



# Legal frameworks for the governance of international transboundary aquifers: Pre- and post-ISARM experience

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## ABSTRACT

*Study region:* Africa, Latin America, Europe.

*Study focus:* Through the extensive study and mapping of the world's aquifers that lie astride the international boundary lines of sovereign States, ISARM has awakened concerned States to the existence of aquifers stretching beyond their borders, and precipitated cooperation in generating a body of knowledge that facilitated cooperation in governance arrangements for such aquifers. In parallel, ISARM influenced the shape and direction of the United Nations "Draft articles on the law of transboundary aquifers" appended to UN Resolution 63/124 of 2008. Both stimulated cooperation among concerned States, and provided a frame of reference for the legal grounding of such cooperation in aquifer-specific agreements.

*New hydrological insights:* Through this synergistic paradigm, ISARM has made an impact on the shape and direction of cooperation in the Guaraní Aquifer in South America, and in the Iullemeden and Taoudeni/Tanezrouft Aquifer Systems (ITAS) in the Sahel region of Africa. It is having an influence on the shape and direction of cooperation being negotiated on the Stampriet Aquifer System in Southern Africa, and on the Ocotepeque-Citalá Aquifer in Central America. The link of ISARM to other international aquifer agreements on record is tenuous, and ISARM's influence on their generation speculative. The visibility of ISARM has faded since 2012, however its legacy is lasting.

## 1. Introduction

The Internationally Shared Aquifer Resources Management (ISARM) joint initiative of UNESCO-IHP, UN/FAO, and the International Association of Hydrogeologists (IAH), traces its origins back to the Ministerial Declaration of the Hague on Water Security in the 21<sup>st</sup> Century (March 2000). It has had from inception a multidisciplinary and multidimensional breadth of scope, mirroring the multi-faceted dimensions of the management of transboundary aquifers. Also from the start, the governance-cum-legal dimension has featured prominently on ISARM's radar screen and scope of activities, aimed at generating policy-relevant pointers for countries to stimulate cooperation in the governance of transboundary aquifers (UNESCO-IHP *et al.*, 2001). In this particular respect, ISARM, which had become a steady feature of UNESCO-IHP's programme from 2000 to 2012,<sup>1</sup> has yielded a mix of one discrete normative result at the global level, and "diffuse" results at the ground level of specific countries, in the area of the governance of transboundary aquifers shared by sovereign States across international boundary lines. Arguably, this has been a direct spinoff of the

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<sup>1</sup> See Council Resolutions XIV-12 (2000), XIX-9 (2010), and XX-3 (2012), all of which are dedicated to ISARM. No further UNESCO-IHP Council resolution on ISARM is on record. The knowledge-generation and aquifer mapping thrust of ISARM continued through the groundwater component of the Transboundary Waters Assessment Programme (TWAP), funded by the Global Environment Facility and executed – as regards groundwater – by UNESCO-IHP. TWAP was active from 2010 through 2016.

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extensive and successful knowledge-generation and mapping of the internationally shared transboundary aquifers of the world, conducted under ISARM auspices over the years 2001–2010, and after that under the umbrella of the Transboundary Waters Assessment Programme (TWAP), with the support – technical and financial – of the international community (Puri and Villholth, 2018; Rivera and Candela, 2018). Starting from a brief overview of the – admittedly few – international transboundary aquifer agreements on record, from the analysis of the chief global-scale normative instrument also on record in the matter, and taking also on board the role of groundwater in international river/lake/basin governance arrangements, this chapter will seek to un-pack the influence ISARM may have had in all three respects. Some final considerations will be made regarding the foreseeable future direction if ISARM in relation to the governance dimension of inter-State cooperation in regard to international transboundary aquifers.

It bears emphasizing at the outset that only agreements, and other comparable legal instruments, made by sovereign States regarding transboundary aquifers that lie astride an international boundary line are canvassed in this chapter. Agreements, and other comparable legal instruments, made by (a) sub-national entities, regarding transboundary aquifers that lie astride an international boundary line, and (b) states or provinces of federal countries, regarding transboundary aquifers that lie astride inter-state or inter-provincial boundary lines, are outside the reach of this chapter as neither kind of transboundary aquifers has been embraced by ISARM. As implied by its very name of Internationally Shared Aquifer Resources Management (emphasis added), ISARM has consistently addressed itself to sovereign States and to the transboundary aquifers they have in common across international boundary lines, to the exclusion of the other two transboundary aquifer types mentioned earlier.

