Factors Preventing Finalization of the Draft Articles in the 2008 UNGA Resolution on the Law of Transboundary Aquifers

Malcolm J. Gander, Ph.D.

Abstract

This article evaluates scientific, legal, political and socio-economic factors preventing finalization of the 2008 United Nations General Assembly's Draft Articles on the Law of Transboundary Aquifers. The final Draft Articles must be grounded in fundamental hydrogeologic principles:

1) Aquifers are finite resources.
2) Aquifer depletion can occur through overpumping.
3) Recharge zones collect aquifer water, and must be protected.
4) Polluted aquifer cleanup requires years and great cost.
5) Early definition of aquifer characteristics is needed.
6) Most of the world's accessible groundwater is moving.
7) Most aquifers are of two types: those replenished by surface water, and fossil aquifers.

Introduction

Groundwater is the primary source of drinking water worldwide (UN-Water 2014). Much of this groundwater is present in aquifers that are located within two or more neighboring countries, and are termed transboundary aquifers (TBAs). There is a growing global interest in establishing effective governance constructs to manage this vital resource.

The United Nations General Assembly (UNGA) established Resolution 63/124 on the "Law of Transboundary Aquifers" on December 11, 2008, which took note of the 19 Draft Articles (Draft Articles or DAs) on the Law of Transboundary Aquifers, formulated by the International Law Commission (ILC). Since 2008, there has been relatively little movement toward finalization of the DAs.

Specifically, in 2011, the UNGA's Sixth Committee discussed the final form of the DAs. Development of a binding treaty; acknowledgement that State practice did not support the status of the international law of transboundary aquifers; and adoption of the DAs in the form of a resolution or declaration of principles that could serve as guidelines; were all considered (Eckstein and Sindico 2014). The UNGA adopted the Law of Transboundary Aquifers on January 13, 2012 via Resolution 66/104, which encouraged States to make bilateral or regional arrangements to properly manage transboundary

aquifers, *taking into account* the provisions of the DAs. Consideration of the final form of the DAs was deferred to the 2013 UNGA meeting.

In 2013 the Sixth Committee discussed the various paths to finalization of the DAs. The UNGA's 2013 Resolution encouraged policymakers to use the DAs as guidance when forging agreements, and encouraged United Nations Educational, Scientific and Cultural Organization-International Hydrological Programme (UNESCO-IHP) to provide ongoing scientific and technical support. Disposition of the DAs and the Law of Transboundary Aquifers was postponed until 2016 per Resolution 68/124.

The DAs and the Law of Transboundary Aquifers were scheduled for discussion during the 71st Session of the UNGA in September 2016, but this activity did not take place.

Purpose

The purpose of this summary article is to compile and examine the factors preventing finalization of the DAs as part of the development of an international legal instrument for transboundary aquifers. This summary is intended to assist decision makers and policymakers, and raise awareness of the broad audience that is involved in, or has an interest in, the management of TBAs shared by two or more nations.

Increasingly since 2001, transboundary aquifer experts have noted the various fundamental reasons why agreements are virtually nonexistent between nations that share an aquifer that is situated in part within each respective country's borders (e.g., Puri et. al. 2001; Eckstein and Eckstein 2005; McCaffrey 2007; Salman 2011; Eckstein and Sindico 2014). Reasons for the lack of agreements include the invisible nature of groundwater and aquifers, the poor understanding of basic hydrogeologic principles by decision makers, and the lack of international legal frameworks to guide policymakers,

This article compiles both overarching reasons as well as more subtle but important factors influencing the current situation, divided into four categories: scientific, legal, political, and socio-economic.

Additionally, in an effort to effectively bridge science and policy, the article presents and discusses seven core hydrogeologic principles that should be applied during TBA agreement-making, along with application of the essential international water law tenets of cooperation between States; equitable and reasonable utilization of the resource; infliction of no significant harm; ongoing information sharing; and prior notification of activities that will affect the resource.

