

Juggling Water: Transboundary Issues Facing the Guarani Aquifer: UNESCO-IAH-UNEP Conference, Paris, 6-8 December

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Abstract

This paper begins with an overview of the ecology of the Guarani Aquifer region before turning to the legal and ecological problems it faces. Because the majority of the Guarani Aquifer underlies Brazil (with the rest residing below Argentina, Paraguay & Uruguay), the laws and policies of Brazil have a significant managerial impact. Consequently, the Brazilian legal regime forms the focus of the first section of the paper. The paper then analyzes the international transboundary framework before turning to the recently enacted Agreement on the Guarani Aquifer. This Agreement, signed but not yet ratified by four countries, represents a major step forward in transnational cooperation. However, its language is so broad that it elides some of the principal management challenges facing this and all transboundary aquifers. The paper then looks at the legal and policy issues that climate change presents for the management of the aquifer.

The complexity and environmental importance of the region, as well as the looming threats presented by climate change, make the need for accurate and detailed scientific and technical information urgent and crucial. Yet, relying on such information to manage such a complex natural resource also presents risks. Too often, the role of uncertainty in risk assessment and in legal and managerial decisions gets reduced or ignored.

Lessening uncertainty requires reducing asymmetric information. The recent international agreement regarding the Guarani represents a significant (albeit preliminary) step forward in this regard. Increasing knowledge over the regulated resource demands categorizing “hard” and “soft” uncertainties. In addition, the regulatory framework must acknowledge the unitary nature of the aquifer while yet remaining sensitive to differing national and local priorities.

Keywords: Guarani, climate change, hard/soft uncertainty

1. OVERVIEW OF REGIONAL ECOLOGY

The Guarani Aquifer – the world’s largest – underlies Brazil, Paraguay, Uruguay, and Argentina. It contains 30 trillion m³ of water, 1.2 million km² of surface area and comprises one of the most important eco-regions in the world (Almanaque Brasil Socioambiental, 2008). It is integrally connected through overland rivers (the Parana and the Paraguay) with the Pantanal, the largest wetland in the world, which oversits Bolivia, Paraguay and Brazil (Almanaque Brasil Socioambiental, 2008). The health of the Pantanal and that of the Guarani, both of which reside in the La Plata River Basin, are inexorably intertwined and the issues created by that transboundary overlap presents a complex management dilemma. Furthermore, the region’s delicate ecology faces a present and growing threat from climate change, extractive industry, and the expansion of the agricultural frontier.

2. BRAZILIAN LAWS AND POLICIES REGARDING THE GUARANI AQUIFER

We focus here on Brazilian laws and policies regarding the Guarani Aquifer for several reasons. First, the largest portion of the aquifer underlies Brazilian territory, thus making any Brazilian management practices potentially more influential. This influence is underscored by the recently signed (but not yet ratified) agreement (Acordo 2010) amongst the four overlying nations regarding the Guarani’s management. The agreement cedes exclusive authority for managing each portion of the aquifer to the nation overlying it. This means that Brazil will have an outsized influence over the Aquifer’s management.

Second, Brazil’s agribusiness activities rely heavily on its water resources – a reality that renders the Guarani vulnerable to policies that do not necessarily address the aquifer directly (Almanaque Brasil Socioambiental, 2008). Third, from a practical perspective, the background and expertise of the authors permits us far more insight into the Brazilian (as well as the international) legal framework for transboundary and groundwater management. Nonetheless, we acknowledge that

a truly comprehensive analysis of the Guarani must include a similar treatment of Paraguay, Uruguay and Argentina. The longer version of this paper will do just that.

2.1 *The Legal & Regulatory Framework*

Historically, Brazilian legislators have paid very little attention to groundwater (Benjamin *et al.*, 2005). Growing pressure over this scarce resource is forcing policymakers to address the regulatory gap between surface water and groundwater. Consequently, the legal regime dealing with groundwater issues in Brazil is of comparatively recent vintage. The challenge has been to integrate surface and groundwater management (Benjamin *et al.*, 2005).