## 2. Agreements regarding international aquifers

The agreements on record regarding aquifers which straddle the international boundary lines of states are the following, in chronological order

- the agreement first made in 1977, then re-negotiated in 2007 by France and Switzerland on the Genevese Aquifer;
- three agreements on the Nubian Sandstone Aquifer System, made in 1992 and 2000 by Chad, Egypt, Libya and Sudan;
- the agreement (technically, minutes of meetings and joint ministerial declarations) for the establishment of a tri-lateral consultative arrangement for the North-Western Sahara Aquifer System, made by Algeria, Libya, and Tunisia in the period 2002–2008;
- the agreement (technically, a Memorandum of Understanding) made in 2009 by Mali, Niger and Nigeria for the establishment of a tri-lateral consultative arrangement for the Iullemeden Aquifer System (IAS). The agreement is not in force yet, however it is due for replacement by a later agreement (also technically, a Memorandum of Understanding) made in 2014 by Algeria, Benin, Burkina Faso, Mali, Mauritania, Niger and Nigeria for the Iullemeden and Taoudeni/Tanezrouft Aquifer Systems (ITAS), for the establishment of a comparable multi-partite Consultative Mechanism for the ITAS. This later agreement, however, is not yet in effect pending the signature of three of the Parties;
- the agreement on the Guarani Aquifer, made in 2010 by Argentina, Brazil, Paraguay and Uruguay; and
- the agreement on the Al-Sag/Al Disi Aquifer, made in 2015 by Jordan and Saudi Arabia.

The Genevese Aquifer agreement, made in 1977 and re-negotiated in 2007 for a period of thirty years, is a complex instrument covering controlled groundwater extractions, controlled artificial aquifer recharge operations, pollution control, and the apportionment of all relevant costs. The permanent bi-lateral Commission in place since 1978 for the administration and implementation of the obligations of the Parties has been confirmed by the 2007 agreement (De los Cobos, 2018).

The Nubian Sandstone Aquifer System (NSAS) agreements provide for a Joint Authority of country representatives (1992 agreement), and rules for Monitoring and Exchange of Groundwater Information, and for Monitoring and Data Sharing, respectively (2000 agreements). The Joint Authority is mandated to collaborate and develop co-operative activities for the sustainable and mutually beneficial development of the aquifer, including monitoring groundwater withdrawals and levels. By the other two agreements, the NSAS countries undertook to monitor and share among them certain data, and to feed them to a shared Regional Information System (NARIS) with a view to keeping the latter up to date (Mechlem, 2012).

The North-Western Sahara Aquifer System (known as SASS after its acronym in French), shared by Algeria, Libya, and Tunisia is governed by a tri-lateral Consultative Mechanism (*Mécanisme de concertation*), made up initially of country focal points and a Coordination Unit headed by a Coordinator. The Mechanism was contemplated in minutes of a meeting of the three countries held in Rome, Italy in December 2002, and became operational gradually. In 2006, a Council of (water) Ministers and a Permanent Technical Committee were added to the initial structure of the Mechanism, and National Committees replaced the original national focal points, by a joint Declaration of the Water Ministers of the three countries. The Mechanism is tasked with managing the aquifer model, monitoring the aquifer, promoting and conducting joint studies, and reporting to the member Governments on the state of the aquifer. A Protocol was drafted in 2015, with a view to grounding on a definitive legal basis the member countries' commitment to cooperation (Taibi, 2017).

