetry in political and economic terms, in the last century these countries have peacefully agreed on the apportionment of critical water resources and joint solutions to water allocation problems. Occasionally, as with the Colorado River salinity crisis of the Chamizal boundary dispute, water-related issues have proven difficult to resolve since most of the region is arid and shared river and aquiferous resources are extremely valuable. This region between the United States and Mexico has seen its share of surface-water conflict, from the Colorado to the Rio Grande/Bravo but it has also been a model for peaceful conflict resolution, notably through the work of the IBWC, the supra-legal body established to manage shared water resources as a consequence of the 1944 Mexico-US Water Treaty (Secretaría de Relaciones Exteriores, 1947).

The primary purpose of the bi-national 1944 Treaty between Mexico and the United States for the Utilization of Waters of the Colorado and Tijuana Rivers and of the Rio Grande (henceforth referred to as the Water Treaty) is to allocate and manage U. S. and Mexican surface boundary waters, specially the Rio Bravo/Rio Grande. Historically, the United States-Mexico boundary waters have been managed through the Treaty of Peace and Friendship of 1848 and the Convention between the United States and Mexico for the Equitable Distribution of the Waters of the Rio Bravo/Rio Grande in 1906 until the 1944 Water Treaty.

The Water Treaty, signed in Washington on February 3 1944 allocated water along the United States-Mexico border based on a negotiation formula. In Article 4, the 1944 Treaty allotted the waters, of the Rio Grande/Bravo between Fort Quitman, Texas and the Gulf of Mexico to the two countries as follows:

A. To Mexico

- a) All the waters reaching the main channel of the Rio Grande (Rio Bravo) from the San Juan and Alamo Rivers, including the return flow from the lands irrigated by the last two rivers.
- b) Half of the flow in the main channel of the Rio Grande (Rio Bravo) below the lowest major international storage dam, insofar as said flow is not specifically allotted under this Treaty to either of the two countries.

- c) Two-thirds of the flow reaching the main channel of the Rio Grande (Rio Bravo) from the Conchos, San Diego, San Rodrigo, Escondido and Salado Rivers and the Las Vacas stream.
 - d) Half of all other flows not otherwise allotted by this Article 4 occurring in the main channel of the Rio Grande (Rio Bravo), including contributions from all the unmeasured tributaries, which are those not named in Article 4, between Fort Quitman and the lowest major international storage dam.
- B. To the United States
- a) All of the waters reaching the main channel of the Rio Grande (Rio Bravo) from the Pecos and Devils Rivers, Good-enough Spring, and Alamito, Terlingua, San Felipe and Pinto Creeks.
 - b) One-half of the flow in the main channel of the Rio Grande (Rio Bravo) below the lowest major international storage dam, so far as said flow is not specifically allotted under this Treaty to either of the two countries.
 - c) One-third of the flow reaching the main channel of the Rio Grande (Rio Bravo) from the Conchos, San Diego, San Rodrigo, Escondido and Salado Rivers and the Las Vacas Arroyo, provided that this third shall not be less, as an average amount in cycles of five consecutive years, than 350 000 acre-feet (431 721 000 cubic meters) annually.

The United States shall not acquire any right by the use of the waters of the tributaries named in this subparagraph, in excess of the said 350 000 acre-foot (431 721 000 cubic meters) annually, except the right to use one-third of the flow reaching the Rio Grande (Rio Bravo) from said tributaries, although such one-third may be in excess of that amount.

- d) One-half of all other flows not otherwise allotted by this Article 4 occurring in the main channel of the Rio Grande (Rio Bravo), including the contributions from all the unmeasured tributaries, which are those not named in this Article 4, between Fort Quitman and the lowest major international storage dam.

The 1944 Treaty specifies that in the event of extraordinary drought or serious accident to the hydraulic systems on the measured Mexican tributaries, making it difficult for Mexico to make available the run-off of 350 000 acre-feet (431 721 000 cubic meters) annually, allotted in subparagraph *c*) of paragraph B of Article 4 to the United States as the minimum contribution from the aforesaid Mexican tributaries, any deficiencies existing at the end of

the aforesaid five-year cycle shall be made up in the following five-year cycle with water from the said measured tributaries.

Whenever the conservation capacities assigned to the United States in at least two of the major international reservoirs, including the highest major reservoir, are filled with waters belonging to the United States, a cycle of five years shall be considered as terminated and all debits fully paid, where upon a new five-year cycle shall commence.

