

# **Managing Hidden Treasures Across Frontiers: The International Law of Transboundary Aquifers**

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## **ABSTRACT**

Although there is only one international agreement in the entire world squarely addressing the allocation and management of a transboundary aquifer (for the Genevese Aquifer shared between France and Switzerland), that distinction may soon be an historical oddity. In recent years, transboundary aquifers have received growing attention in numerous policy-making and negotiating circles. Cooperative agreements have been forged by the countries overlying the Guarani Aquifer in South America and the Nubian Sandstone Aquifer in northern Africa. Likewise, arrangements have been developed on local, sub-national levels, such as between the sister-cities of Ciudad Juarez, Mexico, and El Paso, USA, and between the US State of Washington and Canadian Province of British Columbia. And in 2008, the UN International Law Commission presented the UN General Assembly with 19 draft articles in their effort to codify the international law of transboundary aquifers.

The law of transboundary aquifers is in an early stage of development. Nevertheless, there is a growing body of experience that indicates the emergence of accepted legal principles. This is evidenced by the increase in local and regional arrangements over transboundary ground water resources, as well as the growing attention that the subject is receiving in various fora. By reviewing these recent arrangements, as well as pronouncements of international organizations, this study identifies trends in the development of customary international law for transboundary aquifers. It also considers gaps and shortcomings in the emerging governance system and offers recommendations for the further development of the law.

Keywords: international water law, international groundwater law, transboundary aquifer, water dispute

## **1. INTRODUCTION**

In recent years, transboundary aquifers have received increasing attention in policy and law-making efforts at all levels of civil society, in academic exercises, and in a number of significant negotiations. Rudimentary consultative and data-sharing agreements have been implemented on the Nubian Sandstone and Northwestern Sahara aquifers in North Africa, while more detailed management schemes were developed for the Genevese Aquifer situated along the French-Swiss border and the Guarani Aquifer in South America. A detailed cooperative arrangement was crafted for the Iullemeden Aquifer System in West Africa, while less detailed arrangements were entered into by sub-national political entities for the Hueco Bolson aquifer underlying the cities of El Paso and Juarez on the Mexico-U.S. border, and for the Abbotsford-Sumas Aquifer between the US State of Washington and Canadian Province of British Columbia; a model aquifer treaty was developed by water law experts for the Mexico-U.S. border; and the UN International Law Commission (UNILC) formulated 19 draft articles on the law of transboundary aquifers. In addition, transboundary ground water resources feature prominently in the 1992 UN/ECE Convention on the Protection and Use of Transboundary Watercourses and International Lakes, the 1997 UN Convention on the Non-navigational Uses of International Watercourses, the 2000 Revised Protocol on Shared Watercourses in the Southern African Development Community, and the International Law Association's 2004 Berlin Rules.

This expanding interest in transboundary aquifers is largely a reflection of the growing importance that ground water resources, especially those traversing international boundaries, are having in meeting nations' development goals and interests. It, however, is also a response to the realization that

few concrete rules exist in international law to govern relations over these hidden treasures. As nations around the world begin to extract (or intensify their withdrawals of) ground water from aquifers traversing political boundaries, they are raising question related to their rights and obligations over these shared resources.

State practice and experience related to the utilization of transboundary ground water resources are now slowly developing, and nations and scholars are beginning to give more thought to the articulation of rules and regulations for the management of these critical resources. While the law of transboundary aquifers is in an early stage of development, it is already possible to ascertain trends that are relevant to this nascent body of law from the practices of states. This study reviews such practices, as well as relevant pronouncements by international organizations, as a means of identifying emerging rules governing shared ground water resources. It also assesses trends in these practices implicating the emergence of generally accepted international legal norms, identifies gaps and shortcomings in the emerging regulatory regime, and offers recommendations for the further development of the law.

## 2. THE IMPORTANCE OF TRANSBOUNDARY AQUIFERS

In places like the Middle East and the Mexico-U.S. border, transboundary aquifers often serve as the primary or sole source of fresh water for human and environmental sustenance. Libya, for example, which has no meaningful surface water resources, obtains the majority of its fresh water – some 6.5 million cubic meters of water daily – from the Nubian Sandstone Aquifer, which also underlies sections of Libya's neighbours (Chad, Egypt, and Sudan) (Watkins, 2006). Similarly, the city of Ciudad Juarez, Mexico, obtains nearly all of its fresh water from the underlying Hueco Bolson Aquifer while across the border, El Paso in the United States obtains around 30-40% of its water from the same source (ISARM, 2005).

