

## **EPA Geography and Water**

### **Final Report**

#### **Development of a Transboundary Diagnostic Analysis Framework for the Sustainable Use of the Rio Grande**

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## Introduction

The Rio Grande, with a length of 3,000 km, is the 5<sup>th</sup> longest river in North America, and 24<sup>th</sup> longest in the world. It is a major boundary between Mexico (where it is known as the Rio Bravo) and the U.S. As an asymmetric river border between a developing and developed country, any successfully implemented transboundary management mechanism can be a useful example to be emulated in other transboundary basins in the world.

Because of its importance to both countries, and because it has been identified in recent years among the world's ten most endangered rivers by both the Worldwide Fund for Nature and American Rivers, **the primary objective of this project was to develop a comprehensive Transboundary Diagnostic Analysis (TDA) framework for the Rio Grande.**

The Rio Grande is central to the cultural heritage and history of the border region of both countries. Its 467,000 km<sup>2</sup> drainage basin stretches across five Mexican States (Chihuahua; Coahuila; Nuevo Leon; Tamaulipas; Durango) and three U.S. States (Colorado; New Mexico; Texas), and has a combined population of more than 13 million inhabitants. This international basin is the most rapidly-growing area in both countries, with 90% of the border population residing in 14 paired sister cities along the Rio Grande, most exhibiting growth rates exceeding 3%.

The river is over-allocated throughout its drainage basin, with some water abstractions so large that little or no water is available in some locations. The largest single consumer of water in the river is agriculture, particularly in the lower Rio Grande Valley and the Rio Conchos basin.

Because it is the primary source of irrigation water for economically-important agricultural activities on both sides of the border, the water scarcity situation in the lower Rio Grande Valley is particularly critical, with intermittent droughts being a continuous threat in this stretch of the river. The precarious state of the estuary at the Rio Grande river mouth became dramatically evident in February 2001, when the mouth was blocked by a sandbar caused by low-flow conditions resulting from a severe drought existing since 1995. The average annual flow rate at the Rio Grande river mouth was nearly 3 million m<sup>3</sup> in 1962, compared to an average flow of zero during 1990-1995. The river mouth remained closed until dredged open by the International Boundary and Water Commission (IBWC) in September 2001. Subsequent tidal water changes again closed the mouth until September 2002, when higher tides and increased rainfall runoff partially opened it.

Water diversions, dams, high evaporation rates, recurring droughts, invasive species, sensitive biodiversity, agricultural and urban land use changes, and social dislocations seriously hinder the sustainable use of the river for meeting human and ecosystem water needs. Because of such factors, the Rio Grande is a river in serious disarray, being unable to support a formidable range of human physical, social, and economic needs, while also maintaining important ecosystems.

Further complicating the issue is that a myriad of international, national and State organizations and agreements focus on a range of water use matters. As a result, the Rio Grande is managed in a piece-meal manner, with many organizations and agencies addressing only one or a few aspects of water quantity or quality in its basin. This ensures that no single entity considers the efficient, sustainable use of the river and its resources as a whole. This reality negatively impacts the use of the Rio Grande for beneficial purposes, as well as impacting the region's environmental and socio-economic conditions. Although the extent of the crisis in managing the river and its resources is well known, determining how to deal with it is much more problematic.

There is every indication that the serious water shortage problems throughout the Rio Grande basin will continue into the future unless efforts are undertaken to develop and implement a comprehensive action plan for the sustainable use and management of the river and its resources throughout its drainage basin. Past experience clearly illustrates that the water allocations prescribed in the 1944 Treaty, which were developed under a significantly different hydrologic setting and schedule of water needs, are inadequate for addressing the long-term issue of equitable and sustainable water uses along the Rio Grande.

#### *Transboundary Diagnostic Analysis*

The need to share and utilize the water resources of the Rio Bravo Basin in a sustainable manner is at the core of this project. It is directed to developing a comprehensive, participatory framework for coordinated bi-national management activities, with a focus on facilitating more efficient water use throughout the basin for meeting both human and ecological uses. The socio-economic factors influencing the livelihoods of basin inhabitants, particularly the poor and underrepresented population, are integral to such goals, particularly for maximizing transboundary benefits. The natural heritage of the Rio Grande Basin also is considered to be unmatched by any comparable desert riverine system in the world.

An approach for addressing this serious management gap already exist within the framework of a Transboundary Diagnostic Analysis (TDA), as the scientific basis for development of a comprehensive Strategic Action Program (SAP), consistent with the approach promulgated by the Global Environment Facility (Washington, D.C.), an independent financial organization that facilitates projects benefitting the global environment, and promoting sustainable livelihoods in local communities.

The agreed TDA Framework provides a rational basis for the two governments to undertake the integrated management of the Rio Grande throughout its basin. The TDA will serve as a vehicle for integrating the results of the biogeophysical, institutional, legal, economic, cultural and political knowledge and data generated from a binational, consensus-based 'Vision' process, and the results of targeted research activities.

The TDA will strengthen the ability of country-level institutions to implement common basin-wide programs and projects by creating a shared knowledge base upon which a common

management framework for the Rio Grande Basin can be formulated. As such, it also provides a comprehensive cooperative framework within which the two riparian countries can address the identified constraints to the sustainable use of the Rio Grande. As a particularly important outcome of this project, it will provide the basis for subsequent management interventions to be determined through the formulation of a SAP for the Basin. Completion of the TDA will significantly catalyze the development of a SAP by providing both a knowledge base, and a basis for agreement on needed actions, thereby being of major benefit to all Rio Grande stakeholders.

