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# Development of a Decision Support Tool to Improve Binational Water Quality Planning in the Lower Rio Grande/Río Bravo, South Texas and Northern Tamaulipas

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**Abstract:** We describe the development of a decision support tool designed to facilitate and enhance collaborative binational decision-making efforts associated with integrated transboundary water quality planning and management in the Lower Rio Grande/Río Bravo downstream of Falcon Reservoir. The Lower Rio Grande Water Quality Initiative Decision Support System (LRGWQIDSS) is the result of a multidisciplinary effort to integrate qualitative social science research, geospatial analysis methods, deterministic water quality modeling and the visualization of natural resources data. The LRGWQIDSS incorporates information currently used by urban planning and natural resource management organizations working along the Texas-Mexico border area and provides a means to analyze and display the information in a way that is useful to institutional actors involved in jurisdictional and transboundary water quality planning efforts. The LRGWQIDSS uses a deterministic water quality model capable of simulating the effects, on water quality in the river, of a variety of development scenarios, including changes in land use and population with and without specific investments in sanitation infrastructure and/or the implementation of agricultural best management practices. The simulated effects on water quality are measured using physicochemical parameters commonly monitored by both the US and Mexico, including dissolved oxygen, total dissolved solids and fecal bacteria. While stakeholder analysis methods, such as Agent-based modeling have contributed greatly to decision support system development efforts, factors that affect institutional change, such as path dependency and jurisdictional disputes have remained largely underemphasized in these efforts. The analysis of the institutional arrangements currently in place to protect water quality in the Lower Rio Grande/Río Bravo played an important role in the design and development of the LRGWQIDSS and its successful application. The development of the LRGWQIDSS represents a case study in the importance of the role of institutional analysis in the successful development of decision support systems for transboundary water quality management.

**Keywords:** Decision Support Tool; Transboundary Water Quality Planning and Management; Collaborative Binational Decision-making; Lower Rio Grande/Río Bravo, Qualitative Social Science Research