Chapter VI

SHARED NATURAL RESOURCES

A. Introduction

68. The Commission, at its fifty-fourth session (2002), decided to include the topic "Shared natural resources" in its programme of work and appointed Mr. Chusei Yamada as Special Rapporteur.[489] A working group was also established to assist the Special Rapporteur in sketching out the general orientation of the topic in the light of the syllabus prepared in 2000.[490] The Special Rapporteur indicated his intention to deal with confined transboundary groundwaters, oil and gas in the context of the topic and proposed a step-by-step approach beginning with groundwaters.[491]

69. From its fifty-fifth (2003) to fifty-seventh (2005) sessions, the Commission received and considered three reports from the Special Rapporteur.[492] During this period, the Commission established two working groups, one in 2004, chaired by the Special Rapporteur, to assist in furthering the Commission's consideration of the topic and the other, in 2005, chaired by Mr. Enrique Candioti, to review and revise the 25 draft articles on the law of transboundary aquifers proposed by the Special Rapporteur in his third report, taking into account the debate in the Commission. The 2005 Working Group did not complete its work.

B. Consideration of the topic at the present session

70. At the present session, the Commission decided, at its 2868th meeting, on 2 May 2006, to reconvene the Working Group on shared natural resources, chaired by Mr. Enrique Candioti. The Working Group held five meetings and completed the review and revision of the draft articles submitted by the Special Rapporteur in his third report. At the 2878th meeting of the Commission, on 18 May 2006, the Chairperson of the Working Group submitted the report of the Working Group containing in its annex 19 revised draft articles.

71. The Commission, at its 2878th and 2879th meetings, on 18 and 19 May 2006, considered the report of the Working Group, and at the latter meeting decided to refer the 19 draft articles to the Drafting Committee.

72. The Commission considered the report of the Drafting Committee at its 2885th meeting, on 9 June 2006, and adopted on first reading draft articles on the law of transboundary aquifers consisting of 19 draft articles and at its 2903rd, 2905th and 2906th meetings on 2, 3 and 4 August 2006, adopted the commentaries thereto.

73. At its 2903rd meeting, on 2 August 2006, the Commission decided, in accordance with articles 16 to 21 of its Statute, to transmit the draft articles (see section C below), through the Secretary-General, to Governments for comments and observations, with the request that such comments and observations be submitted to the Secretary-General by 1 January 2008.

74. At its 2906th meeting, on 4 August 2006, the Commission expressed its deep appreciation for the outstanding contribution that the Special Rapporteur, Mr. Chusei Yamada, had made to the treatment of the topic through his scholarly research and vast experience, thus enabling the Commission to bring to a successful conclusion its first reading of the draft articles on the law of transboundary aquifers. It also acknowledged the untiring efforts and contribution of the Working Group on shared natural resources under the Chairpersonship of Mr. Enrique Candioti, as well as the various briefings during the development of the topic by experts on groundwaters from UNESCO, FAO, UNECE and the IAH.

C. Text of the draft articles on the law of transboundary aquifers adopted by the Commission on first reading

1. Text of the draft articles

75. The text of the draft articles adopted by the Commission on first reading is reproduced below.

PART I

INTRODUCTION

Article 1. Scope

The present draft articles apply to:

(*a*) utilization of transboundary aquifers and aquifer systems;

(*b*) other activities that have or are likely to have an impact upon those aquifers and aquifer systems; and

(*c*) measures for the protection, preservation and management of those aquifers and aquifer systems.

Article 2. Use of terms

For the purposes of the present draft articles:

(*a*) "aquifer" means a permeable water-bearing underground geological formation underlain by a less permeable layer and the water contained in the saturated zone of the formation;

(*b*) "aquifer system" means a series of two or more aquifers that are hydraulically connected;

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[489] *Yearbook … 2002*, vol. II (Part Two), p. 100, paras. 518–519. The General Assembly, in paragraph 2 of resolution 57/21 of 19 November 2002, took note of the Commission's decision to include the topic "Shared natural resources" in its programme of work.

[490] *Yearbook … 2000*, vol. II (Part Two), annex, p. 141–142.

[491] *Yearbook … 2002*, vol. II (Part Two), pp. 100–102, para. 520.

[492] Preliminary report: *Yearbook … 2003*, vol. II (Part One), document A/CN.4/533 and Add.1; second report: *Yearbook ... 2004*, vol. II (Part One), document A/CN.4/539 and Add.1; and third report: *Yearbook ... 2005*, vol. II (Part One), document A/CN.4/551 and Add.1.

(*c*) "transboundary aquifer" or "transboundary aquifer system" means, respectively, an aquifer or aquifer system, parts of which are situated in different States;

(*d*) "aquifer State" means a State in whose territory any part of a transboundary aquifer or aquifer system is situated;

(*e*) "recharging aquifer" means an aquifer that receives a non-negligible amount of contemporary water recharge;

(*f*) "recharge zone" means the zone which contributes water to an aquifer, consisting of the catchment area of rainfall water and the area where such water flows to an aquifer by runoff on the ground and infiltration through soil;

(*g*) "discharge zone" means the zone where water originating from an aquifer flows to its outlets, such as a watercourse, a lake, an oasis, a wetland or an ocean.

PART II

GENERAL PRINCIPLES

Article 3. Sovereignty of aquifer States

Each aquifer State has sovereignty over the portion of a transboundary aquifer or aquifer system located within its territory. It shall exercise its sovereignty in accordance with the present draft articles.

Article 4. Equitable and reasonable utilization

Aquifer States shall utilize a transboundary aquifer or aquifer system according to the principle of equitable and reasonable utilization, as follows:

(*a*) they shall utilize the transboundary aquifer or aquifer system in a manner that is consistent with the equitable and reasonable accrual of benefits therefrom to the aquifer States concerned;

(*b*) they shall aim at maximizing the long-term benefits derived from the use of water contained therein;

(*c*) they shall establish individually or jointly an overall utilization plan, taking into account present and future needs of, and alternative water sources for, the aquifer States; and

(*d*) they shall not utilize a recharging transboundary aquifer or aquifer system at a level that would prevent continuance of its effective functioning.

Article 5. Factors relevant to equitable and reasonable utilization

1. Utilization of a transboundary aquifer or aquifer system in an equitable and reasonable manner within the meaning of draft article 4 requires taking into account all relevant factors, including:

(*a*) the population dependent on the aquifer or aquifer system in each aquifer State;

(*b*) the social, economic and other needs, present and future, of the aquifer States concerned;

(*c*) the natural characteristics of the aquifer or aquifer system;

(*d*) the contribution to the formation and recharge of the aquifer or aquifer system;

(*e*) the existing and potential utilization of the aquifer or aquifer system;

(*f*) the effects of the utilization of the aquifer or aquifer system in one aquifer State on other aquifer States concerned;

(*g*) the availability of alternatives to a particular existing and planned utilization of the aquifer or aquifer system;

(*h*) the development, protection and conservation of the aquifer or aquifer system and the costs of measures to be taken to that effect;

(*i*) the role of the aquifer or aquifer system in the related ecosystem.

2. The weight to be given to each factor is to be determined by its importance with regard to a specific transboundary aquifer or aquifer system in comparison with that of other relevant factors. In determining what is equitable and reasonable utilization, all relevant factors are to be considered together and a conclusion reached on the basis of all the factors. However, in weighing different utilizations of a transboundary aquifer or aquifer system, special regard shall be given to vital human needs.

Article 6. Obligation not to cause significant harm to other aquifer States

1. Aquifer States shall, in utilizing a transboundary aquifer or aquifer system in their territories, take all appropriate measures to prevent the causing of significant harm to other aquifer States.

2. Aquifer States shall, in undertaking activities other than utilization of a transboundary aquifer or aquifer system that have, or are likely to have, an impact on that transboundary aquifer or aquifer system, take all appropriate measures to prevent the causing of significant harm through that aquifer or aquifer system to other aquifer States.

3. Where significant harm nevertheless is caused to another aquifer State, the aquifer States whose activities cause such harm shall take, in consultation with the affected State, all appropriate measures to eliminate or mitigate such harm, having due regard for the provisions of draft articles 4 and 5.

Article 7. General obligation to cooperate

1. Aquifer States shall cooperate on the basis of sovereign equality, territorial integrity, sustainable development, mutual benefit and good faith in order to attain equitable and reasonable utilization and appropriate protection of their transboundary aquifer or aquifer system.

2. For the purpose of paragraph 1, aquifer States should establish joint mechanisms of cooperation.

Article 8. Regular exchange of data and information

1. Pursuant to draft article 7, aquifer States shall, on a regular basis, exchange readily available data and information on the condition of the transboundary aquifer or aquifer system, in particular of a geological, hydrogeological, hydrological, meteorological and ecological nature and related to the hydrochemistry of the aquifer or aquifer system, as well as related forecasts.

2. Where knowledge about the nature and extent of some transboundary aquifer or aquifer systems is inadequate, aquifer States concerned shall employ their best efforts to collect and generate more complete data and information relating to such aquifer or aquifer systems, taking into account current practices and standards. They shall take such action individually or jointly and, where appropriate, together with or through international organizations.

3. If an aquifer State is requested by another aquifer State to provide data and information relating to the aquifer or aquifer systems that are not readily available, it shall employ its best efforts to comply with the request. The requested State may condition its compliance upon payment by the requesting State of the reasonable costs of collecting and, where appropriate, processing such data or information.

4. Aquifer States shall, where appropriate, employ their best efforts to collect and process data and information in a manner that facilitates their utilization by the other aquifer States to which such data and information are communicated.

PART III

PROTECTION, PRESERVATION AND MANAGEMENT

Article 9. Protection and preservation of ecosystems

Aquifer States shall take all appropriate measures to protect and preserve ecosystems within, or dependent upon, their transboundary aquifers or aquifer systems, including measures to ensure that the quality and quantity of water retained in the aquifer or aquifer system, as well as that released in its discharge zones, are sufficient to protect and preserve such ecosystems.

Article 10. Recharge and discharge zones

1. Aquifer States shall identify recharge and discharge zones of their transboundary aquifer or aquifer system and, within these zones, shall take special measures to minimize detrimental impacts on the recharge and discharge processes.

2. All States in whose territory a recharge or discharge zone is located, in whole or in part, and which are not aquifer States with regard to that aquifer or aquifer system, shall cooperate with the aquifer States to protect the aquifer or aquifer system.

Article 11. Prevention, reduction and control of pollution

Aquifer States shall, individually and, where appropriate, jointly, prevent, reduce and control pollution of their transboundary aquifer or aquifer system, including through the recharge process, that may cause significant harm to other aquifer States. In view of uncertainty about the nature and extent of transboundary aquifers or aquifer systems and of their vulnerability to pollution, aquifer States shall take a precautionary approach.

Article 12. Monitoring

1. Aquifer States shall monitor their transboundary aquifer or aquifer system. They shall, wherever possible, carry out these monitoring activities jointly with other aquifer States concerned and, where appropriate, in collaboration with the competent international organizations. Where, however, monitoring activities are not carried out jointly, the aquifer States shall exchange the monitored data among themselves.

2. Aquifer States shall use agreed or harmonized standards and methodology for monitoring their transboundary aquifer or aquifer system. They should identify key parameters that they will monitor based on an agreed conceptual model of the aquifer or aquifer system. These parameters should include parameters on the condition of the aquifer or aquifer system as listed in draft article 8, paragraph 1, and also on the utilization of the aquifer and aquifer system.

Article 13. Management

Aquifer States shall establish and implement plans for the proper management of their transboundary aquifer or aquifer system in accordance with the provisions of the present draft articles. They shall, at the request by any of them, enter into consultations concerning the management of the transboundary aquifer or aquifer system. A joint management mechanism shall be established, wherever appropriate.

