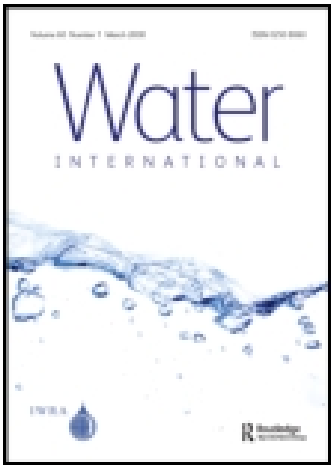

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Codification of the Law of Transboundary Aquifers (Groundwaters) by the United Nations

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Having served as a Special Rapporteur for the United Nations International Law Commission's topic of Shared Natural Resources, the author was responsible for formulating the Draft Articles on the Law of Transboundary Aquifers, which was submitted to the United Nations General Assembly in 2008. In this article, the author discusses the background to the Draft Articles, their formulation in cooperation with hydrogeologists and groundwater administrators, the principles and concepts contained in the Draft Articles, positions of various states, and the future prospect of the Draft Articles.

Keywords: international water law; International Law Commission; transboundary aquifers; groundwater

Introduction

I served as a member of the United Nations (UN) International Law Commission (ILC) from Japan for 17 years from 1992 to 2009. While on the ILC, I served as a Special Rapporteur for the ILC's topic of Shared Natural Resources and was responsible for formulating the Draft Articles of the Law on Transboundary Aquifers (groundwaters), which was submitted to the UN General Assembly in 2008. I would like to present the background to these Draft Articles, how they were formulated in cooperation with hydrogeologists and groundwater administrators, main elements of the principles and concepts contained in the Draft Articles, positions of various states and the future prospect of the draft articles.

International law

I would like to emphasize first the importance of the codification of international law. In order to secure justice and order and to settle any dispute among states by peaceful means, it is essential to establish the "rule of law" among the world community. The main sources of international law are treaties and customary international law. Treaties are like contracts that bind only those states that become parties to those instruments. States are fully acquainted with the rights and duties under treaties as they are expected to carefully examine them before they decide to become parties. On the other hand, customary international law binds all states of the international community regardless of their participation in the formulation of such customary norms. Customary international law is defined as "international custom, as evidence of a general practice accepted as law" (Article 38, Statute of the International Court of Justice).

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Historically speaking, in the absence of a world legislature, international law has largely developed as customary law. However, it is often difficult to ascertain precisely what the customary rules are, and states have differences in the interpretation of those rules. Furthermore there exist many lacunae in customary international law. These factors present serious difficulties to practitioners of international law. In order to remove the ambiguities of customary international law, there have been efforts at the restatement of customary rules to be agreed upon by states. This process is referred to as the codification of international law. The Charter of the UN, in Article 13, 1(a), provides that one of the important functions of the UN General Assembly is to promote the codification of international law.

The ILC was established in 1947 as a subsidiary organ of the UN General Assembly whose mandate is to prepare basic documents for the codification of international law in the form of draft articles. Article 13, 1(a) of the UN Charter contains two concepts. The first is the "codification of international law" and the other is "progressive development of international law". The Statute of the ILC defines them separately in its Article 15. However, the ILC has found it difficult to separate one from the other in practice. Its codification now contains both concepts, with increasing focus in recent years on the progressive development of international law. The UN has so far adopted 13 codification treaties on the basis of the work of the ILC, including such important conventions as Diplomatic and Consular Relations, Law of Treaties, Law of the Sea and Jurisdictional Immunity of States and Their Properties.

Why water?

Let me now address the question of "water". With respect to freshwaters, the Rhine and Danube rivers in Europe were subject to international regulations as early as the beginning of the nineteenth century for the purpose of free navigation. In fact, their river commissions, which were established for regulating international navigation, were the precursors of present international administrative organizations. The first time the UN dealt with transboundary freshwater resources occurred when it instructed the ILC in 1970 to take up the study of the law of the non-navigational uses of international watercourses.

Since the mid-twentieth century, large projects were undertaken along the international rivers of the world, notably the construction of dams and other facilities for the purposes of drinking, electric-power generation, irrigation and other uses. These upstream activities inevitably have downstream effects, and in many cases, threaten to cause significant adverse effects upon downstream states. To regulate these activities, the UN adopted in 1997 the Convention on the Law of the Non-Navigational Uses of International Watercourses (hereafter referred to as the 1997 International Watercourses Convention) on the basis of work by the ILC. While that convention theoretically covers groundwater resources as they are physically linked to international surface waters, it essentially was meant to regulate surface waters. In the preparation of that convention, the ILC did discuss the question of whether to include groundwater within the project. Although it recognized the need to properly deal with groundwater, the ILC decided that a separate study was required for that purpose.

