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CODIFICATION OF THE LAW OF TRANSBOUNDARY GROUNDWATERS

Chusei Yamada*

I. Introduction

The UN International Law Commission is now engaged in the work of codification of the law of transboundary groundwaters. The Commission is expected to finish the first reading of the draft articles at the forthcoming Fiftieth Session in 2006. The Commission would most probably complete the second and final reading in a few years, taking accounts of the comments and observation from the governments on the first reading texts of the draft articles. The ground waters are the most precious fresh water resources for many of the AALCO member States and most o them share them with their neighbours. Accordingly, it is extremely important for the Commission to receive ample inputs in the form of comments and State practices from the AALCO members in order to reflect and safeguard their position in the final texts of the draft articles. This paper is designed to provide the background of the work of the Commission as well as commentaries to draft articles in order to assist the AALCO member States in offering their contributions to the United Nations for the codification of the law on the topic. The first-reading text of the draft articles which is now being considered by the Commission is found in the Annex.

At its 55th session in 2002, the Commission decided on the inclusion in its programme of work of the topic entitled "Shared Natural Resources". It was generally understood that this topic included groundwaters, oil and natural gas, while some preferred to include also such resources as migratory birds and animals on one hand and some others preferred to limit it to deal solely with groundwaters on the other hand. The Special Rapporteur considered that it would be appropriate to begin with the consideration of ground waters as the follow up of the Commission's previous work on the

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* Member of the UN International Law Commission since 1992 and its Special Rapporteur on the topic of "Shared Natural Resources" since 2003.

codification of the law of international surface waters[1] and also that it would complicate the work if the Commission was to deal with three different resources simultaneously. The Commission endorsed his approach to focus on transboundary groundwaters for the time being and at least during the first reading of the draft articles. It is nevertheless aware of some common characteristics among these three different resources, in particular between non-renewable groundwaters contained in non-recharging aquifers on one hand and oil and natural gas on the other hand. It recognizes that the work on transboundary groundwaters would certainly affect its future codification works on oil and natural gas and also that it would have to take into account some relevant elements of the existing regulations on oil and natural gas before finalizing its work on transboundary groundwaters. The commission therefore would consider this aspect during the second reading of the draft articles.

On the basis of three reports submitted by the Special Rapporteur since 2003, the Commission began the consideration of draft articles in 2005. The product of its work will be provisionally presented in the form of draft articles. Consistent with the practice of the Commission, the term "draft articles" has been used without prejudice as to the final form of the product, whether it should be a convention or otherwise. The question of the final form that the draft articles should take is of course a matter that is of relevance to the formulation of the texts of draft articles and should be addressed in due course while the focus should be on the substance at this stage. The draft articles rely heavily on the 1997 Watercourses Convention. Some argue against it on the ground that there exist distinct differences between surface waters and ground waters. The other do the same on the ground that the Watercourses Convention was a failure because it has not attracted enough ratification necessary for it to come into effect. Of course there are differences between these two resources. However, there are more similarities between them, in particular in the way of managing theses resources. It is true that the Watercourses Convention has not yet come into force.[2] However it is the codification convention reflecting the customary law

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1 See, 1997 UN Convention on the Law of Non-navigational Uses of International Watercourses.

2 Article 36, 1 reads as follows: "the present Convention shall enter into force on the ninetieth day following the date of deposit of the thirty-fifth instrument of ratification, acceptance, approval or accession…". As of 24 October 2005, 14 States had become parties. They are Finland, Hungary, Iraq, Jordan, Lebanon, Libyan Arab Jamahiriya,

and as such it has a certain authority. The ICJ recognized such authority when it referred to the Watercourses Convention in its judgment in the case of Gabcikovo-Nagymaros Project (Hungary v. Slovakia).[3] Many substantive provisions of the Revised Protocol on Shared Watercourses in Southern African Development Community (SADC) reproduce almost word by word the provisions of the Watercourses Convention and they are being implemented[4]. The Watercourses Convention thus offers useful basis for codification of transboundary ground waters.

There are also abundant treaties and other legal documents which provide useful inputs to the current works. Those instruments are compiled by Food and Agricultural Organization (FAO) in association with UNESCO[5] and many of them are quoted in the Third Report of the Special Rapporteur[6]. It has been ascertained that almost all States on the continents and also even island States with land borders have transboundary ground waters with their neighbours. Vast numbers of States practices are emerging. In addition to valuable contribution from States, the UNESCO International Hydrological Program (IHP) has since the year 2003 provided scientific and technical advice to the Special Rapporteur on the issues related to hydrogeology, inviting, coordinating and supporting the contributions of international experts, international and national institutions including centers on groundwater resources, IAH, FAO UNEP/GEF, OAS, IUCN, IGRAC AND UNECE.

II. Background Information of Groundwaters

97.5% of water on our globe is salt water in the sea. Therefore, 2.5% is fresh water. Fresh water is vital for human survival. It is indispensable for drinking, vegetation and livestock. There exists no alternative or substitute resource. However, two thirds of fresh water is locked in ice in the polar region and in the glaciers. It means that only 1% of water of the globe is freshwater

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Namibia, Netherlands, Norway, Portugal, Qatar, South Africa, Sweden and Syrian Arab Republic.