PART IV

ACTIVITIES AFFECTING OTHER STATES

Article 14. Planned activities

1. When a State has reasonable grounds for believing that a particular planned activity in its territory may affect a transboundary aquifer or aquifer system and thereby may have a significant adverse effect upon another State, it shall, as far as practicable, assess the possible effects of such activity.

2. Before a State implements or permits the implementation of planned activities which may affect a transboundary aquifer or aquifer system and thereby may have a significant adverse effect upon another State, it shall provide that State with timely notification thereof. Such notification shall be accompanied by available technical data and information, including any environmental impact assessment, in order to enable the notified State to evaluate the possible effects of the planned activities.

3. If the notifying and the notified States disagree on the possible effect of the planned activities, they shall enter into consultations and, if necessary, negotiations with a view to arriving at an equitable resolution of the situation. They may utilize an independent fact-finding body to make an impartial assessment of the effect of the planned activities.

PART V

MISCELLANEOUS PROVISIONS

Article 15. Scientific and technical cooperation with developing States

States shall, directly or through competent international organizations, promote scientific, educational, technical and other cooperation with developing States for the protection and management of transboundary aquifers or aquifer systems. Such cooperation shall include, *inter alia*:

(*a*) training of their scientific and technical personnel;

(*b*) facilitating their participation in relevant international programmes;

(*c*) supplying them with necessary equipment and facilities;

(*d*) enhancing their capacity to manufacture such equipment;

(*e*) providing advice on and developing facilities for research, monitoring, educational and other programmes;

(*f*) providing advice on and developing facilities for minimizing the detrimental effects of major activities affecting transboundary aquifers or aquifer systems;

(*g*) preparing environmental impact assessments.

Article 16. Emergency situations

1. For the purpose of the present draft article, "emergency" means a situation, resulting suddenly from natural causes or from human conduct, that poses an imminent threat of causing serious harm to aquifer States or other States.

2. Where an emergency affects a transboundary aquifer or aquifer system and thereby poses an imminent threat to States, the following shall apply:

(*a*) the State within whose territory the emergency originates shall:

(i) without delay and by the most expeditious means available, notify other potentially affected States and competent international organizations of the emergency;

(ii) in cooperation with potentially affected States and, where appropriate, competent international organizations, immediately take all practicable measures necessitated by the circumstances to prevent, mitigate and eliminate any harmful effect of the emergency;

(*b*) States shall provide scientific, technical, logistical and other cooperation to other States experiencing an emergency. Cooperation may include coordination of international emergency actions and communications, making available trained emergency response personnel, emergency response equipments and supplies, scientific and technical expertise and humanitarian assistance.

3. Where an emergency poses a threat to vital human needs, aquifer States, notwithstanding draft articles 4 and 6, may take measures that are strictly necessary to meet such needs.

Article 17. Protection in time of armed conflict

Transboundary aquifers or aquifer systems and related installations, facilities and other works shall enjoy the protection accorded by the principles and rules of international law applicable in international and non-international armed conflicts and shall not be used in violation of those principles and rules.

Article 18. Data and information concerning national defence or security

Nothing in the present draft articles obliges a State to provide data or information the confidentiality of which is essential to its national defence or security. Nevertheless, that State shall cooperate in good faith with other States with a view to providing as much information as possible under the circumstances.

Article 19. Bilateral and regional agreements and arrangements

For the purpose of managing a particular transboundary aquifer or aquifer system, aquifer States are encouraged to enter into a bilateral or regional agreement or arrangement among themselves. Such agreement or arrangement may be entered into with respect to an entire aquifer or aquifer system or any part thereof or a particular project, programme or utilization except insofar as the agreement or arrangement adversely affects, to a significant extent, the utilization, by one or more other aquifer States of the water in that aquifer or aquifer system, without their express consent.

2. Text of the draft articles with commentaries thereto

76. The text of the draft articles on the law of transboundary aquifers with commentaries thereto as adopted by the Commission on first reading at its fifty-eighth session, is reproduced below.

THE LAW OF TRANSBOUNDARY AQUIFERS

General commentary

(1) At its fifty-fourth session (2002), the International Law Commission decided on the inclusion in the programme of work of the Commission of the topic entitled "Shared natural resources". It was generally understood that this topic included groundwaters, oil and natural gas, although some preferred to include also such resources as migratory birds and animals on one hand, and others preferred to limit it so as to deal solely with groundwaters on the other.

(2) The Special Rapporteur of the topic considered that it would be appropriate to begin with the consideration of groundwaters as the follow-up of the Commission's previous work on the codification of the law of surface waters[493] and also that it would complicate the work if the Commission was to deal with three different resources simultaneously. Accordingly, he decided to focus on transboundary groundwaters for the time being and at least during the first reading of the draft articles. This approach has generally been endorsed. He 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. While he is also aware of dissimilarities among these resources, he recognizes that the work on transboundary groundwaters could affect any future codification work by the Commission on oil and natural gas. Moreover, the Commission might also wish to take into account some relevant elements of the existing regulations and State practice on oil and natural gas before finalizing its work on transboundary groundwaters. He therefore proposed to consider this aspect during the second reading of the draft articles. One member held the view that the decision would have to be taken whether to proceed further with respect to oil and natural gas when that second reading is completed.

(3) The first reading text is 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 text of draft articles, and should be addressed in due course, while focus has been on the substance at this stage. The Commission took the view that it was still premature to reach a conclusion on the question of final form in light of the differing views expressed by States in the Sixth Committee. The draft articles presented thus do not include provisions on dispute settlement, final clauses and any article which might prejudice the issue of final form. If a decision is taken to proceed with a convention, other changes would likely be necessary on second reading, including specifying the relationship of the convention to other agreements and arrangements, and relations with non-parties.

(4) The Commission considered the question of whether it would be necessary to structure the draft articles in such a way as to have obligations that will apply to all States generally, obligations of aquifer States *vis-à-vis* other aquifer States and obligations of aquifer States *vis-à-vis* non-aquifer States. It was decided that, in order to be effective, some draft articles would have to impose obligations on States which do not share the transboundary aquifer in question and in certain cases give rights to the latter States towards the States of that aquifer. In reaching these conclusions, the Commission stressed the need to protect the transboundary aquifer or aquifer system.

(5) The draft articles rely to a large extent on the 1997 Watercourses Convention. Some argue that there exist differences between surface waters and groundwaters. Others contend that the Convention was a failure because it has not attracted the ratifications necessary for it to come into force. There are, of course, differences between these two resources. However, there are many more similarities between them, in particular in the way of managing these resources. It is true that the Convention has not yet come into force.[494] However, it is a framework convention reflecting a certain authority. The ICJ recognized such authority when it referred to the 1997 Watercourses Convention in its judgment in the *Gabčíkovo–Nagymaros Project* case.[495] Many substantive provisions of the 2000 Revised Protocol on Shared Watercourses in the Southern African Development Community (SADC) reproduce almost word for word the provisions of the 1997 Watercourses Convention, and they are being implemented.[496] The Convention thus offers a useful basis for codification of provisions related to transboundary groundwaters.

(6) There are also abundant treaties and other legal documents which provide useful inputs to the current work.

[493] 1997 Watercourses Convention.

[494] Article 36, paragraph 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 at 6 August 2006, 14 States had become parties. They are Finland, Hungary, Iraq, Jordan, Lebanon, the Libyan Arab Jamahiriya, Namibia, the Netherlands, Norway, Portugal, Qatar, South Africa, Sweden and the Syrian Arab Republic.

[495] *Gabčíkovo–Nagymaros Project* (see footnote 363 above), para. 85.

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

Those instruments are compiled by FAO in association with UNESCO,[497] and relevant parts are reproduced in the addendum to the third report of the Special Rapporteur.[498] It has been ascertained that almost all States with land borders also have transboundary groundwaters with their neighbours. Accordingly, most States have a stake in one way or another in the topic. Substantial State practice is emerging. In addition to the valuable contributions from various States, the UNESCO International Hydrological Program (IHP) has, since 2003, provided scientific and technical advice to the Special Rapporteur and the Commission on the issues related to hydrogeology, inviting, coordinating and supporting the contributions of international experts, international and national institutions, including centres on groundwater resources, the IAH, FAO, the United Nations Environment Programme/Global Environmental Fund (UNEP/GEF), the Organization of American States (OAS), IUCN, the International Groundwater Resources Assessment Centre (IGRAC) and UNECE, to which the Special Rapporteur and the Commission are sincerely grateful.

PART I

INTRODUCTION

Article 1. Scope

The present draft articles apply to:

(*a*) utilization of transboundary aquifers and aquifer systems;

(*b*) other activities that have or are likely to have an impact upon those aquifers and aquifer systems; and

(*c*) measures for the protection, preservation and management of those aquifers and aquifer systems.

Commentary

(1) Draft article 1 provides the scope to which the present draft articles apply. The term "groundwaters" has been consistently used in the Commission and in the United Nations General Assembly. While it is perfectly appropriate to commonly denote a body of underground waters that constitutes a unitary whole and could be extracted for human use as "groundwaters", for the purposes of the present draft articles the technical term "aquifer" is opted for, as the term is more scientifically precise and leaves no ambiguity for both lawyers and groundwater scientists and administrators. An aquifer is often hydraulically connected to one or more other aquifers. In such a 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 an "aquifer system". In the draft articles, "an aquifer" and "an aquifer system" are always used together.

(2) The mandate given to the Commission is to codify the law on "shared natural resources". Accordingly, the present draft articles will apply only to transboundary aquifers. Domestic aquifers are excluded from the scope. If the domestic aquifers are connected to international watercourses as defined in the 1997 Watercourses Convention, they will be governed by that Convention and not by the present draft articles. On the other hand, all transboundary aquifers will be governed by the present draft articles, regardless of whether they are hydraulically connected or not to international watercourses. Those transboundary aquifers that are hydraulically connected to international watercourses will be governed by the 1997 Watercourses Convention in accordance with its article 2 (*a*) and also by the present draft articles. The dual application of the provisions 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 with each other. Were there conflicts between them, it would become necessary to address such situation. However, in order not to prejudge the final form of the draft articles, the relationship between the 1997 Watercourses Convention and the present draft articles is not dealt with for the moment.

(3) Draft article 1 specifies, in subparagraphs (*a*) to (*c*), three different categories of activities which must be covered by the draft articles. The activities regulated by article 1 of the 1997 Watercourses Convention are (*a*) the uses of the resources and (*b*) measures of protection, preservation and management related to the uses of those resources. They are substantially reproduced in paragraphs (*a*) and (*c*) of this draft article.

(4) In subparagraph (*a*), the term "utilization" instead of "uses" was adopted, as "utilization" would include also the mode of uses. It is noted that the 1997 Watercourses Convention adopts the phrase "international watercourses and of their waters" to indicate that the articles apply both to the watercourse itself (channel or system of surface waters and groundwaters) and to its waters, to the extent that there may be any difference between the two. Such a consideration is not necessary in this paragraph because the definition of an "aquifer" in draft article 2 makes it clear that an aquifer consists of both geological formation and waters contained therein.

(5) In subparagraph (*c*), "measures for the protection, …" was considered more appropriate than "measures of protection, …" in the comparable provision of the 1997 Watercourses Convention, and also the phrase "related to the uses of" found in the Convention was deleted to widen the scope of the present draft articles. The "measures" are meant to embrace not only those to be taken to deal with degradation of aquifers but also the various forms of cooperation, whether or not institutionalized, concerning the utilization, development, conservation and management of transboundary aquifers.

(6) In addition to these two categories of activities, subparagraph (*b*) provides an additional category of "other activities that have or are likely to have an impact upon those 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

[497] S. Burchi and K. Mechlem, *Groundwater in International Law: Compilation of Treaties and Other Legal Instruments*, Rome, FAO/UNESCO, 2005.

[498] See footnote 492 above.

around aquifers and cause some adverse effects on them. For example, farming utilizing chemical fertilizers and pesticides may pollute waters in the aquifer. Construction of subways may destroy geological formations or impair the recharge or discharge process. There must, of course, be a causal link between the activities and their effects. The term "impact" is often used to express such adverse or negative effects in the field of the environment, for instance "impact assessment".