The 2009 Iullemeden Aquifer System (IAS) agreement – not in force – provides for a Consultative Mechanism to promote cooperation among Mali, Niger and Nigeria with a view to, in particular, jointly identifying the risks to which the aquifer system and its resources are exposed; facilitating the cooperative management of such risks and the sustainable development of the IAS resources; and promoting the integrated management of groundwater resources in the aquifer. In contrast to the lean Consultative Mechanism for the SASS, that for the IAS has an elaborate internal structure consisting of a Council of Ministers, an *ad hoc* Technical Committee of Experts, a National Technical and Scientific Committee for each member country, and an Executive Secretariat. In addition and as a

complement, the IAS Parties have also committed to “taking into consideration” a number of substantive and procedural principles, i.e., the equitable and reasonable use of the water resources of the aquifer, the duty not to cause significant cross-border damage, public participation in the development and implementation of decisions, precaution, polluter-pays, user-pays, prior notification of planned measures likely to have adverse effects on other member States, and data and information exchange (Mechlem, 2012). The 2009 agreement is due for replacement by a subsequent agreement made in 2014, by virtue of which (a) coverage of the prior agreement is expanded from the IAS to the Iullemeden and Taoudeni/Tanezrouft Aquifer Systems (ITAS), with the consequential increase in the number of States Party from the original three to seven, and (b) the environment-support function of groundwater comes within sharper focus. The new agreement also (c) adds a Coordination Unit and a Permanent Scientific and Technical Committee of country representatives to the structure of the Consultative Mechanism, and (d) re-casts and elaborates on the substantive and procedural obligations of the Parties to the 2009 IAS agreement. To-date, the 2014 agreement is awaiting the endorsement of a few of the seven States Party (Eckstein, 2017).

The agreement on the Guarani Aquifer, made in 2010 by Argentina, Brazil, Paraguay and Uruguay is a framework-type instrument setting forth a number of general obligations patterned after the basic principles of customary international water law, i.e., the reasonable and equitable utilization of the aquifer resources, the duty not to cause significant transboundary harm, the duty of prior notification of planned activities and projects, and the correlated duty to exchange information and data. A Commission of country representatives is provided for, to coordinate cooperation concerning the aquifer (Sindico, 2017, Sindico et al., 2018, Amore, 2018). The agreement has been ratified by all four countries (last by Paraguay, in April 2018), and is due to come into effect in the course of 2018.

By the 2015 Al-Sag/Al-Disi Aquifer agreement, Jordan and Saudi Arabia have agreed to place a five-year moratorium on all extractions of groundwater from a restricted “Protected Area”, and to regulate well drilling and the injection of pollutants in a permitted “Management Area”. The Parties also agreed on the dedication of extracted groundwater from the Management Area to domestic use, to the exclusion of all other uses. A Joint Technical Committee of country representatives oversees the implementation of the agreement (Eckstein 2015). Reportedly, however, the Committee has never met to-date (personal communication).

### 3. International standards and norms of inter-State behaviour regarding transboundary aquifers lying astride international boundary lines

To one degree or another, all the international transboundary groundwater agreements reviewed above substantially adhere to, and bear evidence of, some basic international standards of State behaviour as regards transboundary aquifers that lie astride international boundary lines. These standards are cast in a handful “soft-law” instruments, i.e., non-binding documents crystallizing the practice of States. The most notable such aquifer-specific instruments are the United Nations “Draft articles on the law of transboundary aquifers”, appended to UN Resolution 63/124 of 11 December 2008 (UNGA, 2008) and the “Model Provisions on Transboundary Groundwaters” (2012) made under the umbrella of the 1992 UN Economic Commission for Europe (UNECE) Convention on the Protection and Use of Transboundary Watercourses and International Lakes (UNECE, 2012). Although neither is legally binding, both carry a few “core” rules of State behaviour, commonly known as rules of customary international water law, which are legally binding, and can be traced, if only by implication, in all the agreements reviewed earlier. These “core”, legally binding rules of State behaviour as regards international transboundary aquifers, crystallized in the two above-mentioned instruments, are:

- the right of States to a reasonable and equitable share in the uses of transboundary groundwater and aquifers,
- the duty of States not to inflict “significant” harm across the international border, through its own actions or through those of its subjects,
- the duty of States to exchange information and data,
- the duty of States to provide prior notification of planned measures likely to have a cross-border impact on neighbouring aquifer States.

These rights and obligations all fall under a more general obligation of cooperation, also crystallized in the two instruments above-mentioned as a separate obligation.