3 Gabcikovo: Nagymaros Project (Hungary/Slovakia), Judgment, I.C.J. Reports 1997, p. 56 paragraph 85.

4 Entry into force: 22 September 2003. Parties and/or signatories: Angola, Botswana, Congo, Lesotho, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, Tanzania, Zambia, Zimbabwe.

5 S. Burchi and K. Mechlem, *Groundwater in International Law: Compilation of Treaties and Other Legal Instruments* (FAO/UNESCO, 2005).

6 A/CN.4/551/Add.1.

available for human consumption. Furthermore, 99% of this fresh water is located underground. The mankind has obtained the deep scientific knowledge of surface water from the ancient times. The science of ground waters known as hydrogeology is rather young. However, for the last half a century, it has gained the vast knowledge.

The scientific term of commonly used "ground waters" is "aquifer" which consists of geological formation and water stored in the saturated zone of such formation. Underground geological formations were created by various natural phenomenon and waters in them were supplied from precipitation and surface waters in accordance with global hydrological cycle. Aquifers in temperate zone where hydrological cycle continues to occur currently are recharging aquifers and waters stored therein are renewable resources. On the other hand, aquifers in arid zone where such hydrological cycle ceased to function thousands or millions years ago are non-recharging aquifers and waters stored therein are non-renewable resources. Waters in aquifers is of high quality. It is purified by infiltration through soil and contains various minerals in solution. It is fragile resource because it is extremely difficult to clean once it is contaminated.

Rapid expansion of exploitation of aquifers began in 1950's in the developed world and in 1970's in developing world. Currently 50% of portable water, 40% of industrial water and 20% of irrigation water are from aquifers and groundwater is today the world most extracted raw material. The dependency on ground waters is rapidly increasing in every part of the world. Identification of existing transboundary aquifers is progressing in Europe, Americas and to some extent in Africa. However, it is yet rather unsatisfactory in Asia.

III. Scope of the Draft Articles

Draft Article 1 provides the scope to which the present draft articles apply. An aquifer is often hydraulically connected to one or more other aquifers. In such case, these aquifers must be treated as a single system for proper management as there is hydraulic consistency between them. This series of two or more aquifers is termed as an "aquifer system". In the draft articles, "an aquifer and an aquifer system" are always used together.

The mandate given to the Commission is to codify the laws on "shared natural resources". Accordingly, the present draft articles will apply only to transboundary aquifers. Domestic aquifers are excluded from the scope. If they are connected to the international watercourses as defined in the

Watercourses Convention, they will be governed by that Convention but not by the present draft articles. On the other hand, all the transboundary aquifers will be governed by the present draft articles, regardless of whether they are hydraulically connected or not to the international watercourses. Those transboundary aquifers that are hydraulically connected to the international watercourses will be governed by the Watercourses Convention in accordance with its Article 2(a) and also by the present draft articles. The dual application of these two legal regimes to such aquifers would not in principle cause any problem, as these legal regimes would not be expected to be in conflict. However, if it happens to be causing any problem, a later draft article would address such situation.

Draft Article 1 specifies, in its Paragraphs (a) to (c), three different categories of activities which must be covered by the draft articles. The activities regulated by Article 1 of the Watercourses Convention are (i) the uses of the resources and (ii) measures of protection, preservation and management related to the uses of those resources. They are substantially reproduced in Paragraphs (a) and (c) of draft Article 1. In addition to these two categories of activities, Its Paragraph (b) provides an additional category of "other activities that have or likely to have an impact upon aquifers and aquifer systems". In the case of aquifers, it would be necessary to regulate activities other than utilization of aquifers in order to properly manage them. Such activities are those that are carried out above or around aquifers and cause some adverse effects on them. There must of course be a casual link between the activities and their effects. The term "impact" is often used to express such adverse or negative effects in the field of environment, for instance "impact assessment".

Impact upon aquifers would include deterioration of water quality, reduction of water quantity and adverse change of functioning of aquifer. The assessment of whether an "impact" occurred, as well as the type of impact and the extent of impact, must be based on measurements prepared prior to the impact and then compared to measurements after the impact. The measurements prepared prior to the impact provide a baseline or reference level that can be used to compare against subsequent measurements. When a change in measurements is identified, only then can it be discussed in terms of an "impact". Nonetheless, whether the change rises to the level of an "impact" should be left to the States concerned to determine. Where a State argues that an impact has occurred to its aquifer, it

can do so with appropriate data of the baseline of the aquifer and of the change to substantiate its assertion.

IV. Definitions of Terms

Draft Article 2 defines certain terms that are used in draft articles. There are various definitions of "aquifer" or "groundwaters" in existing treaties and other international legal documents. But they are not precise enough for the purpose of the present draft articles. The definition of an aquifer in Paragraph (a) offers the precise description of two elements of which an aquifer consists. One element is the underground geological formation which functions as a container for waters. The other element is the waters stored therein which are extractable.