(7) "Impact" is broader than the concept of "harm" or "damage", which is more specific. In and of itself, the term "impact" does not relate to either a positive or a negative effect. However, the term "impact" may be understood to have a negative connotation if the context in which it is used is negative, as in the case of subparagraph (*b*). Accordingly, in the context of subparagraph (*b*), "impact" relates to a forceful, strong or otherwise substantial adverse effect, while the threshold of such an effect is not defined here. The determination of the threshold is left to later substantive draft articles such as draft articles 6 and 10. Impact upon aquifers would include deterioration of water quality, reduction of water quantity and adverse changes of the functioning of the aquifer. The assessment of whether an "impact" occurred, as well as the type of impact and the extent of the 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.

Article 2. Use of terms

For the purposes of the present draft articles:

(*a*) "aquifer" means a permeable water-bearing underground geological formation underlain by a less permeable layer and the water contained in the saturated zone of the formation;

(*b*) "aquifer system" means a series of two or more aquifers that are hydraulically connected;

(*c*) "transboundary aquifer" or "transboundary aquifer system" means, respectively, an aquifer or aquifer system, parts of which are situated in different States;

(*d*) "aquifer State" means a State in whose territory any part of a transboundary aquifer or aquifer system is situated;

(*e*) "recharging aquifer" means an aquifer that receives a non-negligible amount of contemporary water recharge;

(*f*) "recharge zone" means the zone which contributes water to an aquifer, consisting of the catchment area of rainfall water and the area where such water flows to an aquifer by runoff on the ground and infiltration through soil;

(*g*) "discharge zone" means the zone where water originating from an aquifer flows to its outlets, such as a watercourse, a lake, an oasis, a wetland or an ocean.

Commentary

(1) There are various definitions of "aquifer" and "groundwaters" in existing treaties and other international legal documents[499] but they are not precise enough for the purposes of the present draft articles. The definition of an aquifer in subparagraph (*a*) offers the precise description of the 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.

(2) Oil and natural gas are stored also in similar geological formations. The term "water-bearing" has been employed to distinguish coverage of the draft articles from oil and natural gas. "Water-bearing" is not used here in the sense of "capable of bearing waters". It is used to indicate that the formation is currently bearing waters. The water-bearing formation includes both saturated and unsaturated parts of the formation. In other words, "water-bearing" is a wider concept than "saturated". The reference to "underground" is meant to indicate that aquifers are found on the subsurface. A "geological formation" consists of naturally occurring materials, either consolidated or unconsolidated, such as rock, gravel and sand. All the aquifers are underlain by less permeable layers which serve, so to speak, as the bottom of the container. Some aquifers are also upper-lain by less permeable layers. The waters stored in such aquifers are termed as

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[499] Article 2, paragraph 11 of Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy: "'Aquifer' means a subsurface layer or layers of rock or other geological strata of sufficient porosity and permeability to allow either a significant flow of groundwater or the abstraction of significant quantities of groundwater" (*Official Journal of the European Union*, No. L 327, 22 December 2000, p. 6).

UNCC, report and recommendations made by the Panel of Commissioners concerning the third instalment of "F4" claims: "aquifer: Natural water-bearing geological formation found below the surface of the earth" (S/AC.26/2003/31, glossary).

Article 1, paragraph 1 of the Bellagio "Model Agreement Concerning the Use of Transboundary Groundwaters" of 1989: "'Aquifer' means a subsurface water bearing geologic formation from which significant quantities of water may be extracted" (Burchi and Mechlem, *op. cit.* (footnote 497 above), p. 537).

Article 3, paragraph 2 of the International Law Association's Berlin Rules on Water Resources of 2004: "'Aquifer' means a subsurface layer or layers of geological strata of sufficient porosity and permeability to allow either a flow of or the withdrawal of usable quantities of groundwater" (*Report of the Seventy-First Conference* (see footnote 331 above), p. 9).

Article 1, paragraph 2 (*a*) of Council Directive 80/68/EEC of 17 December 1979 on the protection of groundwater against pollution caused by certain dangerous substances (*Official Journal*, No. L 20, 26 January 1980, p. 43); article 2 (*a*) of Council Directive 91/676/EEC of 12 December 1991 concerning the protection of waters against pollution caused by nitrates from agricultural sources (*Official Journal*, No. L 375, 31 December 1991, p. 6); article 2, paragraph 3 of the Protocol on Water and Health to the 1992 Convention on the Protection and Use of Transboundary Watercourses and International Lakes; and article 2, paragraph 2 of Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy: "'groundwater' means all water which is below the surface of the ground in the saturation zone and in direct contact with the ground or subsoil".

Article 3, paragraph 11 of the International Law Association's Berlin Rules on Water Resources : "'Groundwater' means water beneath the surface of the ground located in a saturated zone and in direct contact with the ground or soil".

"confined" groundwaters as they are pressurized by more than atmospheric pressure.

(3) 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 outside an aquifer, are kept in pores and mixed with air and in the form of vapour 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 possible to do so at present. The question was raised whether the draft articles should also apply to the formations containing only minimal amounts of waters. While it is obvious that States are not concerned with an aquifer that has no significance to them, it would not be possible to define an absolute criterion for that.

(4) An "aquifer system" consists of two or more aquifers that are hydraulically connected to each other. These aquifers could be of the same geological formations, but could also 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*. The quantity of waters that is capable of being transmitted is important since an insignificant or *de minimis* quantity of waters may not translate to a true hydraulic connection. The standard for determining whether a quantity is significant is directly related to the potential of the transmitting aquifer to have an effect on the quantity and quality of waters in the receiving aquifers. It would not be possible to formulate general and absolute criteria for such an effect. A judgment has to be made in each specific case on whether those aquifers should be treated as a system for the proper management of the aquifers.

(5) Subparagraph (*c*) defines the terms "transboundary aquifer" and "transboundary aquifer system" which are used in draft article 1 on the scope and in many other draft articles. 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, the existence of such factors can be easily established by simple observation of rivers and lakes. 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.

(6) Subparagraph (*d*) defines the term an "aquifer State", which is used throughout the draft articles. Once the existence of a part of a 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 (5) above, that State is an aquifer State for the purposes of the draft articles.

(7) The definition of "recharging aquifer" in subparagraph (*e*) is needed because different rules would apply to a "recharging aquifer" and a "non-recharging aquifer". Waters in a recharging aquifer are renewable resources, while those in a non-recharging aquifer are non-renewable resources. For the purposes of management of aquifers, "non-recharging" aquifers are those aquifers that receive "negligible" water recharge "contemporarily". The term "negligible" refers 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 and the rate at which the recharge occurs.

(8) The term "contemporary" should be understood for convenience as a timespan of approximately 100 years, 50 years in the past and 50 years in the future. The scientists generally classify those aquifers located in an 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 the last 50 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 from mid-1950s. They have been floating in the atmosphere for the last 50 years and can be detected in the aquifer that has received recharge from rainfall during that period.

(9) The definitions of "recharge zone" and "discharge zone" in subparagraphs (*f*) and (*g*) are needed for the application of draft article 10. Those zones exist for a recharging aquifer and are located outside the aquifer, although they are hydraulically connected to the latter. A recharge zone contributes water to an aquifer and includes the zone where the rainfall water directly infiltrates the ground, the zone of surface runoff which eventually infiltrates the ground and the underground unsaturated zone of infiltration. The discharge zone is the area through which water from the aquifer flows to its outlet, which may be a river, a lake, an ocean, an oasis or a wetland. Such outlets are not part of the discharge zone itself.

Part II

GENERAL PRINCIPLES

Article 3. Sovereignty of aquifer States

Each aquifer State has sovereignty over the portion of a transboundary aquifer or aquifer system located within its territory. It shall exercise its sovereignty in accordance with the present draft articles.

Commentary

(1) The need to have an explicit reference in the form of a draft article on the sovereignty of States over the natural resources within their territories was advocated by many States, particularly by those 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. They also pointed out that groundwaters must be regarded as belonging to the States where they are located, along the lines of oil and gas. Reference was made, in that regard, to General Assembly resolution 1803 (XVII) of 14 December 1962, entitled "Permanent sovereignty over natural resources". Some thought that it would be enough to have a reference to it in the preamble, while others considered that such reference would be undesirable for the proper management of aquifers.

(2) Many treaties, other legal instruments and non-legally binding instruments refer to sovereignty of States over natural resources located within their territory.[500] There are basically two types of formulation in State practice 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".[501] The other type is the saving or disclaimer clause such as: "Nothing in this Convention shall affect the sovereign right of States to exploit, develop and manage their own natural resources".[502]

(3) Draft article 3 adopts the positive type and represents an appropriately balanced text. The two sentences in the draft article are necessary in order to maintain such a balance. In essence, each aquifer State has sovereignty over the transboundary aquifer or aquifer system to the extent located within its territory. It is understood also that the present draft articles do not cover all limits imposed by international law on the exercise of sovereignty. Accordingly, the draft articles will have to be interpreted and applied against the background of general international law.

Article 4. Equitable and reasonable utilization

Aquifer States shall utilize a transboundary aquifer or aquifer system according to the principle of equitable and reasonable utilization, as follows:

(*a*) they shall utilize the transboundary aquifer or aquifer system in a manner that is consistent with the equitable and reasonable accrual of benefits therefrom to the aquifer States concerned;

(*b*) they shall aim at maximizing the long-term benefits derived from the use of water contained therein;

(*c*) they shall establish individually or jointly an overall utilization plan, taking into account present and future needs of, and alternative water sources for, the aquifer States; and

(*d*) they shall not utilize a recharging transboundary aquifer or aquifer system at a level that would prevent continuance of its effective functioning.

Commentary

(1) Transboundary aquifers are shared natural resources. Utilization of the aquifer can be divided into two categories, as the aquifer consists of the geological formation and the water contained in it. The use of the water is most common and the water is mainly used for drinking and other human life support, such as sanitation, irrigation and industry. The utilization of the geological formation is rather rare. A typical example is the artificial recharge being undertaken in the Franco–Swiss Genevese Aquifer system where the waters from the River Arve are used for such recharge. The functioning of the aquifer treats the waters with less cost than building a water treatment installation and also produces high quality water.

(2) The basic principle applicable to the utilization of shared natural resources is the equitable and reasonable utilization of the resources. It is embodied in many legal regimes such as water-related treaties and high seas fishery conventions. While the concept of equitable utilization

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[500] (*a*) Treaties referring to the concept within their preambles: the Vienna Convention for the Protection of the Ozone Layer (1985); the 1991 Agreement on air quality between Canada and the United States (United Nations, *Treaty Series*, vol. 1852, No. 31532, p. 79, reproduced in ILM, vol. 30 (1991), p. 678); the United Nations Framework Convention of Climate Change (1992); the Convention on Biological Diversity (1992); the Convention to combat desertification in those countries experiencing serious drought and/or desertification, particularly in Africa (1994); and the Convention on the sustainable management of Lake Tanganyika (2003).

(*b*) Treaties referring to the concept within their provisions: the Vienna Convention on succession of States in respect of treaties (1978); the African Charter on Human and Peoples' Rights (1981); the United Nations Convention on the Law of the Sea (1982); the Convention for the Protection of the Natural Resources and Environment of the South Pacific Region (1986); the Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (1995); the Protocol on Water and Health to the 1992 Convention on the Protection and Use of Transboundary Watercourses and International Lakes (1999); and the African Convention on the Conservation of Nature and Natural Resources (2003).