Background

Eckstein and Sindico (2014) assessed the lack of progress on preparation of the final form of the DAs, and presented possible options. One possible option would involve

using the DAs as a starting point to negotiate a final agreement, leading to a convention on transboundary aquifers that would be signed at an international conference and eventually ratified by the requisite number of States. An increasing number of States have indicated non-support for this approach, based on reasons that Eckstein and Sindico grouped into three categories: legal, political, and socio-economic. This article expands the list of reasons by compiling the scientific issues, and expanding on the legal, political and socio-economic categories.

Analysis

Table 1 provides a breakdown of the factors preventing finalization of the DAs. The following is a summary discussion by category of important elements of the table.

Table 1. Scientific, Legal, Political, and Socio-Economic Factors Preventing Finalization of the Draft Articles.

Factor	Comment	Reference
Scientific		
The world community lacks the education in the definitions and principles of: an aquifer; groundwater flow; groundwater movement; and surface water/groundwa-ter interactions.	UNESCO-IHP has made significant progress in education, but more is needed. Along with raising awareness and promoting an understanding of these definitions, policymakers need to understand the basic interactions between surface water and groundwater.	Puri et al. 2001
Transboundary aquifers must have some level of definition regarding groundwater movement and direction, and estimated volumes within the aquifer. Yet, cost, lack of appropriate prioritization and	Transboundary aquifers are generally poorly defined. The initial stage should consist of the correct identification of flow direction and movement of water followed by its quantification. This requires funding, planning of a technical program, and cooperation between States. "In order for an upstream State to make a credible commitment to an agreement, it needs to feel that it can gain more from a negotiated solution than from the continuation of the *status quo*. (Brochmann and Hemel 2011)."	Puri et. al. 2001; Salman 2015; Uprety 2014; Eckstein and Sindico 2014; McCaffrey 2011; De Gramont et al 2011.

planning, and cooperation are lacking.		
Failure to understand or acknowledge the need to identify and manage recharge zones which may exist within one or more transboundary aquifer States, or may exist outside the borders of transboundary aquifer States.	The sustainable management of TBAs cannot be separated from the preservation of the recharge zones that feed them.	Dellapenna 2011
Failure to understand the difference between an aquifer that actively receives recharge from precipitation or other surface water infiltration sources, and fossil aquifers.	1) Aquifer systems are commonly, although not exclusively, connected to surface water bodies and receive recharge. 2) There are a subordinate number of aquifers, termed "fossil aquifers," that currently receive no recharge and have no hydrologic or physical connection to surface water bodies.	
Conflicting scientific interpretation.	At those locations where data is available, there exists inherent uncertainty posed by interpretation of the subsurface geology and nature and extent of aquifers. This uncertainty is because virtually all knowledge of the subsurface is gleaned from drill holes/wells with a diameter of less than 0.5 meter, with tens or hundreds of meters typically in between the relatively widely-spaced drill holes penetrating a given aquifer system.	
Difficulty in effectively communicating scientific information to	"Science in isolation is insufficient (Puri et al. 2004)." Puri and Aureli (2008) also note how transboundary aquifers are not well understood by policymakers.	Puri et al. 2004; Puri and Aureli 2008

policymakers.		
Legal		
Inadequate governance of TBAs.	There is a lack of international law governing shared aquifers, and a lack of legal frameworks addressing TBAs. The lack of legal frameworks may be exacerbated by countries with different cultural, linguistic, and ethnic origins.	Uprety 2014; Jarvis et al. 2005; Puri and Aureli 2008; Puri et al. 2004; Puri et al. 2001
On some points, the Draft Articles (DAs) are incompatible with the United Nations Watercourse Convention (UNWC).	There is also disagreement over whether the DAs are compatible with other applicable international legal instruments.	UNGA: Statement by the USA, 68th Session of the UNGA Sixth Committee: Agenda Item 87: The Law of Transboundary Agreements" (22 October 2013) found at https://papersmart.unmeetings.org/media2/703097/us-87.pdf.; Eckstein and Sindico 2014
An international TBA may be in conflict with the respective States' internal regulations.	A tendency exists for many countries to resist any type of multinational TBA agreement because of a fear that such an agreement may supersede, be in conflict with, or negate their respective set of in-country regulations. Additionally, a given government's by-laws may have no mechanism to support the establishment of an international agreement such as a TBA. Given that most accessible groundwater is in constant motion, albeit slowly, and in those cases where groundwater exists in an aquifer that occupies two or more countries, establishing an agreement to manage the groundwater is resisted because of the differing set of regulations in each country. Additionally, many countries have no specific regulations for their in-country groundwater.	McCaffrey 2007; (De Gramont et al. 2011); Paisley and Henshaw 2014
Completion of a TBA can be	Control of the resource is administered at: a) the national level in the Middle East; b) the	Beach et al. 2000