A "geological formation" consists of naturally occurring materials, either consolidated or unconsolidated, such as rock, gravel and sand. Oil and natural gas are stored also in similar geological formation. All the aquifers are underlain by less permeable layers which serve, as they were, as the bottom of container. Some aquifers are also upper lain by less permeable layers. The waters stored in such aquifers are termed as "confined" groundwaters as they are pressurized by more than atmospheric pressure. When drilling reaches such aquifers, the water gushes out, as is also the case of oil and natural gas.

The definition of the waters in an aquifer is limited to those stored in the saturated zone of the geological formation as only those waters are extractable. The waters located above the saturated zone of the geological formation, like the waters located underground and outside an aquifer, are kept in pores and mixed with air and in the form of vapor and cannot be extracted. They are like shale oil. It is of course theoretically possible to separate such waters from air and soil but it is not technically or economically feasible to do so at present.

An "aquifer system" consists of two or more aquifers that are hydraulically connected. Those aquifers are not only of same geological formations but also could be of different geological formations. Aquifers could be hydraulically connected vertically and horizontally as well. "Hydraulically connected" refers to a physical relationship between two or more aquifers whereby an aquifer is capable of transmitting some quantity of water to the other aquifers and vice versa.

Paragraph (c) defines the terms "transboundary aquifer" and "transboundary aquifer system". The focus in this paragraph is on the

adjective "transboundary". The paragraph provides that, in order to be regarded as a "transboundary" aquifer or aquifer system, parts of the aquifer or aquifer system in question must be situated in different States. Whether parts of an aquifer or aquifer system are situated in different States depends on physical factors. In the case of surface waters, existence of such factors can be easily established by simple observation of rivers and lakes. However, in the case of groundwaters, the determination of the existence of transboundary aquifers under the jurisdiction of a particular State requires more sophisticated methods, relying on drilling and scientific technology such as isotope tracing to define the outer limit of the aquifers.

Paragraph (d) defines the term an "aquifer State". Once the existence of a part of transboundary aquifer or aquifer system is established in the territory under the jurisdiction of a particular State in accordance with the methods referred to in paragraph 16 above, that State is an aquifer State for the purpose of the draft articles.

The definitions of "recharging aquifer" and "non-recharging aquifer" in Paragraphs (e) and (f) are needed because the different rules would apply to each category of aquifers. The waters in a recharging aquifer are renewable resources, while those in a non-recharging aquifer are non-renewable resources. For the purpose of management of aquifers, "non-recharging" aquifers are those aquifers that receive "negligible" water recharge "contemporarily". The term "negligible" refer to the transmission of some quantity of waters. The measurement of whether the quantity is "negligible" should be assessed with reference to the specific characteristics of the receiving aquifer, including the volume of waters in the receiving aquifer, the volume of waters discharged from the receiving aquifer (naturally and artificially), the volume of waters that recharges the receiving aquifer, the rate at which the recharge occurs, etc. the term "contemporary" should be understood for the convenience as the time span of approximately 100 years, 50 years in the past and 50 years in the future. The scientists generally classify those aquifers located in the arid zone where an annual rainfall is less than 200 mm as non-recharging aquifers. It is possible to ascertain whether a particular aquifer has been receiving water recharge during the period of approximately last fifty years by using radioactive tracers. These tracers are cesium and tritium from nuclear weapons tests with a peak of injection at 1963/1964 and krypton from the continuous emission of the nuclear industry. They are floating in the atmosphere for the last fifty years and can

be detected in the aquifer that receives recharge from rainfall during that period.

V. General Principles

A. Sovereignty of Aquifer States

The need to have an explicit reference in the form of draft article on the sovereignty of States over the natural resources within their territories was advocated by many States, particularly by the aquifer States that are of the opinion that water resources belong to the States in which they are located and are subject to the exclusive sovereignty of those States. Reference was made, in that regard, to the General Assembly resolution 1803 (XVII) of 14 December 1962, entitled "Permanent sovereignty over natural resources". There are basically two types of formulation in the States practices with regard to this issue. One type is the positive formulation. Some have limiting conditions to the exercise of this sovereign right. An example is "States have, in accordance with the Charter of the United Nations and the principles of international law, a sovereign right to exploit their own resources pursuant to their environmental and developmental policies, and the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of their national jurisdiction[7]". The other type is the saving of disclaimer clause such as "Nothing in this Convention shall affect the sovereign right of States to exploit, develop and manage their own natural resources-"[8]. Draft Article 3 adopts the positive type and simply reflects the proposition that an aquifer State has sovereignty over the portion of a transboundary aquifer or aquifer system located within its territorial jurisdiction. It is also clearly understood in its second sentence that such sovereignty is not absolute.