Although the total number of aquifers traversing international political boundaries is still unknown, transboundary aquifers underlie the territory of nearly every non-island nation (Puri and Aureli, 2009). An ongoing study indicates that there are at least 273 transboundary aquifers globally (UNESCOPRESS, 2008), including more than 155 on the European continent, 38 in Africa, 68 in the Americas, and 12 in Asia (Stephan, 2006). In comparison, there are 263 watercourses crossing international boundaries (UNEP, 2002). Additionally, ground water today is the most extracted natural resource globally, providing more than half of humanity's freshwater for everyday uses such as drinking, cooking, and hygiene, as well as 20% of irrigated agriculture (Water for People, 2003). In Europe, 60-99% of drinking water comes from ground water (Almássy & Busás, 1999); in the United States, that figure is between one-half to 97% (Burchi, 1999). Accordingly, ground water resources and specifically transboundary aquifers are a crucially important source of fresh water globally and the sound management and regulation of these resources are critical for ensuring the sustainability of human communities and the environment.

## 3. EXAMPLES OF REGULATRY MECHANISMS FOR TRANSBOUNDARY AQUIFERS

The best known, and still the only treaty managing and allocating the waters of a transboundary aquifer, is the 1978 (revised in 2008) Franco-Swiss Agreement on the Protection, Utilization and Recharge of the Franco-Swiss Genevese Aquifer. This singular arrangement addresses ground water quality, quantity, abstraction, and recharge, largely through the creation of a joint Genevois Aquifer Management Commission. While the Commission has only consultative status, its recommendations and technical opinions carry considerable weight in the modification of existing and development of new water extraction works. The regime also recognizes Swiss artificial recharge obligations, allocates expenses between the countries for the Swiss recharge efforts, and places strict withdrawals

limits on the French side (see Preamble, Arts. 2.3, 8, 11-14, and Annex). The particular significance of this arrangement is that it strikes a balance between state sovereignty and state responsibility in its management scheme, which is based almost exclusively on principles of transparency, good faith, and cooperation. Moreover, the agreement is unique in proffering a purely technical mechanism that is devoid of any provisions directly related to nations' sovereign rights to the aquifer or its waters.

Another fascinating arrangement, albeit one still undergoing development, is the 2009 Memorandum of Understanding relating to the creation of a Consultative Mechanism for the management of the Iullemeden Aquifer System (IAS MoU) entered into by Mali, Niger, and the Republic of Nigeria. While not a binding instrument, the details and language used in the IAS MoU reflects an intention by the parties to comply with the terms of the resulting agreement once it comes into force. The arrangement creates a Consultative Mechanism tasked with promoting cooperation over the management of the IAS and responsible for, *inter alia*, formulating opinions related to water management and utilization operations, coordinate IAS-related activities and harmonize procedures and policies, and develop action plans for implementing its recommendations (see Art. 5). In contrast to the purely consultative Genevois Aquifer Management Commission, the Consultative Mechanism has legal personality and authority to contract, acquire and dispose of property, seek and obtain loans, gifts, and technical assistance, and be a party in legal proceedings (see Art. 6). In addition, the IAS Memorandum explicitly relies on international water law and environmental law principles, including equitable and reasonable utilization, no harm, exchange of data and information, prior notification, environmental protection, public participation, precautionary approach, and polluter and user pays (see Arts. 13-17, 19-22, & 24). Nonetheless, like the Genevese Aquifer agreement, the IAS Memorandum focuses more on balancing state sovereignty and state responsibility while avoiding any reference to sovereignty in its formulation.

The memorandum of understanding entered into by the municipal water utilities of the City of Juárez in Mexico and the City of El Paso in Texas, United States (Juárez-El Paso MoU) is distinctive because it was entered into by sub-national political entities without the oversight of the respective federal governments. While legally unofficial and unenforceable, the purpose of the arrangement is to generate cooperation over the management and exploitation of the Hueco Bolson Aquifer, which as a result of population growth and development in the overlying region, has been overexploited raising concerns over the aquifer's viability as a source of fresh water for the area (Eckstein & Hardberger, 2008). The arrangement "seeks to identify the mechanisms between the parties to increase communications, cooperation, and implementation of transboundary projects of common interest." Moreover, in its "general objectives," the Juárez-El Paso MoU alludes to data and information sharing related to transboundary natural resources, and cooperation in the management, use and protection of natural resources that traverse an international boundary (see final paragraph of Recitals). Furthermore, it obligates the sister cities to develop and coordinate a compatible plan "to secure water supplies and extend the life of the Hueco Bolson" (see parag. 3(a)).