The 1944 Water Treaty provides for the non-navigational use and allocation of the Rio Grande (Articles 4-9, 18, 19, 21 and 26), the Colorado (Articles 10-15, and 27), and future agreements on the Tijuana Rivers (Article 16). The 1944 Treaty does not expressly make provision for water quality, but Article 3 does grant the International Boundary Water Commission (IBWC) the authority to give “preferential attention to the solution of all border sanitation problems”. In practice, the Parties have broadly defined Article 3, and treated sanitation and salinity problems under its scope. This Treaty does not cover groundwater, even where it is related to the surface water. The allocation formulae for the Rio Grande and the Colorado Rivers contain ambiguous language. In particular, Articles 4, 9 (Rio Grande) and 10 (Colorado) allow for reductions in the amount of water delivered in the event of “extraordinary drought” or “serious accident”.

This Treaty apportioned the waters of the Rio Bravo (called Rio Grande in the U. S.) and established the IBWC in Article 2, creating an institutional mechanism for the implementation of the treaty. Article 25 sets out the procedures for the IBWC, based on the 1889 Convention and supplemental rules and procedure adopted by the IBWC with the approval of the governments.

INTERNATIONAL BOUNDARY AND WATER COMMISSION (IBWC)

The IBWC is made up of one “Engineer Commissioner” representing each government, who also leads the country section. The sections may include two additional principal engineers, a legal advisor, and a secretary designated by each government. The U. S. Section reports to the Department of State of the U. S. government.

The Commissioners and core staff are accorded diplomatic status and immunity. The jurisdiction of the IBWC encompasses the limits parts of the

Rio Grande and the Colorado River, and works located on the common boundary with each section maintaining jurisdiction over the portion in its territory.

Since, then the IBWC's responsibilities have expanded to include all aspects of water resources management such as allocating water from the Rio Bravo, Colorado River, and other minor rivers and associated tributaries; overseeing groundwater utilization in the Colorado River basin; and monitoring the salinity levels of the Colorado River as it enters Mexico. Although the IBWC has operated efficiently and effectively within the areas mentioned before, it has not solved certain other problems such as hazardous-waste disposal and transport, air pollution, water pollution, and over-pumping of groundwater (Moore, 2000). There are few express compliance mechanisms in the 1944 Treaty, which is not unusual in watercourse agreements. Article 24 allows for ongoing monitoring and information exchange yet makes no provision for public access to information or justice.

Unlike the 1909 Boundary Waters Treaty between the U. S. and Canada, the 1944 Water Treaty does not have a provision for non-discrimination. Article 17 expressly states that neither party shall have claim for damage caused by discharge of flood waters, and Article 20 obliges governments to assume responsibility for claims arising from incidents in their own territories.

Article 24 of the 1944 Water Treaty, contains the general powers of the International Boundary and Water Commission pertaining to compliance system mechanisms. The IBWC has the power to invoke the national courts to support the enforcement of the treaty provisions; and to settle disputes subject to the approval of the two governments. The IBWC is required to provide information to the parties, but not the public. Article 24 requires the IBWC and each section to construct, operate and maintain gauging stations to compile hydrographic data, which is to be exchanged between the two sections, recently updated by Minute No. 289. Article 24 requires the commission to submit annual reports to the two governments, and at any other time on matters within its sphere of responsibility.

The 1944 Treaty replace the 1889 binational convention that had established the old International Boundary Commission/Comisión Internacional de Límites and expanded the authority of the IBWC/CILA to include water issues addressing the application of the boundary and water treaties and settling differences that could arise in their application. The Treaty authorized the following activities:

- Demarcation of the land boundary.
- Preservation of the Rio Grande and Colorado Rivers as the international boundary.
- Protection of lands along the rivers from floods by levee and floodway projects.
- Distribution between the two countries of the waters of the Rio Grande and the Colorado.
- Regulation and conservation of the waters of the Rio Grande for their use by the two countries in the joint construction, operation and maintenance of international dams, reservoirs, and hydroelectric generation plants.
- Delivery of Colorado River water allocated to Mexico.
- Solution of border sanitation and other border water quality problems.