B. Equitable and Reasonable Utilization

The basic principles applicable to shared natural resources are equitable and reasonable utilization of the resources. They are often combined together in various legal regimes[9]. However, the two are of different concept. Draft Article 4, Paragraph 1 deals with the principle of equitable utilization and elaborates the meaning of the principle as equitable allocation of benefits

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7 African Convention on the Conservation of Nature and Natural Resources (2003).

8 Convention for the Protection of the Natural Resources and Environment of the South Pacific Region (1986).

9 See the 1997 Watercourses Convention, Article 5.1.

among aquifer States to be derived from utilization of the transboundary aquifer. Its Paragraph 2 deals with the principle of reasonable utilization. In various legal regimes concerning renewable resources, "reasonable utilization" is often defined as "sustainable utilization" or "optimum utilization". There the principle is implemented to maintain the level of the resources at the maximum sustainable yield (MSY). For non-renewable resources, the principle of sustainability has no place as any exploitation of such resources leads to depletion. Paragraph 2 applies to both renewable and non-renewable resources. Accordingly, the concept of "sustainability" is not appropriate to be explicitly stated here. Instead, the concept of maximizing the "long-term benefits" is adopted.

The phrase "to maximize long-term benefits" refers to the act of maintaining certain benefits over a specific period of time. The phrase, however, does not refer to an obligation of maintaining the groundwater resource or the volume of waters in the aquifer at or over some minimum level. Rather, it reflects a conscience decision-making process that determines what constitutes a benefit, what benefits are desirable, how much benefits should be enjoyed and the time period over which the benefits should be enjoyed. Such decisions are entirely for the aquifer States concerned to make. For recharging aquifer, the utilization can be in perpetuity. However, it is not necessarily obligatory to limit the level of utilization to the level of recharge. The last sentence of Paragraph 2 provides that any utilization of such aquifer should not destroy permanently its capacity to function as an aquifer. The utilization can be only for a specified period. Wasteful utilization must be avoided and the benefits could better be shared among generations. The best way to ensure reasonable utilization is to establish a suitable overall plan by the States concerned. The controlled and planned depletion could be considered as the long-term benefits.

C. Factors Relevant to Equitable and Reasonable Utilization

Draft Article 5 lists the factors to be taken into account in determining equitable and reasonable utilization as provided for in draft Article 4. It is a non-exhaustive list. The rules of equitable and reasonable utilization are necessarily general and flexible and require for their proper application that aquifer States take into account concrete factors and circumstances of the resources as well as of the need of the aquifer States concerned. Paragraph 2 clarifies that all relevant factors are to be considered and conclusion must be reached on the basis of the whole. It remains, however, that the weight to be

accorded to individual factors, as well as their relevance, will vary with the circumstances.

D. Obligation not to Cause Harm to other Aquifer States

Draft Article 6 deals with another basic principle of obligation of aquifer States not to cause harm to other aquifer States. It addresses questions of significant harm arising from utilization and significant harm from other activities other than utilization as contemplated in draft Article 1 as well as questions of elimination and mitigation of significant harm occurring despite due diligence efforts to prevent or mitigate such harm. Sic utere tuo ut alienum non laedas (use your own property to as not to injure that of another) is the established principle of international liability. The obligation contained in this draft article is that of "to take all appropriate measures". It is in substance same as the obligation of "due diligence". It is an obligation of conduct and not an obligation of result. An aquifer State has breached this obligation only when it has intentionally or negligently caused the event that must be prevented or has intentionally or negligently has not prevented others in its territory from causing that event or has abstained from abating it. The draft article applies only to the harm that is caused to other States "through aquifer or aquifer system". The debate continues whether the threshold of "significant harm" is appropriate for the fragile natural resources as the waters in aquifers. The view has been expressed widely that a lower threshold than "significant" harm is required for aquifers that are more fragile and, once polluted, take longer to clean than surface rivers. The Commission had considered this question of the threshold extensively in its previous codification works on the "Watercourses Convention" and "Prevention of transboundary damage from hazardous activities" within the framework of the topic of "International liability for injurious consequences arising out of acts not prohibited by international law" and had established the position on the threshold of "significant harm". The threshold of "significant harm" is a flexible and relative concept and can serve as an appropriate threshold also for aquifers. Even when an aquifer is contaminated by a small amount of pollutant, the harm it may suffer could be evaluated as significant if the contamination has long lasting effects, whiled the contamination of watercourse by the same amount of pollutant might not be evaluated as significant.

E. General Obligation to Cooperate

Draft Article 7 sets out the principle of a general obligation of the aquifer States to cooperate with each other and the procedures for such cooperation. Cooperation among aquifer States is a prerequisite for the fulfillment of the obligations throughout the draft articles. The importance of the obligation to cooperate is indicated in the Principle 24 of the Stockholm Declaration on the Human Environment in 1972. The importance of such an obligation in the present subject is confirmed in the UN Water Conference in Mar del Plata Action Plan in 1977 and in the Chapter 18, Protection of the Quality and Supply of Freshwater Resources; Application of Integrated Approaches to the Development, Management and Use of Water Resources of the UN Conference on Environment and Development, Agenda 21 in 1992. A wide variety of international instruments on surface waters and groundwater issues call for cooperation between the parties with regard to the protection, preservation and management of transboundary aquifers. Paragraph 2 envisages the establishment of "joint mechanisms for co-operation" which refers to a mutually agreeable means of decision making among aquifer States. In practical terms, it means a commission, an authority or other institutions established by the aquifer States concerned to achieve a specified purpose.