Groundwater and the ILC

The UN soon became aware of the rapidly expanding exploitation of groundwater resources for potable, industrial and irrigation uses in both developed and developing countries and of the resulting critical overexploitation and pollution problems. Hence it instructed the ILC

in 2001 to proceed with the work on "Shared Natural Resources" which were generally understood to include groundwater as well as oil and natural gas. The ILC embarked on the work in 2002, appointing me as its Special Rapporteur for this new topic. Though there exist many similarities between groundwater and oil and natural gas, there is also much dissimilarity between them. Upon my recommendation, the ILC chose to adopt a step-by-step approach by embarking first on the work on transboundary groundwater resources as a follow up to the 1997 International Watercourses Convention.

The codification work on the law of transboundary groundwater required a multi-disciplinary process. However, the ILC consists of 34 members with a recognized competence in international law. As such, it does not possess scientific and technical knowledge of groundwater or expertise for proper management of such resources. Since the United Nations Educational, Scientific and Cultural Organization (UNESCO) has great experience coordinating global water issue for various UN organizations, it mobilized a team of hydrogeologists (groundwater scientists), groundwater administrators and water lawyers to assist me and the ILC. Without their untiring and valuable support, the ILC would not have been able to formulate the Draft Articles on the Law of Transboundary Aquifers. For example, during the work with these outside experts, it became clear that international lawyers often employ different concepts and terminologies from those used by scientific professionals. Accordingly, great effort was needed to select terms and expressions to be used in the Draft Articles that could be commonly understood by scientists, administrators and lawyers as well as by lay people.

About groundwater

The formulation of the Draft Articles by the ILC had to be based on firm scientific and technical evidence. Less than 1% of water on earth is readily accessible fresh water. Of this, 97% is located underground in aquifers. These aquifers exist in every continent on earth.

Rapid expansion in the exploitation of groundwater has been taking place since the 1950s in industrialized states and since the 1970s in developing states. Currently, 50% of potable water, 40% of industrial water and 20% of irrigation water is supplied by groundwater. Groundwater is the single most extracted raw material in the world. How groundwater is used varies in different regions. For example, it is used in the Russian Federation mainly for domestic purposes, in India for agriculture and in Central Asia for industries. Through the process of soil filtration, groundwater is usually of high quality and contains various nutritious minerals. Hence, bottled mineral water sold worldwide primarily comes from groundwater resources, although some is artificially produced.

The science of surface water is very old. You might have visited Roman aqueducts, most of which are located in southern Europe from Spain to Turkey. These aqueducts were built from the third century BC to the third century AD to transport water from their sources to cities. Building these aqueducts was possible because the science of surface waters – hydrology – was already highly developed then. Although humankind has tapped groundwater since time immemorial, the science of groundwater, especially of its flow, is a much newer field, dating back only 150 years to when Henry Darcy carried out various hydrologic experiments in Dijon, France. Among his many contributions, Darcy explained the phenomenon of artesian flow and described water flow through aquifers in mathematical terms.

Groundwater resources are distributed widely in the world. Many aquifers are shared by neighbouring states. In western and southeastern Europe, 154 transboundary aquifers have so far been identified by UNESCO and the International Groundwater Resources

Assessment Center. Likewise, transboundary aquifers have been categorized in North America (17), Central America (18), the Caribbean (four), South America (29), Africa (41) and Asia and the Middle East (55).[1]

In South America, the now well-known Guarani Aquifer System underlies the territories of Argentina, Brazil, Paraguay and Uruguay. As this region receives a lot of rainfall, the aquifer receives significant recharge. In contrast, the Nubian Sandstone Aquifer System, which underlies the territories of Chad, Egypt, Libya and Sudan, is a non-recharging or fossil aquifer that is located in an arid region where it no longer receives meaningful recharge from rainfall.

An example of the current grave situation of aquifers in the world is worth mentioning. In the past, India was not self-sufficient in wheat and depended upon US aid supply based on US Public Law No. 480 which authorizes assistance to developing countries with surplus wheat. But in recent years, wheat production in the three northwestern states of India – Punjab, Haryana and Rajasthan – increased rapidly through the utilization of aquifers, allowing India to become self-sufficient in wheat for the first time since its independence in 1947. However, many Indian farmers are now in trouble because of the lowering of the water table and are having problems in financing deeper wells. Analyses conducted by the gravity observation satellite "Grace" revealed that 109 cubic kilometres of water, equivalent to four times the water volume of Lac Leman, were extracted over the last six years in these three Indian states, and that the aquifer there is in a very precarious condition.

