**IMPACTS OF CLIMATE CHANGE ON TRANSBOUNDARY WATER SHARING BETWEEN TEXAS AND MEXICO**

Rosario SANCHEZ, C. Prakash KHEDUN, and Ronald KAISER

1 Water Management and Hydrologic Science, 2 Professor, Department of Recreation, Park & Tourism Sciences, Texas A&M University, College Station

## INTRODUCTION

Climate change will affect the hydrological cycle and consequently water availability by altering precipitation patterns, streamflow, temperature, and evapotranspiration. The Texas-Mexico border area is projected to be a region subject to high-risk climate change impacts. Tension over transboundary sharing of surface water from the Rio Grande and its tributaries and groundwater, will be exacerbated as a result of population increases, and as seasonal patterns disrupt agricultural activities. The impacts of climate change on these water bodies along with the collateral social, economical and legal effects have not been properly considered.

This paper explores the implications of climate change on the sharing of water between Texas and Mexico, that will force policy-makers and institutions of both countries to change their water resources management practices. Higher uncertainty will challenge timing of policy development and adapted short-term regional response to extreme water-scarce and/or flooding forecasts, and will substitute the actual long-term response of institutional boundaries. These changes may require reexamination of the 1944 Treaty to better manage binational tensions arising out of global warming.

## CLIMATE CHANGE AND THE TEXAS - MEXICO REGION

Climate model simulations indicate that North America shall experience a rise in temperature in the range of 1 to 3 °C during 2010 to 2039 and between 2 and 3 °C towards the end of the century. At high latitudes, the warming shall be highest during winter, while in the southwestern part of the US it shall be highest during the summer.

- Warming at high latitudes implies that snowpack and the timing of snowmelts, and consequently flows in the rivers providing water downstream to the southern US, shall be affected
- Evapotranspiration will increase
- Annual precipitation in the south western US is projected to decrease
- Greater temporal variability in precipitation and an increase in the frequency of extreme events may lead to both flooding and droughts
- Water quality is expected to deteriorate with increasing temperature and reduction in flow
- A reduction in recharge and over-pumping to meet the increasing water demand will accelerate the depletion of aquifers

In 2003 the river mouth dried

## THE RIO GRANDE / RIO BRAVO

- With a water availability of less than 500 m³/person/year, the basin is already facing absolute water scarcity (as per UN definition)
- Several cities, including El Paso in Texas and Ciudad Juarez in Mexico, are relying heavily on groundwater from the Hueco Bolson as their sole drinking water supply
- Pumping already exceeds recharge and the declining level of water in the aquifer has led to the intrusion of brackish water, hence reducing its fresh water storage capacity
- Population growth and urban water demands in the basin are expected to double in the next 50 years
- Climate change has surfaced a potential impediment to effective long-term policies and management of water resources
- There is already an over-allocation of existing flow
- Competition for the available water among urban water needs, agriculture, hydropower, and recreation
- Uncertainty of future sources of water
- Persistent long-term droughts associated with climate change will lead to reductions in water availability

## THE 1944 TREATY

Climate change per se has not been addressed in the treaties negotiated between riparian states. Both the Helsinki Rules on the Uses of the Waters of International Rivers and the UN Convention on the Law of the Non-navigational Uses of International Watercourses recommend that climatic factors should be considered in the utilization of shared watercourse systems. The rules that may be applied to transboundary groundwater are still hazy.

The 1944 treaty between the United States and Mexico has, on several occasions, been visited to address infrastructural needs and water quality. With respect to climate change, the challenge shall be the ability of the system to handle short-term variability without major physical changes and major disruption in terms of supply to any user.

- No clear definitions of "extraordinary drought" and "catastrophic change" and how to identify the onset of such events
- River flows are assumed to be constant over time
- Shortfalls in water quantity and adaptation strategies are poorly addressed
- Quality of water is poorly addressed

## RECOMMENDATIONS

- Develop policy response to short and long term shortages
- Assessment of catchment management practices and perspectives
- Conjuctive management of ground and surface water
- Improve disaster management plans for both floods and droughts
- Develop policies and strategies for the sharing of risks and benefits

## CONCLUSIONS

Climate change will affect the flow patterns of the Rio Grande/Rio Bravo and consequently water allocation between Texas and Mexico. The challenges for policy development institutions and international law principles governing transboundary water sheds are daunting. Timing response, adaptability to short and long term climatic conditions, revision of the 1944 Treaty and water demand management, will be critical issues for preventing water conflicts between the two countries in the actual future.

## REFERENCES


## PICTURES

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