F. Regular Exchange of Data and Information

Regular exchange of data and information is the first step for cooperation among aquifer States. Draft Article 8 sets out the general and minimum requirements for the exchange between aquifer States of the data and information necessary to ensure the equitable and reasonable utilization of transboundary aquifers. The requirement of Paragraph 1 that data and information be exchanged on a regular basis is designed to ensure that aquifer States will have the facts necessary to enable them to comply with their obligations under draft Articles 4, 5 and 6. The importance of the exchange of data and information is indicated in a wide variety of agreements. Paragraph 1 requires that aquifer States exchange data and information that is "readily available". This expression is used to indicate that, as a matter of general legal duty, an aquifer State is obligated to provide only such data and information as readily at its disposal, for example those which it has already collected for its own use or are easily accessible. In a specific case, whether data and information are "readily" available would depend upon an objective evaluation of such factors as the efforts and costs which their provision would entail, taking into account the human, technical,

financial and other relevant resources of the requested aquifer State. Paragraph 2 requires aquifer States to pay due regard to the uncertainties of transboundary aquifers. One of the difficulties to realize effective international cooperation in the present subject is the uncertainty of scientific knowledge about transboundary aquifers. The aquifer States are required to cooperate with each other or with relevant international organizations in order to collect new data and information and make them available to other aquifer States.

G. Monitoring

Groundwater experts (scientists and administrators) emphasize monitoring as indispensable for the proper management of a transboundary aquifer. In practice, monitoring is usually initiated individually by the State concerned, and also in many cases by local government, and develops later to a joint effort with the neighboring States concerned. However, the experts agree that ultimate and ideal monitoring is the joint monitoring based on the agreed conceptual model of the aquifer. Accordingly, draft Article 9, 1 sets out the obligation of aquifer States to undertake monitoring of their transboundary aquifer. It requires the aquifer States to monitor, wherever possible, jointly with other aquifer States concerned. It also recognizes the case where such joint monitoring has not been implemented and sets out the obligation of aquifer States to monitor individually and share the results of monitoring with other aquifer States concerned. There are several stages in the obligation of international cooperation. Regular exchanges of data and information, monitoring, management, planned activities and so on.

The purpose of monitoring are: (1) to clarify the conditions and utilization of a specific transboundary aquifer in order to take effective measures for its protection, preservation and management and (2) to keep regular surveillance of it in order to acquire the information about any change or damage at the early stage. Effective monitoring through international cooperation will also contribute to further development of scientific knowledge about transboundary aquifers. Paragraph 2 provides the essential elements of the obligation of aquifer States to realize effective monitoring, i.e. the harmonization of the standard and the methodology for monitoring. Without such harmonization, collected data would not be useful. Before a State can use data collected by other States, it must first understand when, where, what, why and how those data were collected. With this "metadata" (data about data), the State can independently assess the quality of those datasets and if they meet their minimum data standards, the State can

proceed with harmonizing available data and interpreting the consolidated database. The aquifer States should also agree on the conceptual model of the specific aquifer in order to be able to select key parameters which they will monitor.

H. Relationship between Different Kinds of Utilization

Draft Article 10 sets forth the general principle that no utilization of a transboundary aquifer enjoys inherent priority over other utilization. The different kinds of uses of water in an aquifer may be numerous especially in arid and semi-arid regions where the aquifer is the only source of water. They are for drinking, agriculture, industry, human domestic needs and support for terrestrial and aquatic ecosystem. When a conflict arises between States over different utilization, it should be resolved in accordance with the principle of equitable utilization. In such determination, the special regard shall be given to the requirement of "vital human need". In determining "vital human needs", special attention is to be paid to providing sufficient water to sustain human life, including both drinking water and water required for production of food in order to prevent starvation. The last sentence of draft Article 5, 2 also relates to the special regard for "vital human needs". This special regard is with reference to the weight to be given in determining what is reasonable and equitable utilization and is used in a different context from this draft Article.