(*c*) Non-binding international instruments referring to the concept: the draft articles on prevention of transboundary harm from hazardous activities, adopted by the Commission at its fifty-third session, in 2001 (see footnote 292 above); "Concerted action for economic development of economically less developed countries" (General Assembly resolution 1515 (XV) of 15 December 1960); "Permanent sovereignty over natural resources" (General Assembly resolution 1803 (XVII) of 14 December 1962); the Stockholm Declaration (1972) (see footnote 312 above); the Charter of Economic Rights and Duties of States (General Assembly resolution 3281 (XXIX) of 12 December 1974); the Declaration on the Right to Development (General Assembly resolution 41/128 of 4 December 1986); and the Rio Declaration (1992) (see footnote 301 above).

(*d*) Other related treaties: the ASEAN Agreement on the Conservation of Nature and Natural Resources (1985, not in force).

[Treaties referring to the concept of peoples' right over natural resources.]

The International Covenant on Economic, Social and Cultural Rights (1966); the International Covenant on Civil and Political Rights (1966); and the African Charter on Human and Peoples' Rights (1981).

[501] African Convention on the Conservation of Nature and Natural Resources (2003), preamble.

[502] Convention for the Protection of the Natural Resources and Environment of the South Pacific Region (1986), art. 4, para. 6.

and that of reasonable utilization are different, they are closely interrelated and often combined in various legal regimes.[503] The *chapeau* of draft article 4 sets out this principle and the subparagraphs elaborate the meaning of the principle.

(3) Subparagraph (*a*) explains that equitable and reasonable utilization of the transboundary aquifer should result in an equitable allocation of benefits to be derived from such utilization among States sharing the aquifer. It is understood that "equitable" is not co-terminus with "equal".

(4) Subparagraphs (*b*) to (*d*) mainly concern reasonable utilization. In various legal regimes concerning renewable natural resources, "reasonable utilization" is often defined as "sustainable utilization" or "optimum utilization". There is a well-established scientific definition of this doctrine. It is to take measures on the best scientific evidence available to maintain at, or to restore to, the level of the resources which produces the maximum sustainable yield.[504] In plain language, it requires measures to keep the resources in perpetuity. The 1997 Watercourses Convention dealt with renewable waters which receive substantial recharge. Therefore, sustainable utilization was fully applicable. In the case of aquifers, the situation is completely different. Waters in non-recharging aquifers are not renewable. Any exploitation of such resources leads to depletion. While waters in recharging aquifers are renewable, the quantity of recharge water is usually extremely small compared to the large quantity of water stored in the aquifer over thousands of years. To limit exploitation of water to the quantity of recharge would be tantamount to prohibiting the utilization of even recharging aquifers.

(5) Subparagraphs (*b*) and (*c*) apply to both renewable and non-renewable resources of the aquifer (recharging and non-recharging). It is not appropriate to explicitly state the concept of "sustainability" in the case of an aquifer. Instead, the concept of "maximizing the long-term benefits" is adopted. The phrase "maximizing the long-term benefits" refers to the act of maintaining certain benefits over a long period of time, it being understood that utilization cannot be maintained indefinitely. Wasteful utilization must be avoided and the benefits could better be shared among generations. The provisions, however, do not refer to an obligation of maintaining the groundwater resource or the volume of water in the aquifer at or over some minimum level. Rather, it reflects a conscious decision-making process that determines what constitutes a benefit, what benefits are desirable, how many benefits should be enjoyed and the time period over which benefits should be enjoyed. Such decisions are entirely for the aquifer States concerned to make. In order to maximize long-term benefits, it is a prerequisite to have an overall utilization plan. Therefore, States are required to establish a suitable plan, preferably jointly with the other States concerned on the basis of an agreed lifespan of the aquifer. However, the phrase "individually or jointly" has been added to signify the importance of having a prior overall plan, while at the same time stressing that such a plan need not necessarily emanate from a joint endeavour by the aquifer States concerned. In some circumstances, a controlled and planned depletion could be considered.

(6) For a recharging aquifer, it is desirable to plan a much longer period of utilization than in the case of a non-recharging aquifer. However, it is not necessary to limit the level of utilization to the level of recharge. Subparagraph (*d*) provides that any utilization of such an aquifer should not destroy permanently its capacity to function as an aquifer.

(7) Paragraph 2 of the comparable article 5 of the 1997 Watercourses Convention provides another principle for equitable and reasonable participation[505] by watercourse States which includes both the right to utilize the watercourse and the duty to cooperate in the protection and development thereof. It is not included here, as it serves as an underlying basis for the provisions concerning international cooperation to be formulated in later draft articles.[506]

Article 5. Factors relevant to equitable and reasonable utilization

1. Utilization of a transboundary aquifer or aquifer system in an equitable and reasonable manner within the meaning of draft article 4 requires taking into account all relevant factors, including:

(*a*) the population dependent on the aquifer or aquifer system in each aquifer State;

(*b*) the social, economic and other needs, present and future, of the aquifer States concerned;

(*c*) the natural characteristics of the aquifer or aquifer system;

(*d*) the contribution to the formation and recharge of the aquifer or aquifer system;

(*e*) the existing and potential utilization of the aquifer or aquifer system;

(*f*) the effects of the utilization of the aquifer or aquifer system in one aquifer State on other aquifer States concerned;

(*g*) the availability of alternatives to a particular existing and planned utilization of the aquifer or aquifer system;

(*h*) the development, protection and conservation of the aquifer or aquifer system and the costs of measures to be taken to that effect;

(*i*) the role of the aquifer or aquifer system in the related ecosystem.

[503] See, for example, the 1997 Watercourses Convention, article 5, paragraph 1.

[504] See United Nations Convention on the Law of the Sea, article 119.

[505] See paragraphs (5) and (6) of the commentary to article 5 of the draft articles on the law of the non-navigational uses of international watercourses, *Yearbook ... 1994*, vol. II (Part Two), p. 97.

[506] Draft articles 7–18.

2. The weight to be given to each factor is to be determined by its importance with regard to a specific transboundary aquifer or aquifer system in comparison with that of other relevant factors. In determining what is equitable and reasonable utilization, all relevant factors are to be considered together and a conclusion reached on the basis of all the factors. However, in weighing different utilizations of a transboundary aquifer or aquifer system, special regard shall be given to vital human needs.

Commentary

(1) Draft article 5 lists the factors to be taken into account in determining equitable and reasonable utilization as provided for in draft article 4. "Factors" include "circumstances", and they will be considered in the context of the circumstances surrounding each case. It is a non-exhaustive list and is not based on any particular order of priority. 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. What is an equitable and reasonable utilization in a specific case will depend on a weighing of all relevant factors and circumstances. This draft article is almost a literal reproduction of article 6 of the 1997 Watercourses Convention.

(2) In subparagraph (*c*), "natural characteristics" is used instead of listing factors of a natural character of aquifers. The reason for this is that factors of a natural character should be taken into account, not one by one, but as the characteristics of aquifers. "Natural characteristics" refers to the physical characteristics that define and distinguish a particular aquifer. If a system approach is followed, one can separate the natural characteristics into three categories: input variables, output variables and system variables. Input variables are related to groundwater recharge from precipitation, rivers and lakes. Output variables are related to groundwater discharge to springs and rivers. System variables relate to aquifer conductivity (permeability) and storability which describe the state of the system. They are groundwater-level distribution and water characteristics such as temperature, hardness, pH (acidity and alkalinity), electro-conductivity and total dissolved solids. Together, the three categories of variables describe aquifer characteristics in terms of quantity, quality and dynamics. In effect, these characteristics are identical to those identified in paragraph 1 of draft article 8, on regular exchange of data and information.

(3) Subparagraph (*g*) relates to whether there are available alternatives to a particular planned or existing utilization of an aquifer. In practice, an alternative would take the form of another source of water supply and the overriding factors would be comparable feasibility, practicability and cost-effectiveness in comparison with the planned or existing utilization of the aquifer. For each of the alternatives a cost/benefits analysis needs to be performed. Besides feasibility and sustainability, the viability of alternatives plays an important role in the analysis. For example, a sustainable alternative could be considered as preferable in terms of aquifer recharge and discharge ratio, but less viable than a controlled depletion alternative.

(4) Subparagraphs (*d*) and (*i*) are factors additional to those listed in the 1997 Watercourses Convention. The contribution to the formation and recharge of the aquifer or aquifer system in subparagraph (*d*) means the comparative size of the aquifer in each aquifer State and the comparative importance of the recharge process in each State where the recharge zone is located. The role of the aquifer in the related ecosystem in subparagraph (*i*) is a necessarily relevant factor, in particular for reasonable utilization. The "role" signifies the variety of purposive functions that an aquifer has in a related ecosystem. This may be a relevant consideration in particular in an arid region. There exist different meanings attached to the term "ecosystem" within the scientific community. The term "related ecosystem" must be considered in conjunction with "ecosystems" in draft article 9. It refers to an ecosystem that is dependent on aquifers or on groundwaters stored in aquifers. Such an ecosystem may exist within aquifers, such as in karstic aquifers, and be dependent on the functioning of aquifers for its own survival. A related ecosystem may also exist outside aquifers and be dependent on aquifers for a certain volume or quality of groundwaters for its existence. For instance, in some lakes an ecosystem is dependent on aquifers. Lakes may have a complex groundwater flow system associated with them. Some lakes receive groundwater inflow throughout their entire bed. Some have seepage loss to aquifers throughout their entire bed. Others receive groundwater inflow through part of their bed and have seepage loss to aquifers through other parts. Lowering of lake water levels as a result of groundwater pumping can affect the ecosystems supported by the lake. The reduction of groundwater discharge to the lake significantly affects the input of dissolved chemicals which can be the principal source to the lake, even in cases where such discharge is a small component of the lake's water budget, and may result in altering key constituents of the lake, such as nutrients and dissolved oxygen.

(5) The text of the first two sentences of paragraph 2 was formulated during the final negotiating stage of the 1997 Watercourses Convention. It clarifies that all relevant factors are to be considered together and the conclusion must be reached on the basis of all of them. It remains, however, that the weight to be accorded to individual factors, as well as their relevance, will vary with the circumstances. Special consideration should be given to drinking waters and other essentials for human needs. The reference in the last sentence of paragraph 2 that "special regard shall be given to vital human needs" seeks to accommodate these considerations. The different kinds of utilization 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 the terrestrial and aquatic ecosystem. When a conflict arises between different kinds of utilization, it should be resolved in accordance with the principle of equitable utilization. In such determination, special regard shall be given to the requirement of "vital human needs". During the elaboration of the 1997 Watercourses Convention, the Chairperson of the Working Group of the Whole took note of the following statement of understanding pertaining to "vital human needs": "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."[507] This statement seems to be more precise and narrower than other definitions.[508]

Article 6. Obligation not to cause significant harm to other aquifer States

1. Aquifer States shall, in utilizing a transboundary aquifer or aquifer system in their territories, take all appropriate measures to prevent the causing of significant harm to other aquifer States.

2. Aquifer States shall, in undertaking activities other than utilization of a transboundary aquifer or aquifer system that have, or are likely to have, an impact on that transboundary aquifer or aquifer system, take all appropriate measures to prevent the causing of significant harm through that aquifer or aquifer system to other aquifer States.

3. Where significant harm nevertheless is caused to another aquifer State, the aquifer States whose activities cause such harm shall take, in consultation with the affected State, all appropriate measures to eliminate or mitigate such harm, having due regard for the provisions of draft articles 4 and 5.

Commentary

(1) Draft article 6 deals with another basic 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 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 such harm.

(2) *Sic utere tuo ut alienum non laedas* (use your own property so as not to injure that of another) is the established principle of international liability. The obligation contained in this draft article is that of "[taking] all appropriate measures". It is in substance the same as the obligation of "due diligence". The change from "due diligence" to "to take all appropriate measures" took place during the last negotiating stage of the 1997 Watercourses Convention. 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 not prevented others in its territory from causing that event or has abstained from abating it. In the case of paragraph 1, it is implicit that the harm is caused to other States through transboundary aquifers. In the case of paragraph 2, it is expressly made clear that the draft article applies only to the harm that is caused to other States "through that aquifer or aquifer system".

