Transboundary Water Resources
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Texas-Mexico Water Infrastructure Development

{Under Climate Change}

Figure 1. Border 2012 (EPA, 2009)

Introduction

Water resources in the North American southwest are scarce and could arguably be the most politically intractable of the natural resources. Furthermore, over the past century there has been a major population expansion in an already water stressed zone. These zones have become stressed due to variable flow and anthropogenic factors including municipal development, outdated agricultural irrigation practices, industrial development, government reservoir projects, and pollution. Moreover, climate change and climate variability have intensified the scarcity of water resources by changing snow pack, snow melt, and the seasonal flows to regional streams and rivers in the Rio Grande Basin (WRCC, 2010). One could argue that nowhere else are the aforementioned problems exacerbated and more apparent than between Texas and Mexico.

Over the past 15 years there has been a considerable effort by the Border Environment Commission to mobilize financial and technical assets along the borderlands to implement hard and soft solutions to these issues. The policy discourse revolving water resources and the environment quality date back to the 1983 La Paz Agreement on cooperation for the protection and improvement of the environment in the border area (EPA, 2009). The border area is defined as a 125 mile wide corridor (62.5 miles on each side of the U.S.-Mexico Border). The U.S. Environmental Protection Agency in cooperation with the North American Development Bank (located in San Antonio, Texas) works with Mexican authorities and Texas agencies to discover
solutions to some of the region’s most pressing problems impacting human health and the environment the dumping of untreated sewage from counties in Texas and Mexico’s northern states. The Environmental Protection Agency has aimed to achieve six goals in the region: 1) reduce Water Contamination 2) Reduce Air Pollution 3) Reduce Land Contamination 4) Improve Environmental Health 5) Emergency Preparedness and Response 6) Environmental Stewardship. All of the aforementioned goals are closely related and critical to securing the borderlands for future generations. By the end of this decade (2020) there will be about 20 million people living in this zone (EPA, 2009) The focus of this short report is to discuss what has been actively accomplished in terms of hard infrastructure in the past decade, future development, and development horizons.

**Texas-Mexico**

The Texas-Mexico border extends over 1,250 miles from El Paso, Texas-Ciudad Juarez, Mexico to Brownsville, Texas-Matamoros, Mexico and is demarcated by the Rio Grande River (Citation). The Rio Grande’s headwaters are located in the mountains of Colorado and then flows through the state of New Mexico. Due to heavy use and dependence by upstream urban users, agricultural communities, and water projects that have been implemented by the United States Bureau of Reclamation over the past century such as Elephant Butte Reservoir in New Mexico the Rio Grande barely flows at times through Fort Hancock (TexasWaterMatters, 2009). Cities such as El Paso and Ciudad Juarez once depended on rivers’ surface flows; however, today these border populations now rely upon mixture of surface water, groundwater, and desalinated brackish groundwater (TexasComptroller, 2010). The Rio Grande’s instream flow is augmented near Presidio, Texas when the Rio Conchos, sourced from headwaters of the Sierra Madre Occidental joins to flow southward to the Gulf of Mexico (Kelly, 2001). Though instream flows increase after the Rio Concho’s but the intensive agricultural production of South Texas and Mexico have created conditions where environmental flows to the Gulf of Mexico are a shadow of what they once were.

The Rio Grande is economically vital to sustain various activities such as the production of citrus, upland cotton, sorghum, sugarcane, cattle (TexasComptroller, 2010). However, over the past 25 years the Rio Grande basin has attracted considerable industrial growth in Mexico because of labor costs and overhead costs. Companies from around the world such as Philips North America have established maquiladora operations to assemble products from foreign products. Economic development was the goal, but over the past decade it has become evident that the Mexican government was not prepared to handle the environmental hazards of industry (EPA, 2009) To continue, industry and agriculture have enabled individuals to migrate to the borderlands. Workers are often impoverished and search for the most affordable location to live. Therefore, individuals set up communities known as “colonias” which are usually not affiliated with and do not have the proper infrastructure for water and wastewater (EPA, 2009). Authorities such as the Texas Commission on Environmental Quality, Texas Water Development Board, and Mexico’s National Water Commission have come to an agreement that infrastructure must be established to treat effluent from point and non-point sources (Conagua, 2008). The Rio Grande’s flow to the Gulf of Mexico is imperiled, but moreover the quality of the water is causing environmental and economic repercussions (TexasWaterMatters, 2009). Further, downstream users including residents in Brownsville, Texas and Matamoros, Mexico are among
the last users of the water which often tainted with agricultural products such as pesticides, herbicides, and fecal (EPA, 2009).