Let us now examine the mechanism of the global hydrological cycle. When the rain falls on the surface of the earth, some of the rainwater evaporates back to the atmosphere; some runs off the surface, joins rivers, flows toward oceans and then evaporates back to the atmosphere; some is absorbed by plants; some infiltrates the soil and becomes groundwater. This last description, however, is not entirely precise. In a temperate zone with significant rainfall, as in Japan, the soil near the surface is usually wet. But the water in the shallow soil is not necessarily groundwater. Though it might be technically possible to separate this water from the soil, it would be expensive and would not be an economically viable process for obtaining fresh water.

So what is groundwater? Groundwater is the water found in the subsurface within a saturated geologic formation, also known as an aquifer. This means that underground water that is not inside of an aquifer is not considered groundwater. It also means that an aquifer is a matrix, consisting of such materials as sand, gravel, rock and other porous material, containing groundwater and through which groundwater flows.

Generally, there are two kinds of aquifers. A confined aquifer is a saturated geological formation that is both underlain and overlain by less permeable material. The water contained in the saturated zone of a confined formation is under pressure that is greater than atmospheric pressure. When a well is drilled and reaches this geological formation, the pressure causes the water to shoot up. This is one of the phenomena that Henry Darcy explained through his experiments, and that can also be observed in cases of oil and natural gas. In comparison, an unconfined aquifer is a saturated geological formation that is underlain by a less permeable layer, but is not overlain by a similar confining, less permeable material. The water contained in this geological formation is under pressure equal to that of atmospheric pressure. Therefore, when a well reaches this type of geologic formation, the water contained within does not shoot up but can be pumped out mechanically. In order to manage groundwater properly, we must regulate both the water and the geological formation containing such water. Accordingly, from now on, I will use the term employed by the ILC of "aquifer", which the ILC interpreted to encompass both the geologic formation and the water contained within it.

Threats to aquifers

What activities affect aquifers? First, there is the utilization of groundwater. Over-extraction can lower the water table in an aquifer and deplete the resource and can also destroy the geological formation. Second, activities other than the utilization of water in the surface area overlaying an aquifer, such as agriculture, the use of chemical fertilizers and pesticides, drainage and waste dumping, can pollute the aquifer. In a river, pollutants may be washed away by the flow of the river. Once an aquifer is polluted, pollutants stay there, as the rate of water flow within most aquifers is considerably slower than water flow in rivers. And it is extremely difficult to clean it up. In addition, paving and construction works on the surface and underground can block the recharge and discharge processes of an aquifer or destroy the geological formation itself. For example, the city of Kyoto, Japan overlays a huge aquifer. This aquifer has supported the city, Japan's old capital, for 1000 years. In the 1960s, residents came to notice the lowering of the water table in their wells in some parts of the city and had to dig deeper to extract water. That situation coincided with the construction of a subway network. It is believed that the subway construction blocked the aquifer's recharge process and destroyed parts of the geological formation. In the case of transboundary aquifers, these activities in one state may adversely affect neighbouring states that share the same aquifers, by reducing their share of the water or by polluting the resource.

As stated above, there are recharging aquifers and non-recharging aquifers. Non-recharging aquifers are found primarily in arid regions of the world. One of the most representative is the Nubian Sandstone Aquifer System in North Africa. The region of North Africa used to be a more temperate zone many thousands of years ago. The water stored in the aquifer today is the rainfall of those times. Radioactive tracers have confirmed that the system no longer receives any meaningful recharge. Since the 1960s, radioactive materials of cesium and tritium emitted from nuclear tests and krypton from nuclear industries have been floating in the atmosphere. If these aquifers had received recharge from rainfall during the last 50 years, radioactive traces would have been found in the aquifers. None have been found in the Nubian Sandstone Aquifer System. Therefore, any exploitation of non-recharging aquifers, such as this system, will result in depletion, just as in the case of mineral resources or oil and natural gas.