VI. Protection, Preservation and Management

A. Protection and Preservation of Ecosystems

Draft Article 11 lays down a general obligation to protect and preserve the ecosystems within a transboundary aquifer and also the outside ecosystems dependent on the aquifer by ensuring adequate quality and sufficient quantity of discharge water. "Ecosystem" refers generally to an ecological unit consisting of living and non-living components that are interdependent and function as a community. An external impact affecting one component of an ecosystem causes reactions among other components and may disturb the equilibrium of the entire ecosystem. Such an "external impact" or interference may impair or destroy the ability of an ecosystem to function as a life-support system. Human interferences may irreversibly disturb the equilibrium of freshwater ecosystems, in particular, rendering them incapable of supporting human and other forms of life. Interactions between freshwater ecosystems on the one hand and human activities on the other are becoming more complex and incompatible as socio-economic development

proceeds. The obligation to protect and preserve the ecosystems within and outside transboundary aquifers addresses this problem, which is already acute in some parts of the world and which will become so in other parts. The quality and quantity of the discharge water exerts great influence on the outside ecosystems. The obligation to "protect" the ecosystems requires the aquifer States to shield the ecosystems from harm or damage. The obligation to "preserve" the ecosystems applies in particular to freshwater ecosystems that are in a pristine or unspoiled condition. It requires that these ecosystems be treated in such a way as to maintain, as much as possible, their natural state. Together, protection and preservation of aquatic ecosystem help to ensure their continued viability as life support systems.

B. Protection of Recharge and Discharge Zones

It is important to take measures for the protection and preservation of recharge and discharge areas in order to ensure the proper function of an aquifer. As recharge or discharge zones are outside the aquifer, the separate article is required to regulate such zones. Draft Article 12 provides for the obligations of aquifer States with regard to the protection of recharge and discharge zones of their transboundary aquifers. There are two phases for such obligations. The first is the obligation to identify the recharge or discharge zones of their transboundary aquifers and the second is the one to take special measures to protect such zones for the purpose of the sound function of the aquifers. Once the recharge zones are identified and as far as they are located in their territories, the aquifer States concerned are under the obligation to take special measures to minimize detrimental impacts on recharge process and to take all measures to prevent pollutants from entering the aquifer. Such measures play a pivotal role for the protection and preservation of the aquifer. Paragraph 2 is concerned with the discharge zones. Like the obligations with regard to the recharge zones, the aquifer States are under the obligation to take special measures to minimize detrimental impact on the discharge process once the discharge zones are identified in their territories. Paragraph 3 deals with the particular issue. Recharge or discharge zones of a particular transboundary aquifer could be located in an aquifer States other than the aquifer States that share the transboundary aquifer in question. Recharge or discharge zones of a particular transboundary aquifer could also be located in the territories of non-aquifer States. Considering the importance of the recharge and discharge mechanism for the proper function of aquifers, it is necessary for aquifer States concerned to seek cooperation from these other States.

C. Prevention, Reduction and Control of Pollution

Draft Article 13 sets forth the general obligation of aquifer States to prevent, reduce and control pollution of a transboundary aquifer that may cause significant harm to other aquifer States. The harm is to be caused to other aquifer States through the transboundary aquifer and the aquifer related environment. The problem dealt here is essentially the quality of water contained in the aquifer. Some transboundary aquifers are already polluted to varying degrees, while the others are not. In view of this state of affairs, draft Article 13 employs the formula "prevent, reduce and control" in relation to the pollution. The obligation to "prevent" relates to new pollution, while the obligations to "reduce" and "control" relate to existing pollution. The requirement that aquifer States "reduce and control" existing pollution reflects the practice of States. This practice indicates a general willingness to tolerate even significant pollution harm, provided that an aquifer State of pollution origin is making its best efforts to reduce the pollution to a mutually acceptable level. On the other hand, failure of the aquifer State of origin to exercise due diligence in reducing the pollution to acceptable levels would entitle the affected State to claim that the State of origin had breached its obligation to do so. The obligations of prevention, reduction and control all apply to pollution "that may cause significant harm to other aquifer States". Pollution below that threshold would not fall within draft Article 13 but, depending upon the circumstances, might be covered by draft Article 11.

The last sentence of draft Article 13 encourages the aquifer States to take a precautionary approach in the light of uncertainty about the nature and extent of some transboundary aquifers. Once a transboundary aquifer or aquifer system is polluted, it is very difficult to remove the pollutant and the pollution could be irreversible in many cases. Considering such fragilities and scientific uncertainties of a transboundary aquifer, precautionary approach is required. There are differing views whether or not the "precautionary principle" has been established as customary international law. It is true that there are several treaties or conventions in which "precautionary principle" is expressly mentioned. As far as universal treaties or conventions are concerned, different expressions such as "precautionary approach" and "precautionary measures" are used. It would be better to avoid the conceptual and difficult discussions concerning the expression of "precautionary principle". A less disputed expression of "precautionary approach" could satisfy the basic necessity to introduce the special consideration of scientific uncertainties. Of course, such a minimum

requirement is residual and is without prejudice to the conventions with regard to a specific transboundary aquifer or aquifer system to be concluded by the aquifer States concerned.