complicated by the differing in-country governance of water resources.	state level in India; and c) the sub-state level in the United States. These organizations, and the respective authority that controls each, may wield very different influence in the disposition of the resource.	
Political		
Groundwater's invisibility promotes inaction.	Because aquifers (groundwater) are hidden from view, their importance has been ignored, minimized, or taken for granted.	Bittinger 1972; Puri et. al. 2001; Jarvis et al. 2005; McCaffrey 2007, and others.
Individual States seek to retain absolute sovereignty over that portion of a TBA within its physical boundaries.	Given that most accessible groundwater is moving, it is akin to surface water from an international water law perspective, and thus treating it as an entity manageable by sovereign rule is inconsistent with equitable and reasonable use.	Salman 2015; Uprety 2014; Eckstein and Sindico 2014; McCaffrey 2011; De Gramont et al 2011.
A status of no TBA and minimal knowledge of aquifer characteristics may be desirable to an individual State.	The status quo serves many countries adequately by defining no conditions and setting no requirements.	Eckstein 2015; Eckstein and Sindico 2014
Resistance to change.	"There is nothing more difficult to take in hand, more perilous to conduct, or more uncertain in its success, than to take the lead in the introduction of a new order of things. Because the innovator has for enemies all those who have done well under the old conditions, and lukewarm defenders in those who may do well under the new. This coolness arises partly from fear of the opponents, who have the laws on their side, and partly from the incredulity of men, who do not readily believe in new things until they have had a long experience of them."	Niccolo Machiavelli 1513 *in* Paisley and Henshaw 2014
A State may realize that establishing a TBA that promotes the	This resistance is another example of how maintaining the status quo is preferred.	Uprety 2014

equitable and reasonable utilization of an aquifer system will result in less available water for their own State. Thus, the State will resist such an action.		
Resistance by a political regime to acknowledge the sustainability principle.	A regime may favor continuing the status quo of overpumping in order to stay in the good graces of the current population's perception that their water needs are being met. The regime may only be concerned for their reputation in the here and now, and ignore the critical need for sustainable use of an aquifer.	Dellapenna 2011
Mistrust between countries.	The Mountain Aquifer, shared by Israel and Palestine, is an example of a critical water source shared by two countries with mutual mistrust for one another	Eckstein and Sindico 2014; Mukhar 2006; Uprety 2014
Resistance to establishing agreements with an adjacent more powerful country because of perceived threat of the powerful country controlling more than an equitable and reasonable share.	In addition to water quality and quantity apportionment concerns, resistance can be simultaneously influenced by political and cultural conflict.	Beach et al. 2000
Disagreement with one or more specific articles within the DAs, e.g., a) Resistance by some States to agree to a clause mandating third party resolution of conflict or of alleged violation	India has expressed dissatisfaction with mandatory third party procedures. Pakistan does not support the present form of the the dispute settlement provision.	Uprety 2014

of the terms of an agreement; b) Disagreement with the dispute settlement provision.		
Difficulty in establishing agreements where unresolved non-water-related issues exist between nations.	Israel, Syria and Turkey have outstanding political issues, which complicate discussions on water management issues concerning the Jordan River and Euphrates River.	Beach et al. 2000
States are uninterested in making international agreements because there is relatively little consequence or economic loss if a State chooses to break the agreement.	The terms of an agreement must be sensitive to the stability aspects of the proposed outcomes.	Beach et al. 2000
Difficulty in establishing agreements where TBAs are accessed by wells owned by a combination of public and private entities.	The complicating mixture of public and private ownership exists in the United States and some European countries.	Llamas 2004
Lack of a current international situation to drive finalization.	At present there is no international situation where a TBA is under scrutiny, or being considered, or where a significant conflict exists over groundwater use or apportionment. Thus, there is no situation that is driving the need to finalize the DAs or have the UNGA vote to ratify the DAs.	
Political leaders have little existing basis to spur	Some States' leaders are reluctant to enter into an international agreement where there is a lack of clear legal frameworks to ensure its functional success and enforceability.	Puri 2001; Puri and Aureli 2008; Jarvis et al. 2005