A new paradigm in water law was established in Brazil by the 1988 Federal Constitution and the 1997 National Water Policy Act. Prior to 1988, private ownership over water resources was permissible (Pompeu, 2006). The 1988 Constitution introduced the notion that the environment is an asset of common use and essential to a healthy quality of life. This principle covers water as well (Freitas, 2002). Codifying statutes soon followed. For example, article 99 of the 2002 Brazilian Civil Code states that rivers and oceans are public assets of common use and article 1, I of the National Water Policy Act declare that water lies within the public domain.

However, the above-described shift focused primarily on surface water. The issue of groundwater in the 1988 Constitution was limited to jurisdictional issues regarding the managerial powers of the federal and state governments. Article 20, section III, of the 1988 Constitution entrusts the federal government with managing lakes, rivers, and watercourses on lands within its domain, that wash more than one state, that serve as boundaries with other countries. It also extended jurisdiction over beaches and the territorial sea. By contrast, Article 26 entrusts States with managing groundwater. This created a serious management problem for aquifers such as the Guarani that underlies multiple states and extends beyond national jurisdiction.

The main problem with this provision is that it did not account for interstate and/or international transboundary aquifers. Entrusting individual states with differing priorities and management strategies to manage a resource of multilateral and international significance creates federalist tension and jeopardizes international bilateral agreements. To solve this problem, judicial opinions and legal scholars maintain that the concept of watercourses in article 20 should be broadly construed to include groundwater that serves as boundaries with other countries and/or that wash more than one state. However, this interpretation is not yet settled and seems to flout the plain language of the Constitution. A constitutional amendment has been proposed to address this issue, but has not yet been ratified by the Congress.

Meanwhile, a set of different regulations have been enacted to close the gap between the groundwater and surface water management regimes. The need for integration has become particularly urgent as a result of ballooning demand for water by agribusiness. In 2001 the National Water Resources Council (“CNRH”) enacted a series of resolutions aimed at integrating ground and surface water management. In addition, the National Environmental Council (“CONAMA”) also promulgated groundwater quality standards in 2008.

Those states overlying the Guarani have also taken steps to control access and promote conservation. For instance, the state of São Paulo, the main consumer of the Guarani Aquifer, has created the State Water Resources Council (“CERH-SP”) to regulate to protect the state’s water resources. It has established restricted zones for the perforation of tubular wells in the city of Ribeirão Preto (one of the major consumers within São Paulo) in order to protect the Guarani from contamination. This regulation was approved based on the conclusions of a report produced by the Companhia Ambiental do Estado de São Paulo CETESB. Another example of a brewing conflict lies in the state of Mato Grosso do Sul, where the passage of Resolution 8 in July, 2009 empowers the state Environmental Authority to require permits for property owners seeking to operate wells on their land. However, as the agency begins rationing permits to prevent groundwater overdraft, property owners whose title predates the 1988 Constitution could potentially file takings claims.

3. INTERNATIONAL LEGAL FRAMEWORK

The international legal framework on groundwater is constantly evolving. In general, international laws regarding groundwater build on rules already in place for surface water. Of particular relevance to the Guarani is the 1966 Helsinki Rules on the Uses of the Waters of International Rivers, which was adopted by the International Law Association (ILA) and laid out foundational principles for transboundary water issues (Benjamin, 2005). This agreement was followed by the 1997 UN Convention on Nonnavigational Uses of Watercourses which, in turn, was superseded by the 2004 Berlin Rules on Water Resources.

With respect to groundwater, the international legal framework encompasses the 1986 Seoul Rules on International Groundwaters, the 1994 UN International Law Commission Resolution on Confined Transboundary Groundwater. International agreements specifically dealing with the Guarani Aquifer include the 1969 Treaty on the Prata Basin (Benjamin, 2005). This Treaty provides the foundation upon which the Guarani Aquifer Environmental Protection and Sustainable Development Project was construed.

3.1 Agreement on the Guarani Aquifer

Arguably the most important development on the international legal front regarding the Guarani was also the most recent. We refer to the signing on August 2, 2010 of the Agreement on the Guarani Aquifer by Argentina, Brazil, Paraguay and Uruguay – the four nations whose territory overlies the watercourse. The agreement, outlining basic principles adopted by all the signatory countries, will (if ratified by the 4 nations) represent a major step forward for the aquifer's management. It will also represent a significant achievement in the field of international water law. To date, only a handful of international groundwater management agreements exist (Benjamin, 2006) despite the existence of at least 270 transboundary aquifers, which provide water to millions of people.