The International Boundary and Water Commission, according to the 1944 Treaty (henceforward referred to as the Treaty) was given the following duties:

- a) To initiate and undertake research and develop plans for the works which are to be constructed or established in accordance with the provisions of the Treaty and other treaties or agreements in force between the two Governments dealing with boundaries and international waters; to determine, in relation to such works, their location, size, kind and characteristic specifications; to estimate the cost of such works; and to recommend the division of such costs between the two governments, the arrangements for the furnishing of the necessary funds, and the dates for the beginning of the works, to the extent that the matters mentioned in this subparagraph are not otherwise covered by specific provisions of the 1944 Treaty or any other treaty.
- b) To construct the works agreed upon or to supervise their construction and to operate and maintain such works or to supervise their operation and maintenance, in accordance with the respective domestic laws of each country. Each section shall have, to the extent necessary to give effect to the provisions of this treaty, jurisdiction over the works constructed exclusively in the territory of its country whenever such works shall be connected with or shall directly affect the execution of the provisions of the treaty.
- c) In general to exercise and discharge the specific powers and duties entrusted to the commission by the treaty and other treaties and agreements in force between the two countries, and to carry out and prevent the violation of the provisions of those treaties and agreements. The authorities of each

country shall aid and support the exercise and discharge of these powers and duties, and each commissioner shall invoke when necessary the jurisdiction of the courts or other appropriate agencies of his country to aid in the execution and enforcement of these powers and duties.

- d) To settle all differences that may arise between the two governments with respect to the interpretation or application of the treaty, subject to the approval of the two governments. In any case to which the commissioners do not reach an agreement, they shall so inform their respective governments reporting their respective opinions, find the grounds therefore and the points upon which they differ, for discussion and adjustment of the difference through diplomatic channels and for application where proper of the general or special agreements which the two governments have concluded for the settlement of controversies.

According to Article 38 of the Internal Regulations of the Mexican Ministry of Foreign Affairs, published in the Official Diary of the Federation (*Diario oficial de la federación*, DOF) on August 28, 1998 with the modifications which had been published in the DOF on November 13, 1998, the Secretary of Foreign Affairs (Secretaría de Relaciones Exteriores, SRE) in its organizational chart should consider the Mexican Section of the International Boundaries and Water Commission (Comisión Internacional de Límites y Aguas, CILA) (Secretaría de Relaciones Exteriores, 2000).

Each section reports to its national government through either the U. S. Department of State or the Mexican Foreign Affairs Secretariat. In Mexico, the SRE is the Mexican counterpart to the U. S. Department of State. Under Mexico's Federal Public Administration Law, the Foreign Affairs Secretariat handles all issues regarding international boundaries and water. SRE undertakes studies and projects concerning the administration and distribution of water of international rivers, including the Rio Grande/Bravo. SRE carries out its responsibilities for the management of international waters through the Mexican Section of the IBWC/CILA (Schmandt, 2000).

Over the course of 100 years the two governments have used amendments known as “minutes” to address new issues and settle disputes. The minutes are mostly clarifications of technical details and unclear language not mentioned in the original 1944 Treaty, which has remained essentially unchanged. The IBWC announces its decisions in the form of “Minutes” which are subject to the approval of the two governments and which are substantive agree-

ments. The flexibility of this procedure has allowed the IBWC to respond to changing conditions without the need to re-negotiate the treaty. This evolving practice is one of the strengths of the U. S.-Mexico treaty.

The major problems regulated by agreement of the parties and documented in the minutes of the IBWC are: 1) salinity; 2) sanitation; and 3) water shortages. In general, the compliance system mechanisms include the exchange of information between the states; monitoring construction, quantity and quality of surface water; prior consultation; and assistance through financing schemes (Mumme, 1993).

More recently, the IBWC and CILA have cooperated in the establishment and implementation of several initiatives designed to focus on specific regional water resource management challenges. Minute 294 establishes a Facilities Planning Program that focuses on water infrastructure deficiencies in the Ambos Nogales region, and two facets of this minute offer important ideas regarding innovations in cross-border water-related planning.

This minute specifically states the IBWC/CILA “shall establish a bi-national team of technical experts in wastewater matters from competent agencies of each country” (IBWC, 1995:2); this mechanism advances a formal binational, yet regionally grounded, technical mechanism towards problem resolution. The minute also calls for local planning priorities to be included in the planning process, and local capacity and information sharing to be advanced.

For several decades after the signing of the 1944 Treaty of International Waters, surface water issues along the border were managed through the IBWC/CILA framework. However, by the 1990's, environmental problems, as well as the worldwide discussion of shared water-related issues, led to attempts by both the U. S. and Mexican governments to address these problems. Nevertheless, the political difficulty of achieving treaty-level agreement bi-nationally, and within Mexico and the United States, isolated the IBWC and its narrow jurisdiction and limited water management mission reinforce both political insulation and dependence, in the Mexican case from the central government (Mumme and Moore, 1999). The political limitations bearing on the commission derive from different sources in each country. In the United States, a strong federalism and powerful national congress have been the basic arenas in which agreements related to the United States-Mexico affairs have been forged.