## **Objectives**

The objectives associated with this project were as follows:

- (1) Development of a comprehensive Transboundary Diagnostic Analysis (TDA) Framework, including consideration of the recommendations arising from the international Project Rio conference;
- (2) Identification, analysis and incorporation of past and present Rio Grande research efforts and results, as appropriate, as input information and data for the TDA, with special attention being paid to the Rio Grande Database Clearinghouse developed by the Texas State University, and the research efforts encompassed within the “Sustainable Agricultural Water Conservation” project of the Texas State University System;
- (3) Revision of the Rio Grande TDA, as appropriate, to incorporate the research data and information arising from item (2) above.

## **Methodology**

In addition to the funding from the US Environmental Protection Agency, creating this comprehensive TDA framework was conducted in part with funding from the US Department of Agriculture, and the United Nations Environment Programme. In an effort to ensure there was no duplicative funding, and because of the significant water usage, this project focused on the agricultural component of the TDA.

Development of the TDA involved the following steps:

- (1) Identifying all relevant agricultural, socio-economic, institutional, legal, and biogeographic problems and elements hindering the sustainable use of the river and its resources on a transboundary basis. This was accomplished by conducting a comprehensive literature review, including:
  - a) Reviewing the conclusions and recommendations of the Project Rio Workshop, previously held in Ciudad Juarez, Chihuahua, Mexico during October, 2006.
  - b) Reviewing the contents of the Rio Grande Institutional and Publications Databases of the River Systems Institute. This activity included reviewing relevant organizations conducting research in the Rio Grande Basin, or which have acquired significant data and information on the Rio Grande, particularly of a transboundary nature (e.g., International Boundary and Water Commission; Boundary Environment Cooperation

Commission; Commission on Environmental Cooperation; National Heritage Institute; North American Development Bank). Additional information was sought from governmental organizations on both sides of the border, including the U.S. Environmental Protection Agency; U.S. Geological Survey; U.S. Fish & Wildlife Service; SEMARNAT; Mexican National Water Commission; Texas Commission on Environmental Quality, Texas Water Development Board; and Texas Parks and Wildlife Department.

- c) Reviewing the ongoing and completed research projects being conducted under the “Sustainable Agricultural Water Conservation” project by the five universities comprising the Texas State University System.
- (2) Analyzing all relevant agricultural, socio-economic, institutional, legal, and biogeographic problems, and identifying their root causes.
- (3) Consulting with relevant officials in the United States and Mexico regarding the elements to be included in the TDA, as the basis for a comprehensive framework document that considers the major environmental and socioeconomic concerns of both countries regarding the Rio Grande Basin.
- (4) Compiling, analyzing, and utilizing the totality of this data and information, as appropriate, in developing a logical TDA Framework focusing on the sustainable use of the Rio Grande throughout its basin.

The methods specifically used in the agricultural component included a comprehensive literature review, compilation and analysis of statistical data from the USDA’s 2007 and 2009 Census, SIAP (Mexico’s Agricultural Statistics Service), and a collection of statistical data from the Food and Agriculture Organization (FAO) of the United Nations, among other organizations.

## **Results**

The results of this research include several relevant publications, as follows:

- (1) “Agriculture in the Rio Grande Basin: An Overview of Trans-boundary Practices” (see Appendix 1).
- (2) Directed research for a Masters degree in Applied Geography by Margaret Morris, “A Trans-boundary Analysis of Agricultural Practices in the Southern Portion of the Rio Grande Basin” (see Appendix 2).
- (3) “Regional Framework Sustainable Use of the Rio Bravo - Sub-project II.3: Transboundary Diagnostic Analysis,” subsequently submitted to the Global Environment Facility (Washington DC) for funding (see Appendix 3).

## **Implications**

As previously noted, the Rio Grande is currently degraded and overallocated throughout its basin. Its arid basin is subject to recurring droughts, invasive species, sensitivity biodiversity, and changing land use patterns. Further, the river is managed in a piece-meal manner, with multiple international, national and local organizations and agencies responsible for only one or a few aspects of water quantity of quality in its basin. The high population growth rate in its

basin continues to be fuelled by the possibility of increased economic livelihoods associated with the North American Free Trade Agreement. Accordingly, the ability of the river to support the existing range of human, physical, social and economic needs, as well as maintaining its environmental sustainability, is seriously hindered.

There is every indication that this situation will continue into the future unless a means of ensuring its comprehensive, holistic management is developed. The development of a Transboundary Diagnostic Analysis (TDA) represents a major step in this direction. As an agreed transboundary scientific and socio-economic knowledge base, the TDA provides a strong binational cooperative mechanism for the two riparian countries to identify constraints to the sustainable use of the Rio Grande, as well as their root causes. Further, it will provide the information the two countries need to develop an effective binational management program for the Rio Grande, within the context of a basin-wide Strategic Action Program (SAP). In the absence of such actions, the continued degradation and over-allocation of the Rio Grande throughout its basin is inevitable, with negative implications to both basin inhabitants and ecosystems.

## **Recommendations**

There are several recommendations arising from this project, as follows:

- a) The elements and components of the TDA developed in this project should be considered and implemented by both riparian countries in a timely, cooperative and sustainable manner;
- b) The pilot projects and targeted research activities be funded and implemented on both sides of the border, as needed to provide input and guidance for a transboundary Strategic Action Program (SAP) (see Appendix 4);
- c) Every effort should be made to ensure comprehensive stakeholder participation in the development of both the Rio Grande TDA and SAP;
- d) Both riparian countries should cooperate to ensure sustainable financial sources for the recommended components and activities incorporated in the TDA, as well as considering the long-term requirements for the Rio Grande Basin SAP;
- e) Both riparian countries should develop and implement a comprehensive communication program to inform the citizens and officials in both riparian countries of the conduct and progress of the TDA elements and activities.