The agreement adopts a number of important management principles. For example, the four nations agreed to share information as well as to inform fellow signatories of any domestic initiatives that may cause transboundary impact. Furthermore, Article 4 of the agreement acknowledges the multilateral importance of protecting and conserving the resource and the need to identify areas requiring special attention, especially those near borders (Acordo 2010). However, as is often the case in multi-party agreements, the language is broad and may simply be papering over disputed issues that remain in dispute (Benjamin, 2005). Similarly, Article 15, which creates a multilateral commission to oversee and manage cooperation between the parties, does not set out any specific duties or authority of the Commission. Instead, it simply states that the Commission will propound its operating regulations at a later date.

Another area of concern in the agreement is the amount of power ceded to the individual nations. Article 2 states that each party will have exclusive dominion over the groundwater that lies within their respective boundaries. The fact that such language could find itself into a transboundary water agreement in 2010 reflects the enormous difficulty that continues to bedevil international ground (and surface) water management (Eckstein 2010).

There is no hydrological logic to apportioning groundwater management by overland national boundaries. Because groundwater migrates and because the policies of the respective nations toward overdraft, pollution, etc. will inevitably impact the rest of the aquifer and the countries claiming sovereignty over the water, the management strategies of the four countries must be either interlinked or fundamentally incoherent. The Agreement implicitly recognizes this even while ceding management authority over the groundwater underlying each country to those individual countries alone. That recognition appears in the form of the adoption (in Articles 3&4) of the principles of reasonable and equitable use as well as (in Articles 3, 6 & 7) of that of no significant harm (Acordo 2010). However, even as it recognizes these precepts, the Agreement offers no means of enforcing their adoption and instead gives signatory nations the means through which to ignore them. This approach is understandable in light of the different national interests involved. However, it offers little hope for future efforts to manage the resource multilaterally. Given the looming challenges of climate change, that reality becomes especially sobering (Hall, 2008).

4. HYDROLOGICAL CHALLENGES PRESENTED BY CLIMATE CHANGE

4.1 *The Brazilian Legal Approach*

Climate change presents significant challenges relating to water availability. The situation in Brazil is serious and rapidly worsening. Long periods of drought are becoming more frequent, even in wet states in the south, like Paraná and Rio Grande do Sul. A major diversion project aimed at diverting water from the San Francisco River for the arid northeast region of Brazil offers another example of how water management policies in a country known for its water abundance must now focus on avoiding water shortages.

According to the IPCC, 'There is *high confidence* that northeastern Brazil will suffer a decrease in water resources due to climate change.' The report projects significant adverse impacts on agriculture, water supply, energy production and health. While dry regions will become drier, there will also be changes in rainfall patterns and runoff in traditionally humid zones. This will impact water availability and quality and present challenges to infrastructure. (Hall, 2008).

Brazil has implemented a national climate change policy at the end of 2009 that highlights the need to manage natural resources in light of the risks posed by climate change. However, the policy provisions offer guidelines rather than any specific plan of action. Specific regulatory measures were left to the executive branch to enact and also delegated to states and municipalities.

Incorporating the guidelines of the new climate change policy act into existing water law will present significant new challenges. The principles embedded in the 1997 National Water Policy Act demonstrate an emerging awareness that water management must adapt to modern environmental realities, including climate change (Hall, 2008). Together with the 2009 National Climate Change Policy Act, principles such as the precautionary approach, intergenerational equity, multiple use, and risk assessment now infuse the Brazilian water regime. Enforcement, however, remains a significant issue for Brazil (as well as the other three countries) (McAllister, 2008).

The task now facing the nation involves fashioning an independent regulatory apparatus that can withstand campaigns to manipulate public opinion and undermine sound policymaking. Sound water policymaking in the post-climate change world requires acknowledging the principles and guidelines already in place despite the pressures and allures created by large-scale development projects that fail to account for the new water-scarce reality.

4.2 *Transboundary Challenges*

The recent evolution of international laws and agreements regarding the Guarani Aquifer offers a first step toward a successful management regime (Benjamin, 2005). International cooperation enabled the involved countries to assess the challenges imposed by the many ecosystemic and political variables. Those variables range from the threat of climate change to significant and potentially irreversible impacts on different ecosystems including the Pantanal (Hall, 2008). Inventorying uncertainties is also a crucial component of providing for the needs of the overlying countries (Sunstein, 2004).