establishment of TBAs.		
Lack of champions among political leaders.	The concept of TBAs lack champions at the higher political levels in individual countries, and in global organizations such as United Nations.	Paisley and Henshaw 2014.
Third-party contributions may be necessary to forge agreements.	Entities such as World Bank or Global Environment Facility can influence and spur the completion of agreements. Advocacy coalitions, non-governmental organizations, or non-profit organizations can also exert significant influence through involvement of local populace.	Conti 2014; De Gramont 2011; Salman 2011
Socio-Economic		
An acute need to immediately utilize or over-utilize groundwater resources to meet demand, resulting in long-term deleterious effects.	Socio-economic pressures may have either already initiated withdrawal of water, or have such a priority that legal agreements lag behind. Institutional weakness and political pressures may fail to address all the relevant issues, potentially leading to severe environmental impacts and unsustainable development. For example, A period of significant industrialization in one country may cause an unrealistic or inaccurate forecast for usage of the aquifer in both States that utilize the aquifer.	Puri et. al. 2001; Puri and Aureli 2008
Opposing needs by neighboring States may unduly exploit the resource.	Heavy agricultural use in one State plus heavy industrial use in the neighboring State may pose an unsustainable situation, as these needs may compound the per capita drinking water needs already served by the aquifer.	Puri and Aureli 2008
Disagreement as to whether rules on transboundary aquifer management can be effectively developed at the global level versus the local/state level.	Because of socio-economic problems related to the use of TBA resources, along with complex political and environmental concerns, some States favor a state-controlled management structure versus a structure defined by the DAs.	Eckstein and Sindico 2014; UNGA: Statement by Guatemala, 68th Session of the UNGA Sixth Committee: Agenda Item 87: The Law of Transboundary Aquifers (22

		October 2013), found at: https://papersmart.unmeetings.org/media2/703107/guatemala-87.pdf.
Overcoming the bias where the majority of existing funding is directed toward surface water projects.	There exists a bias in that the majority of drinking water funding is funneled into the development of surface water resources. Aquifer agreements could be facilitated by funding mechanisms to hold meetings, exchange ideas and information, raise awareness, and finalize documentation.	Llamas 2004
A country's geographic position with regard to upgradient and downgradient neighbors, all of whom share an aquifer, may dictate a non-participatory agreement-making strategy.	This situation would result in a differentiated strategy that is not amenable to a uniform strategy set forth by a set of guidelines such as the DAs.	Modified from Uprety 2014

Note: References cited are not necessarily the primary source, or original source, of the concept or idea.

Scientific Factors

Leaders and policymakers need to be educated in basic hydrogeologic principles. Table 2 provides seven core hydrogeologic principles that should be applied during TBA agreement-making. The political and economic realities of a country shall always be the main drivers in a given country's activities; however, these realities will tend to be tempered in a more responsible fashion if balanced with an understanding of these principles.

Table 2. Core Hydrogeologic Principles to be Considered During Preparation of Transboundary Aquifer Agreements.

1) **Aquifers are finite resources**, meaning they can be depleted if mismanaged.
2) **Aquifer depletion can occur through overpumping**, and the effects of overpumping may not be evident until one or more years after overpumping is initiated.
3) **Recharge zones collect the water stored in aquifers, and must be protected.**
4) **The pollution of aquifers is either impossible to clean up, or cleanup will take years and great cost,** unlike surface water bodies, which can often be reasonably cleaned up in a matter of months.
5) **Early definition of aquifer characteristics is needed** (spatial extent and contained water volume), but this is usually not done due to high cost. Therefore, ongoing well water level readings and pumping rates should be recorded and shared amongst neighboring States so the resource is not depleted.
6) **Most of the world's accessible groundwater is moving**. Therefore, the resource is similar to surface water and an individual State cannot reasonably declare an absolute sovereign right to the entire resource by accessing that resource through wells located within their boundaries.
7) **Most aquifers are of two types**: Those that are replenished by surface water, and those that have no connection to surface water (called fossil aquifers).