D. Management

Draft Article 14 sets out the obligation of the aquifer States to undertake to establish plans and to implement these plans for the proper management of their transboundary aquifer. In view of the claims for sovereignty over the aquifer located in the State's territory and the needs for cooperation among aquifer States, two kinds of obligations are introduced in draft Article 14: First, the obligation of each aquifer State to establish its own plan with regard to its aquifer and to implement it and second the obligation to enter into consultation with other aquifer States concerned at the request of any of the latter States. It does not necessarily require that they establish a joint organization, such as commission or other management mechanism. The outcome of the consultations is left in the hands of the States concerned. States have, in practice, established numerous joint commissions, many of which are charged with management. In particular, the modes of the cooperation with regard to a specific transboundary aquifer are undertaken in less formal means, such as by holding regular meetings between the appropriate agencies or the representatives of the States concerned. Many transboundary aquifers are managed often or trans-frontier level or by local level (municipal). Such cooperation between local authorities should be encouraged. Thus the draft Article 14 refers to a joint management "mechanism" rather than an organization in order to provide for such less formal means of management.

VII. Activities affecting other States

A. Assessment of Potential Effects of Activities

Draft Article 15 sets out the minimum obligation of an aquifer State to undertake prior assessment of the potential effect of the planned activity. Planned activities include not only utilization of transboundary aquifers but also other activities that have or likely to have an impact upon those aquifers. It should be noted that the obligation in draft Article 15 is a minimum requirement in two senses. First, an aquifer States is required to assess the potential effects of the planned activity only when it has reasonable grounds for the probability of adverse effects. Second, an aquifer State is not under this obligation if the assessment is not practicable. The obligation of the assessment by an aquifer State that is planning a particular activity is provided

in a wide variety of treaties and conventions. The importance of the environmental impact assessment is also indicated in the instruments prepared by the United Nations. The results from the assessment contribute to the sound planning of the activity. They also constitute the basis for the prior notification to other aquifer States provided in draft Article 16.

B. Planned Activities

Draft Article 16 establishes a procedural framework designed to avoid disputes relating to planned activities. When the assessment of the potential effects of a planned activity conducted in accordance with draft Article 15 indicates that such activity would cause adverse effect on transboundary aquifers and that it may have a significant adverse effect on other aquifer States, the original aquifer State is obliged under its Paragraph 1 to notify the States concerned of its finding. Such notification to be accompanied by available technical data and information, including environmental impact assessment, is to provide the affected States with necessary information to make their own evaluation of the possible effect of the planned activity. If the notified States are satisfied with the information and the assessment provided by the notifying States, they have the common ground to deal with the planned activity. On the other hand, if they disagree on the assessment of the effect of the planned activity, they have obligation to endeavor to arrive at an equitable resolution of the situation in accordance with its Paragraph 2. The precondition to such resolution would be for the States concerned to have a common understanding of the possible effects. To that end, an independent fact-finding mechanism would play an important role in providing scientific and impartial assessment of the effect of the planned activity. Unlike the case of surface water, it seems that there exist no evidences as yet for such obligation in relation to ground waters. Accordingly, an optional reference to such fact-finding mechanism is adopted. The procedure provided for in draft Article 16 is triggered by the criterion that the planned activity might have "a significant adverse effect" upon aquifer States. This threshold is lower than that of "significant harm" under draft Article 6. What are envisaged here are the procedures for avoiding conflicts among States concerned, arising out of planned activity that causes harm less than significant harm. If the planned activity is to cause a significant harm, such activity must be regulated by draft Article 6.

VIII. Miscellaneous provisions

A. Scientific and Technical Assistance to Developing States

Draft Article 17 sets out the scientific and technical assistance to developing States. The science of groundwaters, hydrogeology, is rapidly developing. Such new and rapidly developing scientific knowledge is mainly owned by developed States and is not yet fully shared by many developing States. So far, the scientific and technical assistance to developing States has been provided through the competent international organizations, for example, the UNESCO, the FAO or the World Bank. The IAEA also contributes to the research of aquifers by utilizing isotope. The regional arrangements are also developing successfully due to wide ranges of assistance rendered by the competent international organizations. It would be appropriate to provide for the obligation of promoting scientific and technical assistance by individual States. The obligation under this draft article is one of the modalities of cooperation among aquifer States provided in draft Article 7 and it finds the roots in Article 202 of the 1982 United Nations Convention on the Law of the Sea (UNCLOS). The assistance under this draft article mainly focuses on the scientific, educational and technical assistance. It would be appropriate to put the emphasis upon the assistance for the education and training of the scientific and technical personnel and for the capacity building of developing States concerning the measures for protection, monitoring or impact assessment. Such assistance will contribute to the development of mutual assistance and cooperation among developing States in the future. The list is not exhaustive.

B. Emergency Situations

Draft Article 18 deals with the obligations of aquifer States in responding to actual emergency situations that are related to transboundary aquifers. It is to be contrasted with draft Article 14 which deals with the prevention and mitigation of conditions that may be harmful to aquifer States. In the case of aquifers, emergency might be as numerous and destructive as in the case of watercourses. It would be desirable to insert an article on this issue in view of the devastating tsunami disaster along the coast of the Indian Ocean, which resulted from a great earthquake that occurred off Band Aceh, Indonesia, in December 2004. Although no definite studies have yet been published, a great number of aquifers must have been negatively affected. Owing to the destruction of the discharge processes, salinization of aquifers might have

occurred. In consultation with groundwater experts, this draft article was prepared to cope with such situations.