(3) The debate continues whether the threshold of "significant harm" is appropriate for such fragile natural resources as 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 considered this question of the threshold extensively in its previous codification works on the 1997 Watercourses Convention and "Prevention of transboundary harm 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 a position on the threshold of "significant harm".

(4) During the elaboration of the draft convention on the law of non-navigational uses of international watercourses, the Chairperson of the Working Group of the Whole took note of the statements of understanding to the texts of the Convention. On the term "significant", the following understanding was recorded: the term "significant" is not used in this article or elsewhere in the present Convention in the sense of "substantial". What is to be avoided are localized agreements, or agreements concerning a particular project, programme or use, that have a significant adverse effect upon third watercourse States. While such an effect must be capable of being established by objective evidence and not be trivial in nature, it needs not rise to the level of being substantial.[509] 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, while the contamination of a watercourse by the same amount of pollutant might not be evaluated as significant.

(5) This draft article is intended to cover activities undertaken in a State's own territory. The scenario where an aquifer State would cause harm to another State through an aquifer by engaging in activities outside its territory is considered unlikely, but is not excluded.

(6) Paragraph 3 deals with the eventuality of significant harm even if all appropriate measures are taken. The reference to "activities" in paragraph 3 covers both utilization and "activities other utilization" in paragraphs 1 and 2. That eventuality is possible because activities have a risk of causing harm and such risk cannot be eliminated. The reference to the question of compensation found in the corresponding article of the 1997 Watercourses Convention is not included. The Commission decided not to address in these draft articles the issue of compensation in circumstances where harm resulted despite efforts to prevent such harm. The issue is covered by other rules of international law, including the draft principles on liability, and does not require specialized treatment with respect to transboundary aquifers.

Article 7. General obligation to cooperate

1. Aquifer States shall cooperate on the basis of sovereign equality, territorial integrity, sustainable

[507] A/51/869, para. 8.

[508] " 'Vital human needs' means waters used for immediate human survival, including drinking, cooking, and sanitary needs, as well as water needed for the immediate sustenance of a household" (see article 3, paragraph 20 of the International Law Association's Berlin Rules on Water Resources, *Report of the Seventy-First Conference* (footnote 331 above)).

[509] See A/51/869.

development, mutual benefit and good faith in order to attain equitable and reasonable utilization and appropriate protection of their transboundary aquifer or aquifer system.

2. For the purpose of paragraph 1, aquifer States should establish joint mechanisms of cooperation.

Commentary

(1) Draft article 7 sets out the principle of a general obligation of aquifer States to cooperate with each other and contemplates procedures for such cooperation. Cooperation among aquifer States is a prerequisite for the fulfilment of the obligations throughout the draft articles. The importance of the obligation to cooperate is indicated in Principle 24 of the 1972 Stockholm Declaration.[510] The importance of such an obligation for the present subject is confirmed by the Mar del Plata Action Plan adopted by the United Nations Water Conference in 1977[511] and Chapter 18 of Agenda 21 on the Protection of the Quality and Supply of Freshwater Resources: Application of Integrated Approaches to the Development, Management and Use of Water Resources, of the 1992 United Nations Conference on Environment and Development.[512] A wide variety of international instruments on surface waters and groundwater issues call for cooperation between parties with regard to the protection, preservation and management of transboundary aquifers.[513]

(2) Paragraph 1 provides for the basis and objectives of cooperation and reproduces more or less the text of article 8 of the 1997 Watercourses Convention. To some members of the Commission, the question remains as to whether the principles of "sovereign equality" and "territorial integrity" could better be reflected elsewhere in the draft articles rather than in the context of the cooperation provision. The principle of "sustainable development" has been included as a general principle that ought to be taken into account in addition to the text of the 1997 Watercourses Convention. The term "sustainable development" denotes the general principle of sustainable development and should be distinguished from the concept of "sustainable utilization".[514]

(3) Paragraph 2 envisages the establishment of "joint mechanisms for cooperation" which refers to a mutually agreeable means of decision-making among aquifer States. In practical terms, it means a commission, an authority or other institution established by the aquifer States concerned to achieve a specified purpose. The competence of such a body would be for the aquifer States concerned to determine. The objectives in creating such a mechanism is to cooperate in decision-making, coordinate activities and avert, to the extent possible, disputes among aquifer States.

(4) Europe has a long tradition of international river commissions such as the International Commission for the Protection of the Rhine, the International Meuse Commission and the Danube Commission. Within these commissions or in close cooperation with them, bilateral cross-border commissions such as the Permanent Dutch–German Boundary Waters Commission operate. The existing commissions deal primarily with surface water issues. The European Union water framework Directive 2000/60/EC[515] is implemented mainly through commissions for delineation and monitoring. In the future, these commissions will become responsible for transboundary aquifer management as well.[516] In other parts of the world, it is also expected that comparable regional organizations play a role in promoting establishment of similar joint mechanisms.[517] It is also noted that there are many cases of joint mechanisms established by local governments along the border.[518]

Article 8. Regular exchange of data and information

1. Pursuant to draft article 7, aquifer States shall, on a regular basis, exchange readily available data and information on the condition of the transboundary aquifer or aquifer system, in particular of a geological, hydrogeological, hydrological, meteorological and ecological nature and related to the hydrochemistry of the aquifer or aquifer system, as well as related forecasts.

2. Where knowledge about the nature and extent of some transboundary aquifer or aquifer systems is inadequate, aquifer States concerned shall employ their best efforts to collect and generate more complete data and information relating to such aquifer or aquifer systems, taking into account current practices and standards. They shall take such action individually or jointly and, where appropriate, together with or through international organizations.

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[510] See footnote 312 above.

[511] See *Report of the United Nations Water Conference, Mar del Plata, 14–25 March 1977* (United Nations publication, Sales No. E.77.II.A.12), Part One, p. 51 (recommendation 85).

[512] *Report of the United Nations Conference on Environment and Development, Rio de Janeiro, 3–14 June 1992* (see footnote 301 above).

[513] ASEAN Agreement on the Conservation of Nature and Natural Resources (1985), Convention on the Protection and Use of Transboundary Watercourses and International Lakes (1992), Protocol on Water and Health to the 1992 Convention on the Protection and Use of Transboundary Watercourses and International Lakes (1999), Convention on cooperation for the protection and sustainable use of the river Danube (1994), Convention for the Protection of the Rhine (1999), African Convention on the Conservation of Nature and Natural Resources (2003), Framework Convention on the Protection and Sustainable Development of the Carpathians (2003), Convention on the sustainable management of Lake Tanganyika (2003), and Protocol for Sustainable Development of Lake Victoria Basin (2003).

[514] See above, paragraph (4) of the commentary to draft article 4.

[515] See footnote 499 above.

[516] The European Union water framework Directive requires member States to establish a management plan. See also guidelines 2 and 8 of the Guidelines on Monitoring and Assessment of Transboundary Groundwaters of the UNECE, Institute for Inland Water Management and Waste Water Treatment, *UN/ECE Task Force on Monitoring & Assessment under the Convention on the Protection and Use of Transboundary Watercourses and International Lakes (Helsinki, 1992)—Working programme 1996/1999*.

[517] African Union: paragraph 3 of article VII (Water) of the African Convention on the Conservation of Nature and Natural Resources, and SADC: article 5 (Institutional framework for implementation) of the Revised Protocol on Shared Watercourses in the Southern African Development Community.

[518] Franco–Swiss Commission on the Genevese Aquifer established by the Canton of Geneva and the Prefect of Haute-Savoie, and Memorandum of Agreement Related to Referral of Water Right Applications (10 October 1996)—Appendix to British Columbia/Washington Memorandum of Understanding (12 April 1996), Burchi and Mechlem, *op. cit.* (footnote 497 above), p. 230.

3. If an aquifer State is requested by another aquifer State to provide data and information relating to the aquifer or aquifer systems that are not readily available, it shall employ its best efforts to comply with the request. The requested State may condition its compliance upon payment by the requesting State of the reasonable costs of collecting and, where appropriate, processing such data or information.

4. Aquifer States shall, where appropriate, employ their best efforts to collect and process data and information in a manner that facilitates their utilization by the other aquifer States to which such data and information are communicated.

Commentary

(1) Regular exchange of data and information is the first step for cooperation among aquifer States. The text of article 9 of the 1997 Watercourses Convention has been adjusted to meet the special characteristics of aquifers. In particular, paragraph 2 is additionally formulated in view of the insufficient status of scientific findings of some aquifers. There are several stages for the exchange of data and information throughout the draft articles. Data and information in this draft article are limited to those concerning the conditions of aquifers. They include not only raw statistics but also the results of research and analysis. Data and information concerning monitoring, utilization of aquifers, other activities affecting aquifers and their impact on aquifers are dealt with in later draft articles, including draft articles 12, 13 and 14.

(2) 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. Aquifer States require data and information concerning the condition of the aquifer in order to apply draft article 5, which calls for aquifer States to take into account "all relevant factors" and circumstances in implementing the obligation of equitable and reasonable utilization laid down in draft article 4. The rules contained in draft article 8 are residual. They apply in the absence of a specially agreed regulation of the subject and they do not prejudice the regulation set out by an arrangement concluded among the States concerned for a specific transboundary aquifer. In fact, the need is clear for aquifer States to conclude such agreements among themselves in order to provide, *inter alia*, for the collection and exchange of data and information in the light of the characteristics of the transboundary aquifer concerned.

(3) 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. In requiring the "regular" exchange of data and information, paragraph 1 provides for an ongoing and systematic process, as distinct from the *ad hoc* provision of such information as concerning planned activities envisaged in draft article 14. Paragraph 1 requires that aquifer States exchange data and information that are "readily available". This expression is used to indicate that, as a matter of general legal duty, an aquifer State is under an obligation to provide only such data and information as is readily at its disposal, for example, that it has already collected for its own use or is 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. The term "readily", as used in paragraphs 1 and 3, is thus a term of art having a meaning corresponding roughly to the expression "in the light of all the relevant circumstances" or to the word "feasible", rather than, for example, "rationally" or "logically". The importance of the exchange of data and information is indicated in a wide variety of agreements.[519]

(4) The phrase in paragraph 1 "in particular of geological, hydrogeological, hydrological, meteorological and ecological nature and related to the hydrochemistry of the aquifer or aquifer system" relate to the data and information that define and distinguish characteristics of the aquifer. "Geology" describes the age, composition and structure of the aquifer matrix. "Hydrogeology" describes the ability of the aquifer to store, transmit and discharge groundwaters. "Hydrology" describes elements other than groundwater of the water cycle, primarily effective precipitation and surface water that are important for aquifer recharge, the aquifer regime, storage and discharge. Effective precipitation is the part of precipitation which enters aquifers. In other words, it is total precipitation minus evaporation, surface runoff and vegetation. "Meteorology" provides data on precipitation, temperature and humidity which is necessary to calculate evaporation. "Ecology" provides data on plants, necessary to calculate plants' transpiration. "Hydrochemistry" yields data on chemical composition of the water necessary to define water quality. Aquifer States are required by paragraph 1 to exchange not only data and information on the present condition of the aquifer, but also related forecasts. The forecasts envisaged would relate to such matters as weather patterns and their possible effects upon water levels and flow; the amount of recharge and discharge; foreseeable ice conditions; possible long-term effects of present utilization; and the condition or movement of living resources. The requirement in paragraph 1 applies even in the relatively rare instances in which an aquifer State is not utilizing, or has no plan of utilizing, the transboundary aquifer.