In the Draft Articles as well as in the Model Provisions mentioned earlier, these “core”, legally binding rules of State behaviour are complemented by norms about the recharge and discharge areas of aquifers, uses of aquifers other than the extraction of groundwater, the interface and interactions of land and the sub-surface space with groundwater and aquifers, the ecosystem-support function of aquifers, and joint institutional arrangements. Non-recharging (also known as “fossil”) aquifers receive indirect attention in the Draft Articles through equitable and reasonable utilization norms aimed at “maximizing” the useful lifespan of aquifers in general. Arguably, “maximization” resonates with, in particular, the peculiar circumstances of non-recharging aquifers, and with concern for their exposure to being “mined”, to the detriment of the aquifers’ useful lifespan. It bears re-emphasizing however that these norms of State behaviour are not binding and, as a result, have an aspirational value and a moral weight only. Nonetheless, the authoritativeness of the source of the two instruments lends such moral weight a persuasiveness not to be under-estimated (UNESCO-IHP, 2009, Stephan 2011, Eckstein 2017).

#### 4. Groundwater in river/lake basin agreements and organizations

Another modality of inter-State engagement regarding aquifers that lie astride international boundary lines is though the inclusion of groundwater in agreements on transboundary surface waters or river/lake basins, whereby the commitments made in regard to surface waters or river/lake basins automatically extend to linked transboundary groundwater/aquifers. Examples abound, ranging from the River Danube Convention (1994) to the Rhine Protection Convention (1998) in Europe, and from the Lake Tanganyika Convention (2003) to the Lake Victoria Protocol (2003) in Africa, among others. Invariably, however, groundwater generally features in all surfacewater treaties almost as an afterthought, and has junior status to surfacewater. Lately, purposeful attention is being directed to groundwater underlying international transboundary river or lake basins, within the existing framework of treaties, agreements and joint commissions established for such transboundary surfacewater basins. Notable examples are the Senegal river and Lake Chad, in Africa, where, with assistance from the international donor community, the relevant basin organizations are casting their net wider by looking to the aquifers underlying the respective basins.<sup>2</sup> Another notable example is the Stampriet Aquifer System, shared by Botswana, Namibia and South Africa. Under the auspices of UNESCO-IHP, attention to the specific management challenges the aquifer will face has made its way and found a “home” in an existing river basin organization, i.e., the Orange-Senqu River Commission (ORASECOM), formed under a 2000 agreement by the three Stampriet states, plus Lesotho. Nesting of the Stampriet Aquifer in ORASECOM has been anchored legally in ORASECOM’s implied mandate for transboundary groundwater in the basin in general, and has been effected by homing the Stampriet Aquifer in the internal structure of ORASECOM and, in particular, in the Groundwater Hydrology Committee of the Technical Task Team, which is one of four standing task teams operating under the Council (ORASECOM, 2017). A similar “story” may unfold in Central America, also under UNESCO-IHP auspices, regarding in particular the Ocotepeque-Citalá Aquifer shared by El Salvador and Honduras. There, under the influence of a strong tradition of locally-based water governance in general, leveraging the existing local-level governance arrangement for the overlying Lempa River basin (i.e., the Tri-national Lempa River Association of Municipalities (*Mancomunidad tri-nacional Río Lempa*) grouping a number of contiguous municipalities in El Salvador and Honduras, in addition also to Guatemala as a co-basin State of the Lempa River basin) is a course of action available to anchor governance arrangements for the shared bi-national aquifer (UNESCO-IHP, 2016). The a-symmetry in the number of States overlying the two aquifers, relative to the larger number of States sharing the overlying river basin, is a noteworthy feature of transboundary governance arrangements for both the Stampriet and the Ocotepeque-Citalá aquifers. Whereas such a-symmetry appears not to have played a role in the ORASECOM’s Council decision to accommodate the tri-Party Stampriet Aquifer in the fold of the four-Party Orange-Senqu River Basin Commission, the effect of such a-symmetry on the further course of governance arrangements being negotiated for the Ocotepeque-Citalá Aquifer in Central America remains to be seen.