For the Mexican national section, border states have little influence in the affairs of the Mexican section, which answers to the Mexican SRE and presi-

dential control. From a decision-making standpoint, its dependence on SRE for policy authority restricts its realm of discretion and reinforces its role as a technical advisory agency to the Mexican Government. Unfortunately, nowadays this role is not enough to cope with the emergence of environmental problems and a wide range of water-related issues which clearly show the inherent limitations on the commission's capacity to innovate in the face of emerging demand for policy action in the border area.

The recent IBWC experience reveals some ideas of interest in discussing water resource management on the U. S.-Mexico border. First, different forms of regional institution building have occurred and been formalized through the various bi-national technical committees that have been formed through IBWC/CILA minutes. These efforts are largely problem and region-specific, and the narrowness of their focus appears to aid in their success.

Second, a more pro-active approach than what was seen in the past is being advanced by the International Boundary and Water Commission in the general area of public outreach through their border-wide Citizens' Forums, although it is still too early to determine how effective these forums are in problem resolution (Brown, 2003), particularly as regards transboundary groundwater resources.

TRANSBOUNDARY WATER RESOURCES: THE HUECO BOLSOON AND THE RIO BRAVO/GRANDE

Water supply for the border region is drawn from the Rio Bravo/Rio Grande and two major aquifers, the Hueco and the Mesilla Bolson. The Hueco Bolson extends south from the New Mexico/Texas state line to the Sierra de Juárez to the west, and to the Sierra El Presidio and Sierra Guadalupe to the south. It is approximately 9 000 feet deep and consists primarily of silt and gravel in the upper levels, and clay and silt in the lower portion.

It contains approximately nine million acre-feet of fresh water and as much as 3.4 million acre-feet of saline water (International Boundary and Water Commission, 1998), which has an annual recharge rate of about 6 000 acre-feet. This figure represents only about five percent of the total amount of water pumped out each year from the aquifer. Accordingly, the water level in this aquifer has been declining by 1.5 to 7 m annually. At the current rates of

pumping, it is estimated that economically recoverable fresh water from this aquifer will be exhausted by 2030.

The Rio Bravo (or Rio Grande as it is known in the United States) and its tributaries drain a land area more than twice the size of the state of California. About half of the basin is in the U. S., and about half of the U. S. area lies in Texas. The nature of the basin in Texas changes dramatically from the arid region around El Paso to a subtropical coastal region near Brownsville. Between these two points, the waters of the Rio Grande have been impounded in two major reservoirs, International Amistad and International Falcon Reservoirs.

The increasing economic activities and migration have already contributed to serious problems in the border communities in terms of the sustainable use and availability of water (Liverman and Varady, 1999). Rapidly-growing urban centers along the lower Rio Bravo/Grande on the border between Mexico and the United States demand increasingly amounts of water.

The basin drains 170 000 square miles of land and incorporates three U. S. and four Mexican states. Certain U. S. and Mexican communities are proposing the construction of new water projects on the Rio Bravo/Grande, or their tributaries. In addition to Elephant Butte, Caballo Reservoir, Amistad and Falcon Reservoirs, there are at least 20 additional reservoirs, dams or diversion structures operating on the U. S. and Mexican tributaries of the Rio Bravo/Grande Basin (Schmandt, and Stolp, 2000).

There is, however a critical element missing from the regional planning picture for the Rio Bravo/Grande water, half of which belongs to Mexico. Elephant Butte reservoir is 40 miles long with more than 200 miles of shoreline. The total storage is 2 109 423 ac-ft and its drainage area is 28 900 sq mi. Caballo reservoir storage capacity is 238 316 ac-ft, of which 100 000 ac-ft is for flood control. The Amistad reservoir surface covers 89 000 acres and its capacity is 5 658 600 ac-ft. The international Falcon reservoir is located on the Rio Bravo/Grande.

The area of Falcon reservoir varies from 870,00 ac at elevation 3001.2 feet to 115 400 ac at the maximum elevation of 314.2 feet. This reservoir has summer storage capacity of 2 371 220 ac-ft. It is premature to plan additional reservoir projects for a bi-national watershed when information on half of that watershed is extremely limited, as is the information on the water quality of the rivers, reservoirs and groundwater on the Mexican side. Furthermore,

the environmental and social impacts of existing and proposed projects are largely unknown (Schmandt, 2000).