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[519] Convention on the Protection and Use of Transboundary Watercourses and International Lakes (1992), Programme for the Development of a Regional Strategy for the utilisation of the Nubian Sandstone Aquifer System (2000), Framework Convention on the Protection and Sustainable Development of the Carpathians (2003), African Convention on the Conservation of Nature and Natural Resources (2003), Convention on cooperation for the protection and sustainable use of the river Danube (1994), Tripartite Interim Agreement Between the Republic of Mozambique, the Republic of South Africa and the Kingdom of Swaziland for Co-operation on the Protection and Sustainable Utilisation of the Water Resources of the Incomati and Maputo Watercourses (2002), Framework Agreement on the Sava River Basin (2002), Convention on the sustainable management of Lake Tanganyika (2003), Protocol for Sustainable Development of Lake Victoria Basin (2003), Protocol amending the 1978 Agreement between the United States of America and Canada on Great Lakes water quality, as amended in 1983 (signed at Toledo on 18 November 1987, United Nations, *Treaty Series*, vol. 2185, No. 18177, p. 504), and Agreement on cooperation for the protection and sustainable use of the waters of the Spanish–Portuguese hydrographic basins (signed at Albufeira on 30 November 1998, *ibid.*, vol. 2099, No. 36496, p. 314).

(5) Paragraph 2 requires aquifer States to pay due regard to the uncertainties of transboundary aquifers. One of the difficulties in realizing 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 such data and information available to other aquifer States. The concept of "generation" of data involves the processing of raw data into usable information. UNESCO-IHP compiles reliable global data and information, including aquifer locations and characteristics, and makes them available to the scientific and management community of aquifers.

(6) Paragraph 3 concerns requests for data or information that are not readily available in the State from which they are sought. In such cases, the State in question is to employ its "best efforts" to comply with the request. It is to act in good faith and in a spirit of cooperation in endeavouring to provide the data or information sought by the requesting aquifer State. In the absence of agreement to the contrary, aquifer States are not required to process the data and information to be exchanged. Under paragraph 3 of draft article 8, however, they are to employ their best efforts to comply with the request. The requested State may condition its compliance with the request on payment by the requesting State of the reasonable costs of collecting and, where appropriate, processing the data. The expression "where appropriate" is used in order to provide a measure of flexibility, which is necessary for several reasons. In some cases, it may not be necessary to process data and information in order to render it usable by another State. In other cases, such processing may be necessary in order to ensure that the material is usable by other States, but this may entail undue burdens for the State providing the material.

(7) For data and information to be of practical value to aquifer States, they must be in a form which allows them to be easily usable. Paragraph 4 therefore requires aquifer States to use "their best efforts to collect and process data and information in a manner that facilitates their utilization" by the other aquifer State.

Part III

PROTECTION, PRESERVATION AND MANAGEMENT

Article 9. Protection and preservation of ecosystems

Aquifer States shall take all appropriate measures to protect and preserve ecosystems within, or dependent upon, their transboundary aquifers or aquifer systems, including measures to ensure that the quality and quantity of water retained in the aquifer or aquifer system, as well as that released in its discharge zones, are sufficient to protect and preserve such ecosystems.

Commentary

(1) Draft article 9 introduces Part III by laying 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. Like article 192 of the United Nations Convention on the Law of the Sea and article 20 of the 1997 Watercourses Convention, draft article 9 contains obligations of both protection and preservation. These obligations relate to the "ecosystems" within and outside transboundary aquifers.

(2) The term "ecosystem" is explained in paragraph (4) of the commentary to draft article 5. "Ecosystem" refers generally to an ecological unit consisting of living and non-living components that are interdependent and function as a community. "In ecosystems, everything depends on everything else and nothing is really wasted."[520] An external impact affecting one component of an ecosystem may cause 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 is likely to become so elsewhere. There are certain differences in the modalities of the protection and preservation of the ecosystem within aquifers and those of the protection and preservation of the outside ecosystems dependent on the aquifers. The quality and quantity of the discharge water exert great influence on the outside ecosystems.

(3) 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 ecosystems help to ensure their continued viability as life-support systems.

(4) The obligation of States to take "all appropriate measures" is limited to the protection of relevant ecosystems. This allows States greater flexibility in the implementation of their responsibilities under this provision. It was noted, in particular, that there may be instances in which changing an ecosystem in some appreciable way may be justified by other considerations, including the planned usage of the aquifer in accordance with the draft articles.

(5) There are ample precedents for the obligation contained in draft article 9 in the practices of States and the work of international organizations. The ASEAN Agreement on the Conservation of Nature and Natural Resources (1985) provides for the obligation of conservation of species and ecosystems and conservation of ecological processes. The Convention on the Protection and Use

[520] ENVWA/WP.3/R.7/Rev.1, para. 9.

of Transboundary Watercourses and International Lakes (1992) sets out the obligation to "ensure conservation and, where necessary, restoration of ecosystems" (art. 2). The Protocol on Water and Health to the 1992 Convention on the Protection and Use of Transboundary Watercourses and International Lakes (1999) provides for the obligation to "take all appropriate measures for the purpose of ensuring … [e]ffective protection of water resources used as sources of drinking water, and their related water ecosystems, from pollution from other causes" (art. 4). The Tripartite Interim Agreement Between the Republic of Mozambique, the Republic of South Africa and the Kingdom of Swaziland for Co-operation on the Protection and Sustainable Utilisation of the Water Resources of the Incomati and Maputo Watercourses (2002) provides that "[t]he Parties shall, individually and, where appropriate, jointly, take all measures to protect and preserve the ecosystems of the Incomati and Maputo watercourses" (art. 6). The Protocol for Sustainable Development of Lake Victoria Basin (2003) provides for the obligation to "take all appropriate measures, individually or jointly and where appropriate with participation of all stakeholders to protect, conserve and where necessary rehabilitate the Basin and its ecosystems".

Article 10. Recharge and discharge zones

1. Aquifer States shall identify recharge and discharge zones of their transboundary aquifer or aquifer system and, within these zones, shall take special measures to minimize detrimental impacts on the recharge and discharge processes.

2. All States in whose territory a recharge or discharge zone is located, in whole or in part, and which are not aquifer States with regard to that aquifer or aquifer system, shall cooperate with the aquifer States to protect the aquifer or aquifer system.

Commentary

(1) Groundwater experts explain the importance of the measures to be taken for the protection and preservation of recharge and discharge zones in order to ensure the proper functioning of an aquifer. Disrupting or blocking recharge or discharge processes by, for example, constructing a concrete barrier in these zones would seriously and adversely affect the aquifer. Recharge or discharge zones are outside the aquifer in accordance with the definition of "aquifer" in subparagraph (*a*) of draft article 2 and accordingly this separate draft article is required to regulate such zones. Paragraph 1 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 implementing such obligations. The first is the obligation to identify the recharge or discharge zones of their transboundary aquifers and the second is to take special measures to protect such zones for the purposes of the sound functioning of the aquifers.

(2) As far as the identification of recharge and discharge zones are concerned, those zones must be hydraulically connected to the aquifer directly. Once the recharge and discharge zones are identified and as far as they are located in the territories of the aquifer States concerned, those States are under the obligation to take special measures to minimize detrimental impacts on the recharge and discharge processes. Such measures play a pivotal role for the protection and preservation of the aquifer. It is noted that it is vitally important to take all measures in recharge zones to prevent pollutants from entering the aquifer. However, the obligation to protect the recharge zone from polluting the aquifers is dealt with in the context of draft article 11, which deals specifically with pollution.

(3) Paragraph 2 deals with the case that recharge or discharge zones of a particular transboundary aquifer are located in a State other than the aquifer States that share the transboundary aquifer in question. Considering the importance of the recharge and discharge mechanisms for the proper functioning of aquifers, it was decided to include an obligation on all States in whose territory a recharge or discharge zone is located to cooperate with aquifer States to protect the aquifer. It should be recalled, in this regard, that aquifer States are themselves covered by the general duty to cooperate in draft article 7.

Article 11. Prevention, reduction and control of pollution

Aquifer States shall, individually and, where appropriate, jointly, prevent, reduce and control pollution of their transboundary aquifer or aquifer system, including through the recharge process, that may cause significant harm to other aquifer States. In view of uncertainty about the nature and extent of transboundary aquifers or aquifer systems and of their vulnerability to pollution, aquifer States shall take a precautionary approach.

Commentary

(1) Draft article 11 sets forth the general obligation of aquifer States to prevent, reduce and control pollution of their transboundary aquifer that may cause significant harm to other aquifer States. The harm is that caused to other aquifer States through the transboundary aquifer and the aquifer-related environment. The problem dealt with here is essentially the quality of the water contained in the aquifer. This provision is a specific application of the general principles contained in draft articles 4 and 6.

(2) Some transboundary aquifers are already polluted to varying degrees, while others are not. In view of this state of affairs, draft article 11 employs the formula "prevent, reduce and control" in relation to the pollution. This expression is used in the 1982 United Nations Convention on the Law of the Sea in connection with marine pollution and in the 1997 Watercourses Convention. With respect to both the marine environment and international watercourses, the situation is similar. The obligation to "prevent" relates to new pollution, while the obligations to "reduce" and "control" relate to existing pollution. As with the obligation to "protect" ecosystems under draft article 9, the obligation to "prevent … pollution … that may cause significant harm" includes the duty to exercise due diligence to prevent the threat of such harm. This obligation is expressed by the words "may cause". The requirement that aquifer States "reduce and control" existing pollution reflects the practice of States.

A requirement that existing pollution causing such harm be abated immediately could, in some cases, result in undue hardship, especially where the detriment to an aquifer State of origin was grossly disproportionate to the benefit that would accrue to an aquifer State experiencing the harm. 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. As stated in paragraph (2) of the commentary to draft article 10, a specific reference to the recharge process was added to this draft article.

(3) This draft article requires that the measures in question be taken "individually or jointly". The obligation to take joint action derives from certain general obligations contained in draft article 7, in particular, in its paragraph 2.

(4) 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 the present article but, depending upon the circumstances, might be covered by draft article 9.

(5) The last sentence of the present article obligates aquifer States to take a precautionary approach in view of uncertainty about the nature and extent of some transboundary aquifers or aquifer systems and of their vulnerability to pollution. Groundwater experts emphasize how fragile a transboundary aquifer or aquifer system is. They also emphasize that once a transboundary aquifer or aquifer system is polluted, it is very difficult to remove the pollutant and that the pollution could be irreversible in many cases. Considering such fragilities and scientific uncertainties of a transboundary aquifer or aquifer system, a precautionary approach is required.

(6) Some members of the Commission strongly suggested that an independent draft article should be formulated on the basis of the "precautionary principle". There are differing views as to whether the "precautionary principle" has been established as customary international law. It is true that there are several regional treaties or conventions in which the "precautionary principle" is expressly mentioned.[521] As far as universal treaties or conventions are concerned, different expressions such as "precautionary approach" and "precautionary measures" are used.[522] The majority of the members of the Commission considered that it would be better to avoid the conceptual and difficult discussions concerning the expression of "precautionary principle". The less disputed expression of "precautionary approach" could satisfy the basic necessity of introducing the special consideration of scientific uncertainties and vulnerability of aquifers. 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 to embody the precautionary principle.

Article 12. Monitoring

1. Aquifer States shall monitor their transboundary aquifer or aquifer system. They shall, wherever possible, carry out these monitoring activities jointly with other aquifer States concerned and, where appropriate, in collaboration with the competent international organizations. Where, however, monitoring activities are not carried out jointly, the aquifer States shall exchange the monitored data among themselves.

2. Aquifer States shall use agreed or harmonized standards and methodology for monitoring their transboundary aquifer or aquifer system. They should identify key parameters that they will monitor based on an agreed conceptual model of the aquifer or aquifer system. These parameters should include parameters on the condition of the aquifer or aquifer system as listed in draft article 8, paragraph 1, and also on the utilization of the aquifer and aquifer system.

Commentary

(1) Most groundwater experts (scientists and administrators) emphasize that monitoring is 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 into a joint effort with the neighbouring States concerned. However, experts agree that ultimate and ideal monitoring is joint monitoring based on the agreed conceptual model of the aquifer.

