

TRANSBOUNDARY GROUNDWATER MANAGEMENT IN SOUTH AMERICA: IDENTIFYING BARRIERS FOR POLICY IMPLEMENTATION

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A substantial volume of research has been conducted on transboundary water resources. Despite the numbers, little attention has been paid to groundwater resources that are shared by two or more countries. Furthermore, these studies have systematically focused on conflictive situations especially in cases where cooperation could be achieved in regions under high water stress. However, there is a misleading assumption that international cooperation is the final end point. A more critical analysis of transboundary water resources should take into consideration international and domestic elements alike. Cooperation, once achieved, does not guarantee the sustainability of the resource over time. The objective of this article is to critically evaluate the international project for the joint management of the Guarani Aquifer System shared by Argentina, Brazil, Paraguay and Uruguay. In doing so, both international and domestic aspects of water management will be included. It is argued that the obstacles to achieve international cooperation should be seen as a first step towards effective management. Once agreement exists at the international level, domestic aspects of water management can illuminate many of the problems imposed on developing countries to manage and protect their natural resources.

Between 1950 to 1990, water use around the globe more than doubled (Feitelson 2000). Such demand pressure is not linear and homogeneously distributed. As a result of huge discrepancies in spatial allocation of water resources and human demand patterns; fast quantity and quality deterioration lead to an increasing number of conflicts over water resources (Clarke 1993; Haftendorn 2000; Allan 2001; Chatterji, Arlosoroff et al. 2002; Giordano, Giordano et al. 2002; Vaux 2003). Such conflicts are frequently very complex and hard to solve. In fact, they *"belong to a category that in its structure makes it distinct from other political conflicts as well as from other environmental conflicts"* (Haftendorn 2000:68). Not surprisingly, a considerable body of research tries to better understand how conflicts are overcome and cooperation achieved. However, little attention has been paid to the implications of international cooperation on the protection and sustainable use of water resources.

This article has for its object of study the Guarani Aquifer System (GAS), a transboundary groundwater system shared by Argentina, Brazil, Paraguay and Uruguay. The research calls attention to the misleading perception that international cooperation, once achieved, will guarantee the protection of the water resource. It is argued that the obstacles to attain cooperation at the international level should be seen as a first step towards effective management. A deeper analysis should take into consideration domestic aspects that might impose problems to the implementation of the agreement signed internationally. The research provides advances both in theoretical and empirical grounds.

Analytical Framework

The management of the GAS implies a very complex interrelation of actors and political structures at both the international and national level. With that in mind, a systemic approach is applied to critically assess the viability of the project, and to identify the obstacles to enforce policies to protect the resource. Such a model allows us to deal with both endogenous and exogenous variables and to disregard some specific stakeholders.

A systemic approach of the political system can provide insights into the process of formulation and implementation of water management policies for the GAS. In the case of the GAS Project such an approach is oriented by four main aspects: (1) The level where policy is formulated and implemented. This means that policy formulation¹ is undertaken at international level while policy implementation is undertaken at the domestic level. (2) The political actors. This article is concerned with the government sphere only; hence our analysis will focus on policy-makers. (3) The institutional background, meaning the institutional context where policy is made or implemented. (4) And finally aspects of institutional capacity. Four premises arise from the use of these guidelines: (i) we are dealing with a transboundary resource where decision making occurs on both international and national levels, thus demanding a deeper understanding of each level and on the interrelations between them; (ii) water management policy is a combination of choices and decisions of a specific group in society called policy-makers; (iii) the materialization of water management policies for the protection and sustainable use of the GAS is a response not only from the international institution but also from each national political system; finally (iv) formulation and implementation of water management policy is constrained by the institutional and legal background and the institutional capacity in which it is embedded.