During a recent drought on the border between Mexico and the United States, the U. S. share of water in Falcon and Amistad reservoir fell to 24% of the total supply while Mexico's share dropped to around 15% of the water supply. It is estimated that annual water loss due to evaporation from the Falcon/Amistad system now exceeds total annual municipal water demand from the system. The combined yearly flows from all tributaries subject to U. S. water extraction rights have dropped from 2.3 million acre feet (a/f) to 0.2 million a/f - a loss of over 2 million a/f. Some are not even making it to Rio Bravo/Grande. Water is thus increasingly becoming a major development constraint for the region (Handbook of Texas, 2001).

While the IBWC has continuous allocation-related support services, its agenda has recently made urban water support services and water quality problems a priority (Moore, 2000; Utton, 1994). Water management on the border is complex and follows political boundaries. The Rio Bravo waters are managed at many levels: internationally by the International Boundary and Water Commission (IBWC), which oversees the division of the Rio Grande Waters between the United States and Mexico under the Treaty of 1944; nationally by the National Water Commission in Mexico and the Bureau of Reclamation in the U. S. and between states by the Rio Grande Compact Commission in the United States. In the area of Ciudad Juarez-El Paso, it is overseen at the state level by the Texas Natural Resources Conservation Commission (TNRCC), and the Junta Central de Agua y Saneamiento (Central Board of Water and Drainage) in Chihuahua.

In Mexico's case the nation has, at all times the right to impose limitations on private property as public interest may demand. As far as water resources are concerned, the National Congress approved a new Law of National Waters in December 1992, additional regulations in January 1994, and modifications to certain articles in December 1997.

The Law of National Waters established broad objectives for the development and implementation of plans and policies for water resource management. The responsibility for implementing the Law was assigned to the National Water Commission (Tortajada, 2000).

The traditional CNA approach to water management, which has historically disregarded transboundary-related water resources on the border, is now to-

tally outdated. The problem has become even more serious because CNA has recently paid insufficient attention to the management of border water resources. Its planning and management practices are often antiquated, and its management and technical capacities limited. It continues to be a highly centralized institution, despite of the rhetoric of decentralization in the recent years. In addition, the Mexican River Basin Councils are legally supposed to manage resources from an integral and regional perspective, but so far they have failed to achieve this objective.

Few serious and objective observers of Mexico's recent water management practices would dispute the fact that poor management of this resource has contributed to the deterioration of the water-environmental conditions of the border region. Recent Mexican government policies, explicitly or implicitly, consider that the economic activities and employment opportunities will increase most along the border regions. On the basis of current trends, it is clear that growth in the border region cannot be maintained, even at the current level, in the medium to long-term, because of water and environmental constraints, not to mention higher growth rates in the future.

CONCLUSIONS

Border problems, particularly water issues, can no longer depend on the limited technical skill of IBWC engineers. Changes in the border between Mexico and the United States are complex but can be roughly divided into categories of demographic, economic and political change. The most obvious changes are demographic and economic in nature. Since 1945, twin-cities, along the Mexico-United States border, have quadrupled in size.

The rapid metamorphosis of border cities has placed constant pressure on urban services to provide water supply, sewage and sanitation support. Economic development has meant more intensive patterns of water consumption and use. While the IBWC has continuous water allocation related support services, its contemporary agenda is increasingly occupied with urban support services and water quality problems.

The IBWC's original mandate continues to be the allocation of water treaty resolution of disputes concerning the location of boundary water resources. In the new context of heightened environmental concerns along the border,

the IBWC's traditional approach to water management has been hard pressed. Much of the difficulty seems to arise from the inherent tension between a management approach that is historically oriented toward the distribution of water resources along the border and growing pressures which have entrusted the Commission with a more visible and contentious regulatory role in addressing trans-boundary water problems. For centuries, rivers and wells had been the main source of water in the border region.

After the turn of the century, the growing urban centers along the Rio Grande/Bravo, where the river becomes the international boundary, began increasingly to depend on groundwater. This situation regarding groundwater was not specifically addressed in the 1944 Treaty and further opportunities for functional expansion outside current treaty authority in this issue is limited. Nevertheless, trans-boundary groundwater had been addressed through the Minutes. Under Minute 242, signed in 1973, IBWC was authorized to regulate groundwater in the San Luis-Yuma section of the Lower Rio Colorado River Basin. Minute 242 also authorized the IBWC to enter into discussions aimed at reaching a comprehensive international agreement apportioning and regulating groundwater aquifers along the United States-Mexico border. It is interesting to note that since 1973 (Minute 242), despite some discussion, there has been little real progress toward such an agreement. On the contrary, both nations have intensified their participation, effectively engaging in a quiet pumping war on each other in a race to claim the larger share of this scarce resource.