The ILC and transboundary aquifers

During its consideration of the topic, the ILC was provided by the experts with these valuable scientific and technical characteristics and factors of aquifers. It also found ample state practices and almost 400 relevant treaties, general, regional and bilateral, on the basis of which customary rules could be identified.[2] States have also shown keen interest in the ILC's work as aquifers exist in almost all states and the overwhelming majority of states share transboundary aquifers with their neighbouring states. Many of these states also transmitted their valuable inputs and observations to the ILC. Taking into account the advice of experts and observations from governments, the ILC formulated a final set of 19 Draft Articles on the Law of Transboundary Aquifers in 2008, the text of which was appended to UN General Assembly resolution A/RES/63/124 of 2008. The ILC also drafted detailed commentaries to each of the draft articles in Chapter IV of the ILC Report of 2008 (UN Document A/63/10).[3]

The ILC took 24 years to complete the Draft Articles on the Law of Non-Navigational uses of International Watercourses. That it was able to complete the codification work on transboundary aquifers in six years reflects its awareness of the critical situation of aquifers

and of the urgent need to establish a legal framework for proper management of transboundary aquifers in order to achieve the objectives of equitable and reasonable utilization, protection of the environment and international cooperation. Some salient points of the Draft Articles are as follows:

Article 1: scope

The scope of the application of the Draft Articles is: (a) utilization of transboundary aquifer; (b) other activities that have or are likely to have an impact upon such aquifers; and (c) measures for the protection, preservation and management of such aquifers. The concept contained in paragraph (b) was not included in the 1997 International Watercourses Convention. As noted above, activities other than direct utilization, which are conducted above the aquifers, must be regulated. This point is also relevant to Article 6.

Article 2: use of terms

Article 2 provides definitions for terms used in the Draft Articles. "Aquifer" means both a geological formation which serves as a container and the water contained in the saturated zone of the formation. It is necessary to include the geological formation in the definition of aquifer in order to preserve the proper functioning of aquifer. It is also necessary to include the geological formation in order to regulate its own utilization such as for storage, disposal of waste, or the new experimental technique for carbon sequestration, used to store excess carbon from extracted oil and natural gas in geological formations. A definition of recharging aquifer is also provided in subparagraph (f). The threshold of negligibility is presented here because even non-recharging aquifers can receive some minimal amounts of recharge.

General principles

Articles 3 to 9 of Part Two set out general principles such as sovereignty, reasonable and equitable utilization, obligation not to cause significant harm and international cooperation.

Article 3: sovereignty of aquifer states

This article provides that each state has sovereignty over the portion of a transboundary aquifer located within its territory. I received critical comments from some international lawyers for the inclusion of this sovereignty clause, which might in their view diminish the value of the whole exercise. I share their apprehension, but we must squarely face the current state of affairs. It was the UN that passed the resolution "Permanent Sovereignty Over Natural Resources" (1803[XVII]) in 1962. Many aquifer states hold the view that aquifers are similar to mineral resources and are governed by this resolution. Accordingly, they insisted on the inclusion of this sovereignty article. It is noted that second sentence of Article 3 states that an aquifer state shall exercise its sovereignty in accordance with international law and the present Draft Articles. I believe that the current draft Article 3 represents an appropriately balanced text.

Article 4: equitable and reasonable utilization

The principle of equitable and reasonable utilization of shared resources has now been firmly established in international law. Factors relevant to such equitable and reasonable utilization of aquifers are listed in Article 5. Although the term is the same as that used

in the International Waterourses Convention, the principle of reasonable utilization is quite different here. It covers non-renewable resources as well as renewable ones, while the principle of sustainable utilization applies only to renewable resources. International law has developed the precise legal concept of sustainability in relation to marine living resources. The principle of sustainable utilization is contained in almost all the fisheries conventions. This principle is clearly defined as "to take measures, on the best scientific evidence, to maintain or restore populations of harvested species at levels which can produce the maximum sustainable yield" in Article 119, sub-paragraph 1 (a) of the UN Convention on the Law of the Sea (UNCLOS). Science tells us that such a level of maximum sustainable yield is somewhat below the maximum population of a particular fish stock that nature can maintain. This principle can be applied to other renewable resources.

The 1997 International Watercourses Convention applied this principle and defined it as "optimal and sustainable" utilization in its Article 5, sub-paragraph 1. This obliged watercourse states to limit the amount of water used to that of river recharge and to keep the river flowing permanently. When we considered the dynamics of aquifers, it became clear that this principle could not apply to non-recharging aquifers where any utilization depletes the resource, just as for the mineral resources such as coal. Even for recharging aquifers, the consensus in the ILC was to apply a more flexible standard that would not deprive states of the use of the accumulated resources of non-recharging aquifers while allowing similar use from recharging aquifers. Accordingly Article 4 does not refer to sustainability at all and provides that a recharging aquifer shall not be utilized at a level that would prevent continuance of its effective functioning. Meanwhile, the term "sustainability" has become a sort of catchphrase for many environmentalists. Taking into account their position, the term "sustainable development" is inserted in Article 7, relating to the general obligation to cooperate.

