Policy Note

Hydrological Cycle Management to Reduce the Effects of Drought in the Rio Grande Basin

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Introduction

The Rio Grande Basin, or Rio Bravo as it is known in Mexico, includes northern Mexico and the southern United States. The Mexican side covers an area of 379,552 km², and the Rio Grande has a length of 2,018 km, from Ciudad Juarez, Chihuahua, to its mouth in the Gulf of Mexico.

The basin, which has 21 tributaries, is one of 13 hydrological-administrative regions into which Mexico has been divided, called the Rio Grande Region VI. The region covers 141 municipalities in the states of Chihuahua, Coahuila, Durango, Nuevo Leon and Tamaulipas. It has been divided into six subregions for the purpose of planning: High Bravo, Middle Bravo, Low Bravo, Conchos, Closed Basins of North and San Juan. The region has a population of 10.7 million people, of which 6.4% live in rural areas, and 93.6% live in urban areas. Economically, the basin produces 15.7% of the country's gross domestic product, which places it second nationally.

It is noteworthy that this is a border basin, which implies that water management requires agreements and commitments between Mexico and the United States. For this reason, in 1944 the Treaty on International Water Distribution between the two countries was signed, which establishes three important considerations:

1. Mexico should provide a volume of at least 431.7 Mm³ per year on average in five-year cycles.

2. In cases of continued extraordinary drought or a serious accident to the hydraulic system, causing Mexico to stop passing the agreed volume, the shortfall at the end of the cycle will be replenished in the next cycle.

3. When the international dams shared by both countries (La Amistad and Falcon) reach their maximum capacity, the five-year cycle shall be deemed completed.

In the past 60 years, drought in the basin was recorded between 1948 and 1954 (six years), 1960 to 1964 (four years) and, most recently, 1993 to 2003 (10 years). Distribution of water includes 84%, for agricultural use, 13% for public water supply, 2% for self-supplying industry, and 1% for thermal power plants. In order to achieve sustainability of water in the basin, it is necessary to focus efforts on improving efficiency and productivity in water used for agriculture. This efficiency increase has been hampered in the Rio Grande Basin, due to the aridity of its territory and part of the water drains not being utilized internally.

Sustainability in the basin

In order to be prepared for a new drought, the Mexican government, through the National Water Commission, is developing several actions to achieve sustainable water use in the basin, mitigating the effects of drought and ensuring the needs of water for cities and users of the basin, as well as being able to meet the commitments of the 1944 Treaty. To achieve sustainability in the basin,
four objectives have been proposed:

1. Reduce demand of water for agriculture and increase the supply of water, in order to balance the basin.

2. Increase production, land and earth productivity, regional employment, and the income of agriculture water users.

3. Achieve sustainability and balance between different uses of water.

4. Comply with water transfers to the United States, according to the terms of the Treaty on Distribution of International Waters between the United Mexican States and the United States of America (USA), 1944.

5. Reduce the demand for agricultural use and to increase the supply of water, some guidelines have been established, seeking to reverse the effects of drought in the area.

Guidelines to reduce water demand for agriculture include modernization of the water distribution network; real-time irrigation forecasts; technical improvements of irrigation systems; better sowing and harvesting practices; introduction of low water-demand crops; exclusion of low productive lands and new urban lands; rainwater harvesting; and healthy dam management.

Guidelines to increase available water include integrated water management in the basin (surface and groundwater); exchange of treated wastewater for fresh surface water; make the most of underutilized spring water; repurchase of water use deeds and resizing overall located irrigation districts and units; and cancellation of unused water deeds.

Main results of the work

The total investment in the area between 2001 and 2007 was 1,319 million pesos (approximately $105 million), applied on coatings and tubing of canals, installation of irrigation systems, land leveling and rehabilitation of wells. This investment was used in three irrigation districts in the basin: Delicias, Lower Rio Conchos and Florido River. Of these resources, the North American Development Bank (Nadbank) contributed $40 million.

The use of improved technologies in irrigation, the rehabilitation and modernization of water infrastructure and the introduction of crops that require less water have helped to make the use of the resource more efficient, reducing pressure on overall located water demand sources, and impacting positively on the conservation and preservation of rivers, lakes and aquifers.

As of today, work has already begun with the signing of agreements with eight of the nine irrigation user associations, representing 220,000 hectares. Water savings of 500 Mm$^3$ is expected in this irrigation district by 2012. Future savings in urban water in the area stretching from Nuevo Laredo to Matamoros will be realized with the construction of the aqueduct Falcon-Matamoros. Treated water from the cities will be used for agriculture in exchange for first-use surface water use in cities. This measure is expected to reduce pressures in parts of some over-allocated aquifers.

Once the total irrigation area of the basin has been covered (999.597 ha), the savings could amount to 2,000 Mm$^3$: 1,100 Mm$^3$ in irrigation districts, and 900 Mm$^3$ in the irrigation units. These savings will allow future droughts to be dealt with, despite the potential effects of climate change.

This policy note is based on a paper presented at the International Drought Symposium, http://cnas.ucr.edu/drought-symposium/