What’s New in Infrastructure?

The North American Development Bank (NABD) last quarterly report was December 31, 2009 and detailed several projects that were designed to meet the current and future needs of several communities in the borderlands. The NABD has approved a grant for the expansion of a water distribution system in Colonia Esperanza, Chihuahua to supply water to residents. In November 2009 the City of Nuevo Laredo, Tamaulipas began operating a newly constructed wastewater treatment plant that has the ability to treat nearly 14 million gallons a day or 126,000 residences (North American, 2009). The Border Economic Cooperation Commission noted that this project in particular will reduce unsanitary discharges to the Rio Grande. In October of 2008 a half million gallon a day wastewater treatment facility broke ground in Ciudad Mier, Tamaulipas. Water quality and quantity is an issue that has to be addressed along the entire Rio Grande. The BECC projects that for the fiscal year 2009 nearly 5 million residents will benefit from about $460 million USD of total investment. As one evaluates BECC reports one can observe that border communities are attempting to address the issue of wastewater treatment because discharged water inevitably becomes reused as a primary water supply for downstream communities (North American, 2009).

In Texas the Texas Water Development Board has set up special financing help meet the demand for water projects by region. The Rio Grande runs along three development regions Region M: Rio Grande; Region J: Plateau; Region E: Far West Texas. Figure 4 highlights Region M and Region E both of which are expected to have population expansions of 100% to 200% by the year 2060. Region E which includes the City of El Paso, the population is expected to total 1.5 million from current population levels of about 800,000. Region M which is known as the “Valley” by South Texans is expected to have a population of 3.8 million in 2060 from a population of 1.2 million (TexasWaterMatters, 2009). The U.S. government has numerous laws that essential require the state and the federal government to invest in projects to maintain water quality under the Clean Water Act (EPA, 2009). Border 2012 has enabled the U.S. EPA to aid our partners in Mexico with the exchange of direct capital investment and technical expertise (EPA, 2009). Projects on both sides of the border must be sustainable; meaning that once construction is complete the management must be supported to maintain facilities and the programs. Under climate change the Western Regional Climate Center anticipates that water will become more scarce due to a lack of precipitation in the western United States (WRCC, 2010). Prolonged droughts between Texas, New Mexico, and Mexico have already impacted the availability of water. The system as whole cannot sustain population growth and severe drought conditions (WRCC, 2010).

Infrastructure programs that are funded by the NADB, Texas, Mexico, and the EPA now evaluate the benefit of water conservation programs. There are multiple issues to be considered when developing treatment facilities and pipelines (NorthAmerican, 2009). Water is already a scarce resource in the borderlands. Conserving water saves money. The return on investment is high because conserved water means that less water had to be treated from surface water and groundwater. Texas is arguably one of the most progressive states in terms of re-thinking hard and soft water infrastructure. Large U.S. Bureau of Reclamation projects and Texas Water Development water storage systems such as reservoir may prove to be an outdated technology
under climate change because temperature increased equal evaporation and water loss. Aquifer storage and recovery may be the next step in sustaining populations along the borderlands. Infrastructure in the borderlands will have to ensure populations have adequate water supply for agriculture, industry, and municipalities. But, the projects will also have to respect water rights and the needs of the riparian zone (Conaqua, 2008)

Discussion:

1) Should the United States ensure that all of Mexico’s infrastructure projects are funded in the borderlands?
2) Would secured water resources enhance the quality of life for inhabitants of the borderlands? Or would enhanced development plans lead to unsustainable growth under climate change?
3) As individuals who reside in Texas do you believe that state and federal funds should be granted to support borderland development?
4) Many political scientists believe that basic public services must be met to support a democratic government; with this in mind should the U.S. consider more direct infrastructure aid to Mexico’s struggling efforts with the Mexican cartels?
5) Under current economic conditions the economic productivity is a fraction of the U.S. GDP and has not garnered the same interest from the U.S. Congress, could you argue that the U.S. was too short sighted and even negligent in upholding the Clean Air Act and Clean Water Act?
6) If you were governor of Texas would you advocate for more policies that conserve water resources and ensure freshwater inflow to the Gulf of Mexico? Why or why not?
7) Considering the projected population in the borderlands; what source of power generation would advocate for in the region: nuclear, coal, hydropower, natural gas, or wind? {Keep in mind that water is forecasted to be more scarce in the region}
8) Without in discussing water rights; would you be in favor of changing the surface water rights structure in the state of Texas and to accommodate new users, drought conditions, and reserving water rights for environmental flows?

Required Readings:


Supplemental Readings:


References:


Tables & Figures: {For discussion purposes please evaluate the mostly Texas centric data presented in the following tables and figures.}

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<th>Table 1. Border Impact</th>
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<td><strong>Texas Economic Zones</strong></td>
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<td>Upper Rio Grande</td>
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<td>West Texas</td>
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<td>South Texas</td>
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Figure 2. Economic Zones Basins (Texas Comptroller, 2010)
Figure 3. Precipitation

Water Demand (Texas Comptroller, 2010)

Source: Texas Water Development Board.

Figure 4. Region M - Rio Grande

http://www.texaswatermatters.org/region_m.htm

Region E - Far West Texas
(TexasWaterMatters, 2009)

Excerpt from press release:
Climate Science and Climate Change: Climate science has evolved over the last thirty-five years to a point where predictions by climate models can be considered to have significant information content. The greenhouse effect has clearly established itself as a driver of climate change and the main agent is the continuing increase in the concentration of carbon dioxide in the atmosphere. There are several ways of assessing the status of climate change research, the most recent and comprehensive is from the Intergovernmental Panel on Climate Change: Fourth Assessment Report, released in 2007. According to this report greenhouse gases are expected to cause global temperatures to rise 5.4°F (plus or minus 1.8°F) by the end of the century. Temperature changes in Texas are expected to be comparable. A notable feature of the predictions is the expansion of the tropical zone, familiar in summer for Texans, to include more of the spring and fall. This could lead to less rainfall especially in regions that are already dry. Other important effects include possible changes in El Niño (climate variability) and hurricane behaviors; further research will more accurately specify these and other effects.

The Changing Climate of Texas: Texas temperatures increase from south to north, whereas precipitation increases dramatically from west to east. The seasonal patterns of precipitation also vary greatly across the state (e.g., dry winters in the west, more even distribution in the east). Texas also experiences a variety of severe weather such as tropical storms, tornadoes, drought and flooding. The wide variations in weather and climate across Texas imply a broad range of vulnerabilities to climate change. Averaging over Texas the temperature over the last few decades has been increasing. Precipitation has also steadily increased over the past century, but with variation among the different regions. In the future, Texas temperatures are likely to continue rising. Precipitation changes are much less clear, with most models projecting a decrease. Even if precipitation were to remain stable, rising temperatures would increase evaporation and dryness. The expected changes in temperature and precipitation will have an impact on other sectors of the state's resources as discussed below.

Water Resources: Taking flows to the coast as a measure of river-basin impact, we calculate which changes will occur by mid-century under constant and changes climate conditions. Considering only population growth and the resulting increased water demand flows will be reduced by about 25 percent under normal conditions and by 42 percent under drought conditions. When also considering climate change (3.6 degrees F increase in air temperature and 5 percent decrease in precipitation) 2050 projected flows to the coast are 70 percent of the 2000 values under normal conditions and 15 percent of 2000 normal under drought conditions.

Coastal Zone: There are two direct effects, which are already observable, in the instrumental record: rapid sea-level rise and rising sea temperatures. The sea-level rise rates are specially high in Texas because of the added effect of land subsidence, which is caused by oil and groundwater extraction. The increasing temperatures are already manifesting indirect changes in habitats and water quality.