The Guarani Aquifer System

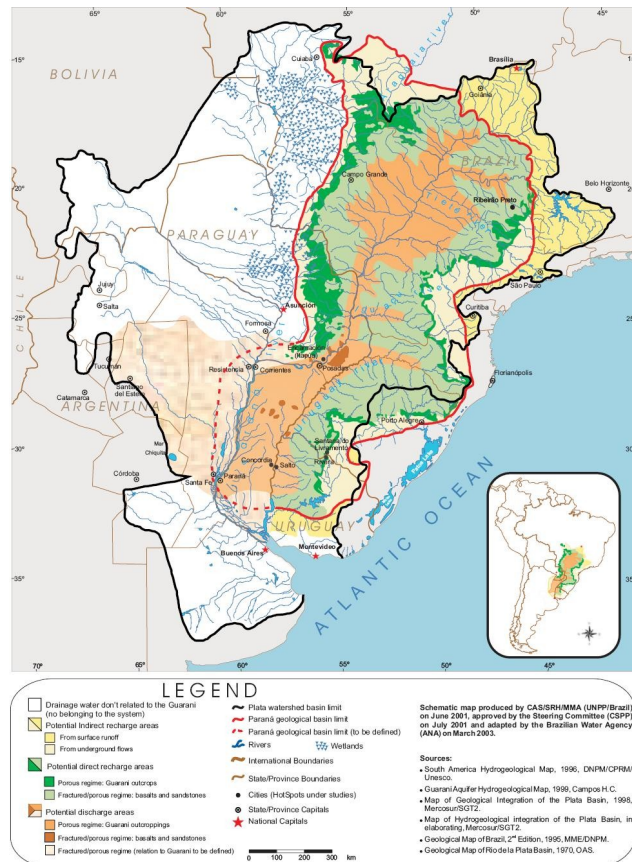
The Guarani Aquifer System (GAS) is thought to be the biggest transboundary groundwater reservoir in the world. The total estimated surface area is 1.200.000 square kilometres, the size of England, France and Spain combined, extending from the Paraná Basin to the Chaco-Paraná Basin in South America. It is an important transboundary groundwater body that underlies Argentina (225.000Km²), Brazil (840.000Km²), Paraguay (71.700Km²) and Uruguay (58.500Km²). Geologically, the aquifer consists of aeolian and fluvial sedimented sandstones from the Triassic and Jurassic period (Usunoff 2000) covered by a thick basalt fractured layer protecting the system in the deepest areas (Amore 2003). The aquifer has an average thickness of 250 meters, with maximum thickness exceeding 1500 meters in the central areas (Kemper, Mestre et al. 2003). It is located in South America between parallels 14°03' and 33°53' South and 43°59' and 64°39' West (Figure below). The recharge area represents 8% of the total area (150.000Km²), with an estimated average recharge of 160Km³ per year. Moreover, recent hydrogeological studies estimate a storage capacity of 40.000Km³ of freshwater, where 90% of this volume is potable (Kemper, Mestre et al. 2003). Compared to the largest body of water in the region, the Guarani Aquifer System reserves correspond to the flow of the Paraná River over more than 125 years (World Bank 2002).

Article's Final Remarks

The difficulties obtaining international cooperation are not the only obstacles to the joint management of transboundary water resources. Even when agreement is reached and cooperation is in order, poor management and degradation are possible outcomes of the process. A common mistake of researchers has been treating States as unitary actors, disregarding domestic aspects that might be responsible for the non-compliance of international agreements. This research commences to bridge this gap by providing evidence that international aspects of transboundary resource management represent just part of the process.

Due to time and scope constraints this article acknowledges that the inputs analyzed are in no way representative of the entire process. Further research should focus on expanding this analysis both in number of inputs, number of actors and government levels. Furthermore, the findings presented here point to the relevance of studying transboundary water management not only as an international consequence, but mostly as the response of the domestic level and the interrelation between international and domestic levels.

¹ Formulation here has an advisory meaning because the institution cannot impose the policies to be implemented. The final objective of the project is a Strategic Plan of Action (SPA) with, at best, recommendations for policy making. However, a transboundary management plan demands agreement over this recommendations.



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