#### 5. Links between contemporary state practice regarding international transboundary aquifers and ISARM

While it is difficult, if not impossible, to trace specific agreements on record to ISARM’s legal thinking and approach to the issue of transboundary aquifer cooperation among sovereign States, it is plausible that the extensive and successful knowledge-generation and mapping exercise of the world’s international transboundary aquifers carried out under ISARM auspices has awakened States to (a) the existence of aquifers under their territory that stretch beyond the international boundary lines with neighbouring States, and (b) the desirability of, and opportunities for, institutionalized forms of cooperation across such lines. The conceptualization and crafting by the UN International Law Commission, with the help of ISARM (see further on in this section), of the Draft Articles on the Law of Transboundary Aquifers, that went on in parallel to the knowledge-generation-cum-mapping exercise of international transboundary aquifers of the world, showed the way forward regarding the legal grounding of cooperation. The two processes – global-scale mapping, and delineating a global-scale legal framework for cooperation –, both driven by ISARM’s philosophy, have acted as a fuse igniting cooperation in at least two instances. This paradigm of mutually re-inforcing synergies has clearly been at work in the Guaraní Aquifer, where cooperation among the four aquifer countries was informed and inspired by the scientific investigations and mapping of the aquifer and its characteristics, initiated under ISARM auspices and subsequently refined with the assistance of the international donor community. The knowledge and awareness thus generated inspired and informed the negotiations that eventually resulted in the crafting and signing of the Guaraní Aquifer Agreement in 2010. In turn, this was strongly inspired by the work of the UN International Law Commission and the Draft Articles (Sindico, 2017). A similar paradigm has been at work in the Iullemeden and Taoudeni/Tanezrouft Aquifer Systems (ITAS), as the 2014 agreement (not yet in effect) has been crafted under the twin influence of the mapping and technical and socio-economic investigations spearheaded by UNESCO-IHP in the spirit of ISARM, and by the Draft Articles.<sup>3</sup> A similar story is unfolding in the Stampriet and the Ocotepeque-Citalá Aquifers, where the initial world-scale aquifer mapping carried out by UNESCO-IHP under the auspices of ISARM prompted the attention of the relevant countries, and the detailed aquifer studies which ensued with the assistance of UNESCO-IHP and the Swiss Government have paved

<sup>2</sup> The Senegal River Basin Development Organization (OMVS) and the Lake Chad Basin Commission will be beneficiaries of the project “Strengthening the institutional capacity of the African Network of Basin Organizations (ANBO), contributing to the transboundary water governance in Africa”, funded by the Global Environment Facility (GEF) and executed by UNESCO (personal communication). The relevant project document was signed in October 2017. The chief goal of the project is to improve transboundary water governance in Africa. A related goal is to build the capacity of selected River/Lake Basin Organizations to deal with transboundary groundwater (Project Document, para.50 on p.22).

<sup>3</sup> Tellingly, both the 2010 Guaraní Aquifer agreement and the 2014 TIAS agreement (MOU) make an explicit reference to the Draft Articles in the preamble, as a source of inspiration for the respective agreement.

the way for the transboundary governance arrangements being negotiated, described earlier. While, by contrast to the Guaraní and the ITAS instruments, the transboundary governance arrangements for the Stampriet and the Ocotepique-Citalá aquifers bear no visible connection to the UN Draft Articles, still both kinds of arrangements can be traced back to the spirit of the Draft Articles.

It is equally true that ISARM has influenced to a considerable extent the conceptualization and the actual drafting of the Draft Articles on the Law of Transboundary Aquifers, through the technical support provided by a team of independent experts acting under the ISARM umbrella and under the aegis of ISARM lead partner UNESCO-IHP, to the Special Rapporteur of the UN International Law Commission (UNILC) appointed to conceptualize and draft norms of inter-State engagement specifically relating to transboundary aquifers. The advisory team of ISARM experts represented a mix of disciplines, primarily hydrogeology and the law. In view of the legal nature and thrust of the task of the UNILC Special Rapporteur, and of his own prevailing legal background, the UNESCO-IHP-led multi-disciplinary ISARM team saw to it that the norms that were eventually distilled by the Special Rapporteur, and that informed the Draft Articles appended to UN Resolution 63/124 mentioned earlier, were backed by a body of scientific evidence voluminous and articulate enough that (a) the norms of inter-State engagement cast in the Draft Articles would be science-based and, as a result, (b) they would be credible before the world community in general, and the target States of such norms in particular. Certain features of the Draft Articles – notably, the shift of attention from groundwater to the aquifer, attention to the recharge and discharge zone of recharging aquifers and to the land/groundwater interface and interactions, to the environment-support function of aquifers, and to the long-term benefits and useful lifespan of aquifers, among others – are directly attributable to the influence of the ISARM team of advisers to the Special Rapporteur. As noted earlier, some of these concepts, including the relevant language, have crept in the Guaraní Aquifer agreement, and in the Iullemeden and Taoudeni/Tanezrouft Aquifer Systems (ITAS) Memorandum of Understanding.