Possibly the most profound effort to develop a governance system for transboundary aquifers are the 19 draft articles prepared by the UNILC and contained in a 2008 UN General Assembly (UNGA Resolution). Largely modeled on the 1997 Watercourses Convention, the chief substantive state obligations are the well-known rules of equitable and reasonable utilization and no significant harm. Those principles, however, are tailored to the unique qualities that differentiate surface from ground water resources. For example, the list of factors for assessing what constitutes equitable and reasonable utilization includes "the natural characteristics of the aquifer or aquifer system," "the contribution to the formation and recharge of the aquifer or aquifer system," and "the role of the aquifer or aquifer system in the related ecosystem" (see Arts. 5(1)(c), (d), and (i)). Likewise, the no significant harm rule also obligates aquifer states not to cause significant harm through "activities other than utilization of a transboundary aquifer ... that have, or are likely to have, an impact upon that transboundary aquifer" (see Art. 6). This latter modification specifically relates to the distinct likelihood that non-aquifer activities undertaken above or around aquifers could detrimentally affected

those aquifers, such as industrial and agricultural operations in the recharge zone, mining activities in the aquifer matrix, and construction, forestry, and other activities that might affect the normal recharge process (Eckstein, 2007). Other notions found in the Resolution include obligations to regularly exchange data and information, protect ecosystems, protect recharge and discharge zones, prevent pollution, monitor the aquifer, and provide prior notification of planned activities (see Arts. 8, 10, 11, 12, 13, and 15).

#### 4. DEVELOPING INTERNATIONAL LAW FOR TRANSBOUNDARY AQUIFERS

The international law for managing and allocating transboundary ground water resources is still in a nascent state. Nevertheless, the increasing number of agreements, as well as the growing international interest in the subject, evidences evolutionary trends in customary international law. Customary international law refers to international law that is based on accepted practices of states rather than codified rules. It emerges from broad and consistent state conduct that is justified by a belief that such behaviour is both legally appropriate and mandated (Brownlie, 1998). While the extent of the practice relating to the management of transboundary aquifer is still somewhat limited, a review of arrangements, including those discussed above, nevertheless indicates a number of emerging trends in customary law applicable to transboundary aquifers.

Possibly the most palpable customary obligation to emerge from the evolving state practice is the procedural duty to regularly exchange data and information. Appearing in all of the arrangements discussed in this study, the duty is fundamental to the cooperation over and sound management and protection of transboundary aquifers. Without sharing such information, aquifer states will be unable to fully project and mitigate deleterious consequences that might result from the utilization of a particular transboundary aquifer (Eckstein 2007). Accordingly, the duty requires aquifer states to share collected information on the aquifer and its functioning on a continuing basis. While the precise type of data and information that to be shared is not always specified, it is obvious that they should relate to the character, use, and functioning of the aquifer. Draft Article 8 of the UNGA Resolution provides that it should include material of a "geological, hydrogeological, hydrological, meteorological and ecological nature and related to the hydrochemistry of the aquifers or aquifer systems, as well as related forecasts."

A corollary procedural obligation to this duty is the requirement to generate additional data and information through monitoring and related activities. Found in a majority of the arrangements discussed here, this obligation is indispensable to fulfilling the duty to exchange. The obligation also acknowledges the need to maintain vigilance in managing a transboundary aquifer and the need to continuously check on activities related to the aquifer's utilization and the possible impact they may have. While focusing on a transboundary watercourse, the International Court of Justice in its recent decision in the Case Concerning the Pulp Mills on the River Uruguay asserted that "once operations have started and, where necessary, throughout the life of the project, continuous monitoring of its effects on the environment shall be undertaken."

Another related procedural obligation found in a majority of the above-noted instruments is the duty of prior notification of planned activities. Where a planned project may adversely affect the territory of another aquifer state through the transboundary aquifer, the acting state must notify the potentially affected state. This obligation is designed the latter to evaluate the possible consequences and to seek an understanding or compromise with the acting state (Eckstein 2007). While the precise procedures vary among the instruments, the basic processes are well accepted in international water law. Under the UNGA Resolution, aquifer states would be obligated to provide "timely" notification "accompanied by available technical data and information ... to enable the notified state to evaluate the possible effects of the planned activities" (see Art. 15). In contrast, the IAS MoU proffers a more rigorous process that prohibits the notifying state from proceeding with the planned activity for a

specific review period, authorizes the planned activity in the absence of a response to the notification, consultation and negotiations in good faith where the acting and notified states disagree about potential consequences, measures in the absence of prior notification, and an emergency exception (see Arts. 24-28).

Among the substantive obligations found in the arrangements discussed here, two well-known principles appear in a majority of instrument: equitable and reasonable utilization and no significant harm. Recognized broadly as the cornerstone principles of international watercourse law, these two principles appear to have been extended to transboundary aquifers. Under the first doctrine, aquifer states must ensure that their utilization of transboundary aquifers are both equitable, in terms of the benefits derived from the use of the aquifer, and reasonable. A non-exhaustive list of factors is typically provided in these instruments to aid in determining whether a particular use confirms to these criteria. Similarly, aquifer states are bound to ensure that their activities related to the shared ground water resources do not result in significant harm to other aquifer states. As occurs in the watercourses context, none of the transboundary aquifer arrangements elaborate on the implementation of these principles. Nonetheless, they represent the nascent state of the substantive law of transboundary aquifers.