C. Protection in Time of Armed Conflict

Draft Article 19 concerns the protection to be accorded to transboundary aquifers and related installations in time of armed conflict. This draft article, which is without prejudice to existing law, does not lay down any new rule. It simply serves as a reminder that the principles and rules of international law applicable in international and internal armed conflict contain important provisions concerning water resources and related works. These provisions fall generally into two categories: those concerning the protection of water resources and related works; and those dealing with the utilization of such water resources and works. Since detailed regulation of this subject matter would be beyond the scope of a framework instrument, draft Article 19 does no more than to refer to each of these categories of principles and rules.

Draft Article 19 is not addressed only to aquifer States, in view of the fact that transboundary aquifers and related works may be utilized or attacked in time of armed conflict by non-aquifer States as well. While a State not party to the present draft articles would not be bound by this provision per se, inclusion of non-aquifer States within the coverage was considered necessary both because of the signal importance of the subject and since the article's principal function is, in any event, merely serve as a reminder to all the States of the applicability of the law of armed conflict to transboundary aquifers. The obligation of the aquifer States to protect and utilize transboundary aquifers and related works in accordance with the present draft articles should remain in effect even during the time of armed conflict. Warfare may, however, affect transboundary aquifers as well as the protection and utilization thereof by aquifer States. In such cases, draft Article 19 makes it clear that the rules and principles governing armed conflict apply.

D. Data and Information Vital to National Defense or Security

Draft Article 20 creates a very narrow exception to the requirement of draft Articles 9, 10, 15 and 16. States cannot be realistically expected to agree to the release of information that is vital to their national defense or security. At the same time, however, an aquifer State that may experience adverse effects of planned measures should not be left entirely without information concerning those possible effects. Draft Article 20 therefore requires the State withholding information to "cooperate in good faith with the other

aquifer States with a view to providing as much information as possible under the circumstances". The "circumstances" referred to are those that led to the withholding of the data or information. The obligation to provide "as much information as possible" could be fulfilled in many cases by furnishing a general description of the manner in which the measures would alter the condition of the aquifer or affect other States. This draft article is thus intended to achieve a balance between the legitimate needs of the States concerned: the need for the confidentiality of sensitive information, on the one hand, and the need for information pertaining to possible adverse effects of planned measures, on the other. As always, the exception created by draft Article 20 is without prejudice to the obligations of the planning State under draft Articles 4 and 6.

E. Bilateral and Regional Arrangements

The importance of bilateral or regional arrangements that take due account of the historical, political, social and economic characteristics of the region and the specific transboundary aquifer must be stressed. Draft Article 21, Paragraph 1 calls upon the aquifer States to cooperate among them and encourages them to enter into bilateral or regional arrangements for the purpose of managing the particular transboundary aquifer. The concept of reserving the matter to the group of aquifer States concerned with the particular aquifer is based on the principles that are set forth in the United Nations Convention on the Law of the Sea (UNCLOS, 1982). In the case of ground waters, international collective measures are still in an embryonic stage and the framework for cooperation remains to be properly developed. Therefore, the term "arrangement" instead of "agreement" has been opted in this paragraph. This paragraph also provides that the States concerned should have equal opportunity to participate in such arrangements. Its Paragraph 2 tries to define the relationship between such bilateral and regional arrangements and the present draft articles. The draft articles are deemed to be a framework agreement and aquifer States are expected to respect the basic principles stipulated therein in formulating such arrangements. However, they are authorized to depart from these principles, if special characteristics of a particular aquifer require certain adjustments. But such departure should not result in inequitable outcomes among the States concerned. This paragraph is based on Articles 3 and 5 of the Watercourses Convention. Paragraph 3 specifies that the bilateral and regional arrangements take priority as *lex specialis* over the present draft articles.

F. Relation to other Conventions and International Agreements

The present draft articles are intended to cover all transboundary aquifers regardless of whether they are related to surface water. This would result in the dual application of the present draft article and the Watercourses Convention for those aquifers that constitute, by virtue of their physical relationship, a unitary whole with systems of surface water. Draft Article 22, Paragraph 1 addresses this situation. As long as the provisions of the present draft articles and the Watercourses Convention are compatible, the problem would not arise. Should, however, a conflict between the two arise, the provisions of the present draft articles shall prevail, since the Watercourses Convention was essentially designed to regulate surface water. Thus, its relevance to groundwater is rather peripheral. In the light of the fact that the Watercourses Convention is most relevant and a sort of precursor to the draft articles, it has been specifically dealt with in this paragraph. Its Paragraph 2 is intended to define the relationship between the present draft articles and other conventions and international agreements which are essentially designed to regulate matters other than ground waters but which may have some limited application to ground waters. If the provisions of the present draft articles and those of other conventions and international agreement are compatible, no problem arises. If on the hand there is a conflict between the present draft articles and other conventions or international agreements, it would not be appropriate to stipulate a general rule of priority such as the one which is set forth in Paragraph 1. A decision of the priority would be possible only when the content of the relevant provisions are fully examined.