Article 6: obligation not to cause significant harm

Another important principle is the obligation not to cause significant harm to other states. This is the cardinal principle of international law. This principle applies not only to adverse effects to other states caused by utilization of aquifers but also to adverse effects through aquifers to other states caused by other activities as defined in subparagraph (b) of Article 1. However, the utilization of aquifers and other activities are necessary for any community. Other states, therefore, have an obligation to bear certain harm unless it exceeds the level of significant harm. The concept of "significant" is relative and cannot be defined abstractly. However, in view of the fragility of aquifers and the difficulty of removing pollutants from aquifers once affected, the threshold of "significant" is much lower than in the case of surface waters. Article 15 provides a consultation procedure for a planned activity which may affect a transboundary aquifer and thereby may have a significant adverse effect upon another state.

Articles 7–15: international cooperation

Yet another important principle is that of international cooperation. The key to the proper management of aquifers is international cooperation among aquifer states. The Draft Articles provide various measures beginning with the regular exchange of data and information, monitoring and establishment of joint management mechanisms.

Article 16: technical cooperation

The Draft Articles also regulate non-aquifer states. In particular, all states are required to promote technical cooperation with developing states in the scientific, educational, technical, legal and other fields for the protection and management of aquifers in Article 16. Here, for example, Japan, although not a transboundary aquifer state, could play a significant role.

The Draft Articles and the 1997 International Watercourses Convention

The relationship between the present Draft Articles and the 1997 International Watercourses Convention and other treaties is left for future negotiation after the present Draft Articles are finalized. It is generally understood that the 1997 International Watercourses Convention covers groundwater that is linked to an international watercourse. Its Article 2 (a) provides that: "Watercourses mean a system of surface waters and groundwaters constituting by virtue of their physical relationship a unitary whole and normally flowing into a common terminus." It is not clear what kind of relationship between surface water and groundwater is envisaged here. The present Draft Articles cover all transboundary aquifers regardless of whether they are recharged by or discharged to an international watercourse.

It must also be pointed out that according to the definition of the present Draft Articles, recharge and discharge zones are outside of aquifers. The ILC considered that all aquifers possess characteristics distinct from those of surface waters. For instance, the Nubian Sandstone Aquifer System is linked to the River Nile south of Khartoum. However the bulk of the Nubian system is a non-recharging aquifer. Accordingly, that aquifer system must be regulated by the present Draft Articles. Since the Draft Articles are generally much broader and stricter than the 1997 International Watercourses Convention, applying both instruments to a particular aquifer should normally not cause any difficulty. However, if it does, drafting a provision to regulate the relationship between the two instruments is required.

Looking forward

The UN General Assembly received the Draft Articles favourably in 2008. I am convinced that this was because it recognized that they are not only scientifically and technically sound, but also incorporate the positions of the majority of the member states of the United Nations. It adopted resolution 63/124 entitled "the Law of Transboundary Aquifers" by consensus on 11 December 2008. The resolution took note of the Draft Articles, encouraged the states concerned to make appropriate bilateral or regional arrangements for the proper management of their transboundary aquifers, taking into account the provisions of the Draft Articles, and further decided to include in the provisional agenda of its 66th session in Autumn 2011 an item entitled "the Law of Transboundary Aquifers" with a view to examining, inter alia, the question of the form that might be given to the Draft Articles. In other words, consideration would be given to whether the Draft Articles should be transformed into a convention or comparable document. States must realize the grave situation of many transboundary aquifers, increase understanding and appreciation of the Draft Articles, and act in the best way to properly manage their transboundary aquifers through international cooperation. It is gratifying to note that the states of the Guarani Aquifer system have already implemented the UN resolution by adopting a new agreement incorporating the principles embodied in the Draft Articles.

Notes

1. See http://www.igrac.net/dynamics/modules/SFIL0100/view.php?fil_Id=121.
2. See FAO (2005).
3. For the text of the Draft Articles see: http://untreaty.un.org/ilc/texts/instruments/english/draft%20articles/8_5_2008.pdf. For the commentaries see: http://untreaty.un.org/ilc/texts/instruments/english/commentaries/8_5_2008.pdf.

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