Although the instruments discussed in this paper present other rules and procedures for transboundary aquifers, the lack of their consistent appearance across the instruments suggest that these additional principles do not yet represent a trend in the development of customary international law for transboundary aquifers. Nonetheless, the presence of these other rules and procedures – such as obligations to protect aquifer-dependent ecosystems, protect the recharge and discharge zones of aquifers, and prevent aquifer pollution – should not be discounted. Rather, their use and effectiveness as regulatory and management mechanisms should be reviewed and assessed periodically, as should their applicability for other transboundary aquifer agreements.

## 5. CONSIDERATIONS FOR THE CONTINUED DEVELOPMENT OF INTERNATIONAL LAW FOR TRANSBOUNDARY AQUIFERS

While surface and ground water resources share numerous similarities, ground water possesses a number of unique characteristics that must be considered when formulating regulatory tools for managing these resources. For example, ground water is typically more vulnerable than surface water to pollution and deterioration because water in aquifers generally flows at slower rates than in rivers and lakes, usually measured in distances of centimeters or meters per day (Hamblin and Christiansen, 2001). This slower flow rate greatly diminish the natural filtering capacities of aquifers and, thereby, their ability to reclaim and clean themselves. In addition, because of the geographic extent of most aquifers and the difficulties associated with monitoring underground formations, the artificial reclamation of a polluted aquifer can be prohibitively complex and expensive. The result is that once contaminated, an aquifer may be rendered unusable for years, decades or longer (Eckstein, 2007).

Accordingly, these unique aspects must be taken into account when formulating appropriate regulatory mechanisms for the sound management of transboundary aquifers. For example, special attention must be paid to the "functioning" of aquifers, which refers to how particular aquifers behave as aquifers. Aquifers typically store and transport water, dilute wastes and other contaminants, provide a habitat for aquatic biota, and serve as a source of fresh water and nutrients to aquifer-dependent ecosystems. Some aquifers even provide geothermal heat. Each of these characteristics comprises a function that is dependent on the particular aquifer's hydrostatic pressure, hydraulic conductivity, and mineralogical, biological, and chemical attributes, all of which may be interdependent with each other to the extent that the aquifer's continued operation depends on the continuation of one or more functions (Heath 2004). If any component related to an aquifer's natural behaviour is impaired or destroyed, it could seriously impair the viability and integrity of the aquifer

as a whole. Accordingly, mechanisms must be developed to maintain and protect the functioning of transboundary aquifers.

Highly related to the functioning of aquifers, recharge and discharge zones of aquifers also require special attention since, with the exception of some non-recharging aquifers, these zones help regulate the flow and water quality of water moving into and out of the aquifer and, thereby, the functioning of the aquifer itself. Hence, the recharge and discharge process, as well as the geographical area in which they operate, must be maintained and protected. Mechanisms might include restrictions on activities in the two zones, such as industrial, agricultural, and municipal development projects that might affect the volume or quality of water percolating into and out of aquifers, regardless of whether or not those activities are related to the use of the aquifer itself.

Finally, a conceptual notion inherently tied to the transboundary characteristic of these aquifers pertains to the perception by some nations that they have unqualified sovereignty over the portion of an aquifer that lies within their jurisdiction. The belief, which harkens back to the long-discredited Harmon Doctrine, suggests that states are free to exploit resources within their jurisdiction without regard to the extraterritorial effects of such action. While a number of the instruments reviewed here appear to subscribe to this notion, the suggestion that water resources can be subject to a state's sovereignty is contrary to the community of interests approach governing transboundary surface waters. Moreover, the idea contravenes the basic tenets of international water law, including those of equitable and reasonable utilization and no significant harm, which clearly espouse a more limited conception of sovereign rights over transboundary waters (McCaffrey, 2009).

The above recommendations do not cover the gambit of issues and aquifer characteristics that require attention within an international legal context. Other issues that must be addressed include, *inter alia*: the threshold of harm necessary to trigger a violation of no significant harm; what aquifer aspects, in terms of functions and geographic scope, are covered by a regulatory or cooperative regime; harmonization of metadata and methodologies among aquifer riparians for generating information about shared aquifers; and exploitation of non-recharging aquifers. Nevertheless, this paper provides a starting point from which to further the conversation about the characteristics of transboundary aquifers that must be considered as well as the regulatory and legal mechanisms that might develop.

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