Legal Factors

As a potentially viable legal framework, the DAs are hampered by the belief in some circles that they are incompatible with other applicable instruments such as the UNWC (Eckstein and Sindico 2014). Globally, there is a lack of international law governing shared aquifers, and a lack of available legal frameworks that countries could use as a starting point to forge agreements (Uprety 2014; Jarvis et al. 2005; Puri and Aureli 2008; Puri et al. 2004; Puri et al. 2001). This void is compounded by a widespread absence of in-country regulations that would provide any mechanism to create an international TBA agreement. Further, many countries have little or no formal regulation of their own country's groundwater, much less the sharing of this resource with a neighboring State. Finally, if a country begins to assess how it would address a TBA agreement, it can be complicated by internal friction on whether the resource is ultimately managed at: a) the national level (as in the Middle East); b) the state level (as in India); and c) the sub-state level (e.g., United States) (Beach et al. 2000).

Political Factors

Individual States will generally seek to retain absolute sovereignty over that portion of a TBA within their boundaries, ignoring the fact that most accessible groundwater is moving and thus is not that country's sole property (McCaffrey 2011; and others).

Political leaders will gravitate toward maintaining the status quo concerning water resources during their tenure if there is no driver such as a lack of water or poor water quality; moreover, agreements with neighboring States may result in access to less of the resource. This approach does not support scientific quantification of the resource, which would lead to the desired sustainability. Mistrust between countries; reluctance to execute agreements with a more powerful State; or a belief that an agreement will have little economic benefit may also be factors.

Socio-Economic Factors

Short-term overuse of a TBA often occurs at the expense of sustainable management of the resource. One State's industrialization may cause an inaccurate forecast for usage in both sharing States (Puri and Aureli 2008). An historic bias toward funding of surface water projects over groundwater projects impedes implementing TBA agreements because definition, management and public awareness of the resource remains inadequately addressed. The adoption of the DAs is also hampered by a perception by some States that a global treaty cannot effectively address regional or individual States' issues (Eckstein and Sindico 2014).

Summary Discussion of the Challenges to Finalizing the Draft Articles

We find that States routinely do not attempt the intrinsically political act to forge TBA agreements because it may cause them harm in profound ways, such as reducing the amount of groundwater available to their own country and causing economic loss. The political challenge is compounded by the scientific complexity of defining the volume, as well as the vertical and lateral extent of a TBA's available water. Moreover, making a volumetric estimate is oftentimes highly interpretive, even when formalized technical studies such aquifer pump tests are completed. Such testing may or may not have a favorable outcome for one or all parties, and perhaps force a change in water supply management. Hence, the maintenance of the status quo, and no action, is the order of the day.

Funding of aquifer testing, which will allow estimates of recoverable water volumes in TBAs, is a necessary step that will ultimately be in the best interest of the States that share the aquifer. This is because although one or more States that share an aquifer may be apportioned less water in the short term as a result of testing and a follow-on agreement, in the long run testing will guide the efficient management and sustainable use of the available resource for all concerned,

Aquifer testing involves pumping water at varying rates over set periods of time (such as a twenty-four hour period) out of existing wells and measuring the amount of water level drawdown in nearby wells, in order to make calculations on the recoverable water in a shared aquifer. In order to be effective, aquifer testing inevitably requires installing additional wells in the aquifer being tested in order to make reasonable volume

estimates, and to take direct water level measurements from widely-spaced wells throughout the aquifer.