Development pressures and conservation goals offer fertile ground for conflicting interests within and among the overlying countries. These conflicts can lead to a Tragedy of the Commons if not properly managed. On the other hand, overregulation can cause suboptimal use, thereby impairing development. Optimizing regulation presents an ongoing challenge but the obstacles grow larger when the commons is as complex as the Guarani Aquifer. The complexity and environmental importance of the region, as well as the looming threats presented by climate change (Hall, 2008), make the need for accurate and detailed scientific and technical information urgent and crucial. Yet, relying on such information to manage such a complex natural resource also presents risks (Beck, 1986).

Environmental uncertainty can never be eliminated; at best it can be quantified and certain aspects of it reduced (Schroeder, 1986). Too often, however, the role of uncertainty in risk assessment and in legal and managerial decisions gets reduced or ignored (Wildavsky, 1966). Understanding the role of uncertainty is a necessary part of achieving a stable regulatory framework – not just for the Guarani region, but for all transboundary water regimes .

Decreasing uncertainty requires reducing asymmetric information. In other words, policymakers must bridge the gaps among scientists coming from different areas of knowledge as a first attempt to mitigate the impacts of the socio-economic burdens (Krier, 1990) born by the

regulated sectors. The less asymmetric information, the lower the degree of uncertainty and, consequently, the more likely the regulating decision will be a better one (Rowe *et al.*, 2004). In this context, better, means both more legitimate and more procedurally efficient (Laffont, 2000).

4.3 *Challenges for the Guarani Aquifer*

With regard to the Guarani, recent developments reveal a laudable (if still nascent) collaboration aimed at reducing asymmetric information at all levels: international, regional and local. However, public participation must also play a key role. Vital pieces of the puzzle sometimes are only provided by traditional and local knowledge (Benjamin, 2005). Another crucial component of a successful multilateral management strategy (and here we refer both to multi-state as well as multinational resource management) lies with coordinating actions and plans. Shared information is often a crucial and overlooked management tool.

Underlying the need for comprehensive information sharing on the Guarani involves determining whether management strategies face challenges predicated on hard or soft uncertainty. Soft uncertainty arises “where [a] precise outcome cannot be predicted but a probability distribution can be specified...” (Wildavsky, 1966). Hard uncertainty occurs “where one does not even know the parameters of the outcomes.” (Wildavsky, 1966). Identifying which policies fall under which category is crucial.

For example, development issues present a soft uncertainty challenge. Potential threats are, for the most part, knowable and their potential impact calculable. Climate change impacts, by contrast, present a problem of hard uncertainty (Posner, 2008). The dimensions of the threat are not yet measurable and the impacts remain mostly unknown. Expressed thus, the threats posed by development present a known unknown while climate change presents multiple challenges predicated on unknown unknowns.

For the former, local policies organized and coordinated by a common of principles that acknowledge the transboundary nature of the resource might be most efficient. As mentioned, the recent multilateral agreement exemplifies both the advantages and the drawbacks to this approach. For the threats posed by climate change, strategies and policies built at the local level must take into account the hard uncertainty underlying the global problem. No local strategy can possibly address the complexity of the dilemma, nor should it. However, local strategies that do not account for global challenges and strategies are doomed to fail.

The policy challenge at both the local and international levels will require close attention to the precautionary approach, which includes understanding and managing for the catastrophic potential of low probability events. This involves constructing mitigation policies that navigate dangers presented by unknown and unpredictable events while remaining non-exclusionary and not unnecessarily burdening regulated sectors (Schelling, 1992). Expressed thus, the task seems impossible. Yet it must be done. The Guarani – and much more – hang in the balance.

5. CONCLUSION

In sum, the legal framework for the Guarani represents progress but also highlights the challenges and risks ahead. Increasing knowledge over the regulated resource demands categorizing management challenges into hard and soft uncertainty problems. Once categorized, policymakers must allow for public participation through the promotion of awareness, capacity building, community involvement and traditional knowledge. In addition, the regulatory framework must acknowledge the unitary nature of the aquifer while remaining sensitive to differing national and local priorities. This challenge – faced by every transnational water negotiation – looms particularly large with the Guarani because of the size and importance of the resource and because of its impact on other sensitive and protected regions.

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