More in general, the legal members on the ISARM multi-disciplinary team of advisers to the UNILC Special Rapporteur further influenced the latter's thinking and conceptualization/drafting process by insisting and ensuring that the basic norms of inter-State engagement briefly illustrated earlier would play centrestage in the Draft Articles, and would be complemented by a body of more forward-looking norms also posited in the Draft Articles by the Special Rapporteur. To the extent that ISARM has influenced the Draft Articles, and that the norms of the Draft Articles have trickled down the Guaraní and ITAS agreements, one can say that ISARM's legal thinking has influenced both agreements, if indirectly and in a “diffuse” fashion. As for the agreements that pre-date UN Resolution 63/124, it is hard to track an ISARM influence on them. Cooperation in the Genevieve Aquifer, in the North-Western Sahara Aquifer System, and in the Nubian Sandstone Aquifer System, long pre-dated ISARM. In effect, States have consistently adhered over the decades to the core norms of inter-State engagement that were eventually crystallized in the ISARM-inspired UN Draft Articles, with or without ISARM. Probably, a virtuous loop has been at work in this connection, whereby the thinking of legal members of the ISARM team has been influenced by the consistent behavioural pattern States have displayed in relation to international transboundary aquifers, before and after the official birth of ISARM, and ISARM's legal thinking has contributed in turn to the solidification, but also to the advancement, of the norms distilled from the behavioural pattern of States, and that were crystallized in the UN Draft Articles eventually.

## 6. Conclusions

As the visibility of ISARM has tapered off, mostly as a direct consequence of its falling off the chief partner UNESCO-IHP's official radar screen, the legacy of the extensive and successful knowledge-generation and mapping of the world's international transboundary aquifers it inspired lingers on, and will likely continue to invite States' attention to the aquifers they have in common across international boundary lines, and to consider opportunities for cooperation – including governance arrangements – across such lines. Germane and in parallel to this, the other lasting legacy of ISARM is the body of norms of inter-State engagement regarding international transboundary aquifers, crystallized in the UN Draft Articles mentioned several times earlier in this chapter. Arguably therefore, through this twin legacy and despite the loss of visibility, ISARM continues and will continue to inspire countries to progress from transboundary aquifer survey, characterization and modelling to transboundary aquifer governance, and, in this latter connection, to look to the norms of inter-State engagement crystallized in the UN Draft Articles, for guidance. In sum, it is fair to say that ISARM has made a major contribution to the governance of international transboundary aquifers of the world and, in the event, to the sustainable management of resources of increasingly strategic importance in the face of climate variability.

## Conflict of interests

None.

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- Convention on the Protection, Utilization, Recharge and Monitoring of the Franco-Swiss Genevois Aquifer, made by the Community of the Annemassienne Region, the Community of the Genevois Rural Districts, and the Rural District of Viry, on one part, and the Republic and Canton of Geneva on the other, at Geneva, 18 December 2007 (available at <https://www.internationalwaterlaw.org/documents/europe.html>).
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- Memorandum of Understanding for the Establishment of a Consultation Mechanism for the Integrated Management of the Water Resources of the Iullemeden-Taoudeni/Tanezrouft Aquifer Systems (ITAS) (Algeria, Benin, Burkina Faso, Mali, Mauritani, Niger, Nigeria), 2nd Council of Ministers of GICRESAIT Project, Abuja (Nigeria) 28 March 2014 (available at <https://www.internationalwaterlaw.org/documents/africa.html>).
- Agreement between Jordan and Saudi Arabia for the Management and Utilization of the Groundwaters in the Al Sag-Al Disi Aquifer, made at Riyadh, 30 April 2015 (available at <https://www.internationalwaterlaw.org/documents/asia.html>).