The barriers to a groundwater treaty are numerous and growing. First, any effort to apportion groundwater will diminish the stock of water available to the border and basin states, particularly in the Rio Grande/Bravo and Colorado River basins. Trans-boundary groundwater is a common pool resource. As with most common pool problems, individual beneficiaries have limited incentives to relinquish short-term benefits for long-term gains. Any groundwater treaty, indeed any treaty addressing any water-related environmental problems along the border, contains the potential for opening up long settled distributive issues among the various basin states and between Mexico and the United States.

This is a level of controversy that the states themselves as well as the two countries have avoided. Taken as a whole, it simply boils down to being able to pump the water faster than one's neighbor is able to do. Second, in recent years, water scarcity has become even more of a critical issue in the

American West than it was due to demographic trends, policy changes, and drought. However, groundwater is an important unfinished business that must be dealt with if damaging conflict between the two countries is to be avoided.

Moreover, the persistent drought in border states such as Chihuahua, Mexico has led to significantly less water from the tributaries reaching the main-stream of the Rio Bravo. Flows have been reduced to the point where Mexico is now in a “deficit” situation with respect to the 1944 U. S.-Mexico Water treaty that governs the allocation of the Rio Bravo/Grande. The Water Treaty provides that one-third of the flow reaching the main channel of the Rio Bravo be allocated to the amount in cycles of five consecutive years (431 Mm³/year).

Mexico owed the U. S. water and this country has a deficit in the current five year cycle, which could affect the development of the northern Mexican region. Mexico has argued that the latest drought in the region could be described as an “extraordinary drought” in terms of the water treaty. Unfortunately this “extraordinary drought” situation is not well defined in the treaty. This lack of certainty is now at the heart of a raging controversy. This dispute, and the Mexican water debt, has reached the level of the respective state departments in Mexico and the U. S. and the IBWC.

The current controversy over the interpretation and implementation of the 1944 Water Treaty indicates the need for the two countries to better define the terms of the Treaty, especially regarding drought issues. This situation has affected water resource planning in some areas such as in the Lower Rio Grande Valley in Texas. Through Minute 307, both countries have pledged to prevent future water deficits and to work jointly to identify measures of co-operation on drought management and sustainable management of the basin.

It is important to enhance this co-operation mainly through the framework of the IBWC and the development of binational studies which contemplated the examination of possible approaches to ensuring water for ecological, urban, societal, and agricultural uses and the consideration by the IBWC of public participation.

For centuries, rivers and wells had been the source of water in the border region. After the turn of the century, the growing urban centers along the Rio Bravo, where the river becomes the international boundary, increasingly began to depend on groundwater. This situation was not specifically addressed in the 1944 Treaty, especially as groundwater use at that time was not as significant. Further opportunities to update the current treaty are limited. Trans-

boundary groundwater issues, have been partly addressed the Minutes of the Treaty, especially Minute 242 signed in 1973.

However, since 1973, despite some discussion, there has been very limited real progress toward an agreement on groundwater. The inherent tension between a management approach that has been historically oriented primarily towards the distribution of water resources along the border, and the emerging water and wastewater disposal problems have forced the IBWC into a more visible and contentious regulatory role.

Since the current Mexican national policy promotes rapid industrialization, and therefore population growth in the border area, it is becoming evident that water availability and contamination are going to be the main constraints to sustainability in the region. This aspect still has not received much political attention in Mexico. If such explosive growth rates continue in the future, existing legal and institutional frameworks will have to be significantly modified to deal with the current and future problems. There are no signs, however, that these changes are likely to take place in the near future. The integrated sustainable approach needed in this region should consider the sustainability of water resources taking into account the cross-border political, ecological, and social aspects, not just economic growth.

Water scarcity itself does not necessary lead to acute interstate conflict. It is when water-shared resources are perceived as being overexploited by others at a cost to oneself that water scarcity becomes an important force behind changes in politics and economics implemented by international actors. Although water conflicts may not always be as conspicuous or dramatic as wars over religious, ethnic or sovereignty issues, they may have serious repercussions on the sustainability and security interests of Mexico—and the United States—along the border.

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