(2) Accordingly, paragraph 1 sets out the obligation of aquifer States to monitor their transboundary aquifer. It requires 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. The general obligation of international cooperation is provided in draft article 7. There are several stages in the obligation

[521] The Convention for the protection of the marine environment of the North-East Atlantic (OSPAR Convention, 1992), the Convention on the Protection of the Marine Environment of the Baltic Sea Area (1992), the Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean (1995), the Convention on the Protection and Use of Transboundary Watercourses and International Lakes (1992), the Treaty establishing the European Economic Community (1957), the Bamako Convention on the Ban of the Import into Africa and the Control of Transboundary Movement and Management of Hazardous Wastes within Africa (1991), the Protocol on Water and Health to the 1992 Convention on the Protection and Use of Transboundary Watercourses and International Lakes (1999), the Framework Convention on the Protection and Sustainable Development of the Carpathians (2003), the Convention on cooperation for the protection and sustainable use of the river Danube (1994), the Convention on the Protection of the Rhine (1999), the Convention on the sustainable management of Lake Tanganyika (2003), and the Protocol for Sustainable Development of Lake Victoria Basin (2003).

[522] For example, the 1996 Protocol to the 1972 Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter and the Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (1995) use the expression "precautionary approach". The United Nations Framework Convention on Climate Change (1992) provides for the obligation to take "precautionary measures".

of international cooperation including regular exchange of data and information, monitoring, management and planned activities. Draft article 12 elaborates one of such stages of international cooperation.

(3) The importance of monitoring is widely recognized in many international instruments, for example, the 1989 Charter on Ground-Water Management[523] and the Guidelines on Monitoring and Assessment of Groundwaters of 2000,[524] both prepared by UNECE, the 1992 Convention on the Protection and Use of Transboundary Watercourses and International Lakes and the African Convention on the Conservation of Nature and Natural Resources.

(4) Draft article 12 is also related to draft article 8 on regular exchange of data and information. For the implementation of the obligation of regular exchange of data and information, effective monitoring is required. However, the data and information required by draft article 8 is limited to those concerning the condition of the aquifer. As stipulated in paragraph 2, monitoring needs to cover not only the conditions of the aquifer but also utilization of the aquifer such as withdrawal and artificial recharge of water.

(5) The purposes of monitoring are: (*a*) to clarify the conditions and utilization of a specific transboundary aquifer in order to take effective measures for its protection, preservation and management; and (*b*) to carry out regular surveillance of it in order to acquire information about any change or damage at an early stage. Effective monitoring through international cooperation will also contribute to further development of scientific knowledge about transboundary aquifers.

(6) There are various international instruments for the joint monitoring of a specific transboundary aquifer. An example is the Programme for the Development of a Regional Strategy for the utilisation of the Nubian Sandstone Aquifer System established in 2000. One of the agreements for the execution of this programme is the Terms of Reference for the Monitoring and Exchange of Groundwater Information. The 2003 Framework Convention on the Protection and Sustainable Development of the Carpathians provides for the obligation to pursue the policies aiming at joint or complementary monitoring programmes, including the systematic monitoring of the state of the environment. The 1994 Convention on cooperation for the protection and sustainable use of the river Danube provides for not only an obligation to harmonize individual monitoring but also an obligation to elaborate and implement joint programmes for monitoring the riverine conditions in the Danube catchment area concerning water quality and quantity, sediments and riverine ecosystem. The European Union water framework Directive 2000/60/EC sets out that "Member States shall ensure the establishment of programmes for the monitoring of water status in order to establish a coherent and comprehensive overview of water status within each river basin district" (art. 8).[525]

(7) As far as the aquifer States can agree to establish such a joint mechanism, it is the most effective approach. However, there are many cases where the aquifer States concerned have not yet initiated any consultation or have not yet reached any agreement to establish a joint mechanism. Even in such cases, they are at least under an obligation to conduct individual monitoring and share the results with the other aquifer States concerned. The 2003 African Convention on the Conservation of Nature and Natural Resources sets out the obligation of each party to monitor the status of their natural resources as well as the impact of development activities and project upon such resources. The 2002 Tripartite Interim Agreement Between the Republic of Mozambique, the Republic of South Africa and the Kingdom of Swaziland for Cooperation on the Protection and Sustainable Utilisation of the Water Resources of the Incomati and Maputo Watercourses sets out the obligation of each party to establish comparable monitoring systems, methods and procedures and implement a regular monitoring programme, including biological and chemical aspects for the Incomati and Maputo watercourses and report, at the intervals established by the Tripartite Permanent Technical Committee, on the status and trends of the associated aquatic, marine and riparian ecosystems in relation to the water quality of the said watercourses. The 2002 Framework Agreement on the Sava River Basin provides for the obligation of the parties to agree to establish a methodology of permanent monitoring of implementation of the Agreement and activities based upon it. The 2003 Convention on the sustainable management of Lake Tanganyika includes the obligation of monitoring in the provision for the prevention and control of pollution. The 2003 Protocol for Sustainable Development of Lake Victoria Basin provides for the obligation of monitoring undertaken by individual States in a standardized and harmonized manner.

(8) Paragraph 2 provides the essential elements of the obligation of aquifer States to realize effective monitoring, i.e. the agreement or harmonization of the standard and the methodology for monitoring. Without such agreement or 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 such data were collected. With these "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. In the case of the Franco–Swiss Commission on the Genevese Aquifer, the two sides started with each other's data standard and, with time and practice, reached a level of harmonization such that their data are comparable. 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. There are two kinds of conceptual models. One is the physical matrix and the other is the hydro-dynamic model. The aquifer States can agree on a model at the beginning and then change it as they gain better knowledge of the aquifer as a result of

[523] Adopted by UNECE in 1989. See *Charter on Ground-Water Management* (United Nations publication, Sales No. E.89.II.E.21), document E/ECE/1197-ECE/ENVWA/12.

[524] Drafted by the UNECE Task Force on Monitoring & Assessment under the Convention on the Protection and Use of Transboundary Watercourses and International Lakes and endorsed by the parties to the Convention in March 2000 (see footnote 516 above).

[525] See footnote 499 above.

monitoring. Key parameters to be monitored include the condition of the aquifer and the utilization of the aquifer as noted in paragraph (4) of the present commentary. The data on the condition of the aquifer relate to extent, geometry, flow path, hydrostatic pressure distribution, quantities of flow, hydrochemistry, etc., and are equivalent to those fields listed in paragraph 1 of draft article 8.

(9) While the general obligations are couched in mandatory language, the modalities for achieving compliance with the main obligations remain recommendatory, in order to facilitate compliance by States. It is also noted that the aquifers to be monitored are ones that are being utilized.

Article 13. Management

Aquifer States shall establish and implement plans for the proper management of their transboundary aquifer or aquifer system in accordance with the provisions of the present draft articles. They shall, at the request by any of them, enter into consultations concerning the management of the transboundary aquifer or aquifer system. A joint management mechanism shall be established, wherever appropriate.

Commentary

(1) Draft article 13 sets out the obligation of the aquifer States to establish and implement plans for the proper management of their transboundary aquifer. In view of the sovereignty over the aquifer located in the State's territory and the need for cooperation among aquifer States, two kinds of obligations are introduced in the present draft article: 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.

(2) Paragraph 2 of article 24 of the 1997 Watercourses Convention provides that " 'management' refers, in particular, to: (*a*) Planning the sustainable development of an international watercourse and providing for the implementation of any plans adopted; and (*b*) Otherwise promoting the rational and optimal utilization, protection and control of the watercourse". Exactly the same definition is accepted in the 2000 Revised Protocol on Shared Watercourses in the Southern African Development Community. This protocol entered into force in 2003. Such a definition can be used in the present subject *mutatis mutandis*.

(3) The rules in relation to the management of transboundary aquifers are provided in Part II. The obligations to utilize them in an equitable and reasonable manner, not to cause harm to other States and to cooperate with other aquifer States are the basis of the proper management of transboundary aquifers. The term "management" encompasses the measures to be taken for the maximization of the long-term benefits derived from the utilization of aquifers. It also includes the protection and preservation of transboundary aquifers.

(4) The first sentence of this draft article states an obligation for each aquifer State to establish plans with regard to its aquifer and to implement them for the proper management of the aquifer, taking into due consideration the rights of the other aquifer States concerned. The second sentence requires that State to enter into consultations concerning the management of the transboundary aquifer, if any other aquifer State should so request. The last sentence mandates that a joint management mechanism be established wherever appropriate. The Commission felt that the strengthening of this obligation was particularly important in the light of the value placed by groundwater experts on the joint management of transboundary aquifers. It was also recognized that, in practice, it may not always be possible to establish such a mechanism. The outcome of the consultations is left in the hands of the States concerned. States have established numerous joint commissions, many of which are charged with management. In particular, the modes of 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. Most of the transboundary aquifers in Europe are rather small and are managed often on the transfrontier level or by local municipalities. Such cooperation between local authorities should be encouraged. Thus the present draft article refers to a joint management "mechanism" rather than an organization in order to provide for such less formal means of joint management.

(5) The Convention on the Protection and Use of Transboundary Watercourses and International Lakes provides for the obligation of the management of the water resources "so that the needs of the present generation are met without compromising the ability of future generations to meet their own needs" (art. 2). The 1999 Protocol on Water and Health to the 1992 Convention on the Protection and Use of Transboundary Watercourses and International Lakes further clarifies the elements to be considered for the purpose of water management. The Framework Convention on the Protection and Sustainable Development of the Carpathians sets out the obligation of "river basin management" (art. 4). The African Convention on the Conservation of Nature and Natural Resources provides for the obligation to "manage their water resources so as to maintain them at the highest possible quantitative and qualitative levels" (art. VII).

(6) There are some examples in which a regional institution or mechanism is established for the purpose of the management of a specific transboundary aquifer. The 2000 Revised Protocol on Shared Watercourses in the Southern African Development Community "seeks to: … promote and facilitate the establishment of shared watercourse agreements and Shared Watercourse Institutions for the management of shared watercourses" (art. 2). The 2002 Framework Agreement on the Sava River Basin provides for the obligation to "cooperate … to achieve [the e]stablishment of sustainable water management" (art. 2). It also sets out the obligation "to develop joint and/or integrated Plan on the management of the water resources of the Sava River Basin" (art. 12). The Convention on the sustainable management of Lake Tanganyika sets out the obligation of the management of the natural resources of Lake Tanganyika and establishes the Lake Tanganyika Authority. One of the functions of this Authority is to advance and represent the common

interest of the contracting States in matters concerning the management of Lake Tanganyika and its Basin. The 2003 Protocol for Sustainable Development of Lake Victoria Basin provides for the obligations of parties and the Commission established by this Protocol with regard to the management plans for the conservation and the sustainable utilization of the resources of the Basin.

Part IV

ACTIVITIES AFFECTING OTHER STATES

Article 14. Planned activities

1. When a State has reasonable grounds for believing that a particular planned activity in its territory may affect a transboundary aquifer or aquifer system and thereby may have a significant adverse effect upon another State, it shall, as far as practicable, assess the possible effects of such activity.

2. Before a State implements or permits the implementation of planned activities which may affect a transboundary aquifer or aquifer system and thereby may have a significant adverse effect upon another State, it shall provide that State with timely notification thereof. Such notification shall be accompanied by available technical data and information, including any environmental impact assessment, in order to enable the notified State to evaluate the possible effects of the planned activities.

3. If the notifying and the notified States disagree on the possible effect of the planned activities, they shall enter into consultations and, if necessary, negotiations with a view to arriving at an equitable resolution of the situation. They may utilize an independent fact-finding body to make an impartial assessment of the effect of the planned activities.

Commentary

(1) The 1997 Watercourses Convention has nine articles on planned measures which may have a significant adverse effect upon other watercourse States. They set out detailed procedures to be followed by the States concerned. In the case of international watercourses, there have been a number of large development projects and related disputes among the States concerned, and detailed procedures to avoid disputes and mitigate such disputes were required. In the case of transboundary aquifers, detailed procedures for dealing with planned activities have not yet been developed and it seems to be the general preference to have simpler procedural requirements which could be provided only in one draft article. Draft article 14 has a broader scope in that it applies to any State that has reasonable grounds for believing that a planned activity in its territory could affect a transboundary aquifer or aquifer system and thereby cause a significant adverse effect on another State, whether it is an aquifer State or not. Thus, the provision does not apply only to aquifer States.