Aquifer testing must be repeated periodically as conditions change, and ongoing data sharing and cooperation must also occur. Because in most cases groundwater is moving in the TBAs, it is inevitably a shared resource. Therefore, a State's desire to have unconditional sovereignty over a water supply within their borders must be tempered by the reality that groundwater, like surface water, needs to be equitably and reasonably shared (Article 7). This fair sharing must achieve some type of balance in the harm that may result from water volume reductions that States will incur in the course of TBA management as driven by aquifer testing.

Nearly as important as the continual movement of groundwater across man-made borders is the concept of recharge. The identification and conservation of recharge areas is vital to the long-term management of any transboundary aquifer system, otherwise the aquifer replenishment will diminish at a greater rate (Dellapenna 2011). Because of common situations where a recharge area situated in one State is necessary to replenish a tranboundary aquifer in an adjacent State, the need for a level of cooperation between participating States is obvious. Recharge areas situated in a State outside those States which physically share the transboundary aquifer must also be preserved and managed, which can present an added layer of political complexity (Dellapenna 2011).

Along with the need to sustain recharge, another subtle but monumental concept that begs for cooperation and information-sharing within a governance framework is the specter of overpumping, or groundwater mining (Linton and Brooks, 2011; and many others). Excessive groundwater pumping can be conducted for a period of years before it manifests itself in the form of substantial decreases in groundwater levels and significantly-depleted aquifers. This practice can severely decrease or destroy the productivity of the aquifer; therefore, the need for fair management of withdrawals by aquifer States is imperative.

The hesitancy to forge agreements is a by-product of the need for a political regime to portray itself in the best possible light. Further, the hesitancy is compounded by the need to define through testing the usable water volumes in the shared aquifer, which costs money that is typically earmarked for other more visible uses. And, if the aquifer testing is actually executed by the aquifer States and if the data is shared as it should be, there is a fear by the political regime that the outcome results in the need for water use reductions (i.e., harm) to their own State.

Conclusions

Mindful of the challenges to finalizing the DAs and regardless of the nature of their eventual use as guidance or as a binding legal instrument, it is essential that international policymakers and water law practitioners promote the principals in the

DAs. As noted in Article 7, the obligation for aquifer States to cooperate and manage TBAs in an equitable and reasonable manner is fundamental. A cornerstone of this cooperation is the need to educate decision makers in the basic principles of groundwater flow, recharge, and sustainable aquifer testing and overall management, as this subject continues to be poorly understood globally.

References

Beach, H.L., Hammer, J., Hewitt, J., Kaufman, E, Kurki, A, Oppenheimer, J., and Wolf, A. 2000. *Transboundary freshwater dispute resolution, theory, practice, and annotated references.* United Nations University Press.

Bittinger, M. W. 1972. *A survey of interstate and international aquifer problems.* Ground Water 10 (2) 44–54.

Brochmann, M. and Hemel, P.R. 2011. *The effectiveness of negotiations over international river claims.* International Studies Quarterly *55,* 859-882.

Conti, K. 2014. *Factors enabling transboundary aquifer cooperation: a global analysis.* International Groundwater Resources Assessment Centre. Available from: http://www.un-igrac.org/sites/default/files/resources/files/Factors%20Enabling%20Transboundary%20Aquifer%20Cooperation.pdf. [Accessed 2 December 2016].

De Gramont, H, Noel, C, Oliver, J.L., Pennequin, D., Rama, M, and Stephan, R.M. 2011. *Toward a joint management of transboundary aquifer systems, methodological guidebook.* Agence Francaise De Developpement (AFD). A savoir no. 3. December.

Dellapenna, J. 2011. *The customary law applicable to internationally shared groundwater.* Water International 36 (5), 584-594.

Eckstein, G. 2015. T*ransboundary aquifers: an interdiscplinary conversation.* Strathclyde Centre for Environmental Law and Governance Seminar Series. 22 May. Available from: www.strath.ac.uk/ research/strathclydecentreenvironmentallawgovernance/events/ guest/lectures/, [Accessed 1 December 2016].

Eckstein, G. and Sindico, F. 2014. *The law of transboundary aquifers: many ways of going forward, but only one way of standing still.* Review of European Community & International Environmental Law, 3 (1), 32-42. Available from: http://ssrn.com/abstract=2429569. [Accessed 27 December 2016].

Eckstein, Y. and Eckstein, G. 2005. *Transboundary aquifers: conceptual models for development of international law.* Ground Water, 43 (5), 679-690.

Jarvis, T., Giordano, Puri, S., Matsumoto, K. and Wolf, A. 2005. *International borders, ground water flow, and hydroschizophrenia.* Ground Water 43 (5), 764–770.

Linton J. and Brooks, D. 2011. *Governance of transboundary aquifers: new challenges and new opportunities.* Water International 36 (5), 606-618.

Llamas, R. 2004. *Water and ethics - use of groundwater.* Series on water and ethics, essay 7. United Nations Educational, Scientific and Cultural Organization (UNESCO).

Machiavelli, N. 1513. *The Prince.* Available from: www.victoria.ac.nz/1915/about/staff/publications/paul-nation/Prince-Adapted2.pdf. [Accessed 1 December 2016].

McCaffrey, S. C. 2011. *The international law commission's flawed draft articles on the law of transboundary aquifers; the way forward.* Water International 36 (5), 566-572.

McCaffrey, S.C. 2007. *The law of international watercourses.* 2nd ed. Oxford University Press.

Mukhar, R.M. 2006. *The jordan river basin and the mountain aquifer: the transboundary freshwater disputes between israel, jordan, syria, lebanon and the palestinians.* Annual Survey of International & Comparative Law: 12 (1), Article 5.

Paisley , R. and Henshaw, T. 2014. *The 1997 united nations watercourses convention from a north american perspective.* August 24. Available from: www.international waterlaw.org/blog/2014/08/. [Accessed 1 December 2016].

Puri, S. and Aureli, A. 2008. *Transboundary aquifers: a global program to asess, evaluate, and develop policy*. Ground Water 43 (5), 551-668.

Puri, S. 2004. *Management of transboundary aquifers: contribution to the water needs of africa.* in *Managing shared aquifer resources in africa.* Edited by B. Appelgren. IHP-VI, Series on Groundwater No. 8. Paris, France: UNESCO.Available from: unesdoc.unesco.org/images/0013/001385/138581m.pdf. [Accessed 1 December 2016].

Puri, S., B. Appelgren, G. Arnold, A. Aureli, S. Burchi, J. Burke, J. Margat, P. Pallas, and W. von Igel. 2001. *Internationally shared (transboundary) aquifer resources management, their significance and sustainable management: a framework document.* IHP-VI, International Hydrological Programme, Non Serial Publications in Hydrology SC-2001/WS/40. Paris, France: United Nations Educational, Scientific and Cultural Organization. Paris (UNESCO).

Salman, S. 2015. *Entry into force of the united nations watercourses convention: why should it matter.* Strathclyde Centre for Environmental Law and Governance Seminar Series. 22 May. Available from: www.strath.ac.uk/

research/strathclydecentreenvironmentallawgovernance/events/seminars. [Accessed 1 December 2016].

Salman, S. 2011. *The world bank policy and practice for projects affecting shared aquifers.* Water International 36 (5), 595-605.

United Nations. 2013. Statement by guatemala, 68th session of the united nations general assembly sixth committee: agenda item 87: the law of transboundary aquifers. 22 October. Available at: https://papersmart.unmeetings.org/media2/703107/guatemala-87.pdf. [Accessed 12 October 2016].

United Nations. 2013. statement by the united states of america, 68th session of the united nations general assembly sixth committee: agenda item 87: the law of transboundary aquifers, 22 October. Available from: https://papersmart.unmeetings.org/media2/703097/us-87.pdf. [Accessed 12 October 2016]

United-Nations Water. 2014. UN-Water: statistics detail. *global water withdrawals are projected to increase by some 55% through 2050.* 7 October. Available from: http://www.unwater.org/statistics/statistifcs-detail/en/c/211820/. [Accessed 12 October 2016].

Uprety, K. 2014. *A south asian perspective on the united nations watercourses convention. f*ourth Eesay in the series related to entry into force of the 1997 united nations watercourses convention. 14 July. Available from: www.internationalwaterlaw.org/blog/2014/07/. [Accessed 3 December 2016].