(2) The activities to be regulated in this draft article could be carried out either by States, their subsidiary organs or private enterprises. In order to fulfil the obligations under this draft article in Part IV on activities affecting other States, States must know in advance all the planning of such activities and therefore must establish the domestic legal regime which requires the authorization by the States of such activities.

(3) Paragraph 1 sets out the minimum obligation of a 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 are likely to have an impact upon those aquifers. Such an obligation should be distinguished from the general obligations in Part III concerning protection, preservation and management, in the sense that it is closely related to the planning of activities. In addition to the measures to be taken under Part III, an aquifer State is under the obligation to undertake assessment of any adverse effects of a planned activity on the transboundary aquifers. This obligation is a minimum requirement in two senses. First, a State is required to assess the potential effects of the planned activity only when it has reasonable grounds for anticipating the probability of adverse effects. Second, the State is not under this obligation if the assessment is not practicable.

(4) The obligation of the assessment by a State that is planning a particular activity is provided in a wide variety of treaties and conventions. For example, the 1985 ASEAN Agreement on the Conservation of Nature and Natural Resources sets forth the obligation to "endeavour … to make environmental impact assessment before engaging in any activity that may create a risk of significantly affecting the environment or the natural resources of another Contracting Party or the environment or natural resources beyond national jurisdiction" (art. 20). The 2003 African Convention on the Conservation of Nature and Natural Resources provides for the obligation to "ensure that policies, plans, programmes, strategies, projects and activities likely to affect natural resources, ecosystems and the environment in general are the subject of adequate impact assessment at the earliest possible stage" (art. XIV). The 1998 Agreement on cooperation for the protection and sustainable use of the waters of the Spanish–Portuguese hydrographic basins provides that "[t]he Parties shall adopt the necessary provisions to ensure that projects and activities covered by this Agreement which, owing to their nature, size and location, must be subjected to transborder impact assessment are so assessed before they are approved" (art. 9).[526]

(5) The importance of the environmental impact assessment is also indicated in the instruments prepared by the United Nations. For example, the 1989 Charter on Ground-Water Management prepared by UNECE provides that "[a]ll projects in any economic sector expected to affect aquifers adversely should be subject to an assessment procedure aiming at evaluating the project's possible impact on the water régime and/or the quality of ground-water resources, with particular attention to the important role ground water plays in the ecological system" (art. XIV).[527] Chapter 18 of Agenda 21 (1992), entitled "Protection of the Quality and Supply of Freshwater Resources: Application of Integrated Approaches to the

[526] See footnote 519 above.

[527] See footnote 523 above.

Development, Management and Use of Water Resources", suggests that all States could implement "mandatory environmental impact assessment of all major water resource development projects potentially impairing water quality and aquatic ecosystems".[528]

(6) The results from the assessment contribute to the sound planning of the activity. They also constitute the basis for the further procedures in paragraphs 2 and 3. Those paragraphs establish 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 paragraph 1 indicates that such activity would cause an adverse effect on the transboundary aquifers and that it may have a significant adverse effect on other States, the original State is obliged under paragraph 2 to notify the States concerned of its finding. Such notification is to be accompanied by available technical data and information, including environmental impact assessment, and is to provide the potentially affected States with the necessary information to make their own evaluation of the possible effects of the planned activity.

(7) 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 effects of the planned activity, they have an obligation to endeavour to arrive at an equitable resolution of the situation in accordance with paragraph 3. 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 a scientific and impartial assessment of the effect of the planned activity. Article 33 of the 1997 Watercourses Convention provides for a compulsory recourse to such fact-finding. It seems that there exists no evidence as yet for such an obligation in relation to groundwaters. Accordingly, an optional reference to such a fact-finding mechanism is adopted.

(8) The procedure provided for in this draft article is triggered by the criterion that the planned activity may have "a significant adverse effect" upon other States. This threshold is lower than that of "significant harm" under draft article 6.

Part V

MISCELLANEOUS PROVISIONS

Article 15. Scientific and technical cooperation with developing States

States shall, directly or through competent international organizations, promote scientific, educational, technical and other cooperation with developing States for the protection and management of transboundary aquifers or aquifer systems. Such cooperation shall include, *inter alia*:

(*a*) training of their scientific and technical personnel;

(*b*) facilitating their participation in relevant international programmes;

(*c*) supplying them with necessary equipment and facilities;

(*d*) enhancing their capacity to manufacture such equipment;

(*e*) providing advice on and developing facilities for research, monitoring, educational and other programmes;

(*f*) providing advice on and developing facilities for minimizing the detrimental effects of major activities affecting transboundary aquifers or aquifer systems;

(*g*) preparing environmental impact assessments.

Commentary

(1) Draft article 15 deals with the scientific and technical cooperation with developing States. It should be highlighted that the term "cooperation" was preferred to the term "assistance" in this draft article. The term "cooperation" better represents the two-sided process necessary to foster sustainable growth in developing States. Under the first sentence of this provision, States are required to promote scientific, technical and other cooperation. The types of cooperation listed in the second sentence represent some of the various options available to States to fulfil the obligation set forth in the first sentence. States will not be required to engage in each of the types of cooperation listed, but will be allowed to choose their means of cooperation.

(2) 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. Scientific and technical cooperation with developing States has been provided through the competent international organizations. UNESCO-IHP plays a central role in this field and is the global intergovernmental scientific programme of the United Nations system which can respond to specific national and regional needs and demands. 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 individual States to promote scientific and technical cooperation.

(3) The obligation under this draft article is one of the modalities of cooperation among States and its roots are to be found in article 202 (Scientific and technical assistance to developing States) of the 1982 United Nations Convention on the Law of the Sea. The Stockholm Declaration[529] indicates the importance of technological assistance as a supplement to the domestic effort of the

[528] *Report of the United Nations Conference on Environment and Development, Rio de Janeiro, 3–14 June 1992* (see footnote 301 above), para. 40.

[529] See footnote 312 above.

development and the special consideration of developing States for the purpose of development and environmental protection (Principles 9 and 12). The Rio Declaration[530] suggests the common but differentiated responsibilities in Principle 7. Principle 9 of this Declaration provides that "States should cooperate to strengthen endogenous capacity-building for sustainable development by improving scientific understanding through exchanges of scientific and technological knowledge, and by enhancing the development, adaptation, diffusion and transfer of technologies, including new and innovative technologies".

(4) The cooperation under this draft article mainly focuses on scientific, educational and technical cooperation. The expression "other cooperation" covers other possible modes of cooperation, for example, procedural or legal assistance to establish appropriate programmes or systems. This list follows the one provided in article 202 of the United Nations Convention on the Law of the Sea. It would be appropriate to place the emphasis upon cooperation 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 cooperation will contribute to the development of mutual cooperation among developing States in the future. The list is not exhaustive.

(5) The elements of cooperation stipulated in this draft article are also mentioned in several conventions and treaties. The Convention on the Protection and Use of Transboundary Watercourses and International Lakes provides for the obligation of mutual assistance. The Protocol on Water and Health to the 1992 Convention on the Protection and Use of Transboundary Watercourses and International Lakes emphasizes the importance of the "education and training of the professional and technical staff who are needed for managing water resources and for operating systems of water supply and sanitation" and of the "updating and improvement of their knowledge and skills" (art. 9). Article 14 of this Protocol enumerates the aspects in which international support for national action is required as follows:

> (*a*) [p]reparation of water-management plans in transboundary, national and/or local contexts and of schemes for improving water supply and sanitation; (*b*) [i]mproved formulation of projects, especially infrastructure projects, in pursuance of such plans and schemes, in order to facilitate access to sources of finance; (*c*) [e]ffective execution of such projects; (*d*) [e]stablishment of systems for surveillance and early-warning systems, contingency plans and response capacities in relation to water-related disease; (*e*) [p]reparation of legislation needed to support the implementation of this Protocol; (*f*) [e]ducation and training of key professional and technical staff; (*g*) [r]esearch into, and development of, cost-effective means and techniques for preventing, controlling and reducing water-related disease; (*h*) [o]peration of effective networks to monitor and assess the provision and quality of water-related services, and development of integrated information systems and databases; (*i*) [a]chievement of quality assurance for monitoring activities, including inter-laboratory comparability.

It is also noted that the 1994 Convention to combat desertification in those countries experiencing serious drought and/or desertification, particularly in Africa, provides a specific article regarding the obligations of developed country parties in article 6. It enumerates such obligations and one of them is to "promote and facilitate access by affected country Parties, particularly affected developing country Parties, to appropriate technology, knowledge and know-how".

(6) The obligation of mutual cooperation is also provided in regional conventions. One of the examples is the 2003 African Convention on the Conservation of Nature and Natural Resources, which sets out the obligation to "encourage and strengthen cooperation for the development and use, as well as access to and transfer of, environmentally sound technologies on mutually agreed terms", and, to this effect, to "adopt legislative and regulatory measures which provide for, *inter alia*, economic incentives for the development, importation, transfer and utilization of environmentally sound technologies in the private and public sectors" (art. XIX).

(7) The importance of the scientific and technical assistance is also mentioned in other non-binding declarations. The Mar del Plata Action Plan adopted by the United Nations Water Conference in 1977 points out the lack of sufficient scientific knowledge about water resources. With regard to groundwater, it recommends that the countries should:

> (i) Offer assistance for the establishment or strengthening of observational networks for recording quantitative and qualitative characteristics of ground-water resources;
>
> (ii) Offer assistance for the establishment of ground-water data banks and for reviewing the studies, locating gaps and formulating programmes of future investigations and prospection;
>
> (iii) Offer help, including personnel and equipment, to make available the use of advanced techniques, such as geophysical methods, nuclear techniques, mathematical models etc.[531]

(8) Chapter 18 of Agenda 21 adopted by the United Nations Conference on Environment and Development (1992) points out that one of the four principal objectives to be pursued is "[t]o identify and strengthen or develop, as required, in particular in developing countries, the appropriate institutional, legal and financial mechanisms to ensure that water policy and its implementation are a catalyst for sustainable social progress and economic growth".[532] It also suggests that:

> [a]ll States, according to their capacity and available resources, and through bilateral or multilateral cooperation, including the United Nations and other relevant organizations as appropriate, could implement the following activities to improve integrated water resources management: … Development and strengthening, as appropriate, of cooperation, including mechanisms where appropriate, at all levels concerned, namely: … (iv) At the global level, improved delineation of responsibilities, division of labour and coordination of international organizations and programmes, including facilitating discussions and sharing of experiences in areas related to water resources management.[533]

It also points out that one of the three objectives to be pursued concurrently to integrate water-quality elements into

[530] See footnote 301 above.

[531] See footnote 511 above.

[532] *Report of the United Nations Conference on Environment and Development, Rio de Janeiro, 3–14 June 1992* (see footnote 301 above), para. 9 d.

[533] *Ibid.*, para. 12.

water resource management is "human resources development, a key to capacity-building and a prerequisite for implementing water-quality management".[534] The Plan of Implementation of the World Summit on Sustainable Development (2002) also mentions technical assistance (chap. IV, para. 25).[535]

Article 16. Emergency situations

1. For the purpose of the present draft article, "emergency" means a situation, resulting suddenly from natural causes or from human conduct, that poses an imminent threat of causing serious harm to aquifer States or other States.

2. Where an emergency affects a transboundary aquifer or aquifer system and thereby poses an imminent threat to States, the following shall apply:

(*a*) The State within whose territory the emergency originates shall:

(i) without delay and by the most expeditious means available, notify other potentially affected States and competent international organizations of the emergency;

(ii) in cooperation with potentially affected States and, where appropriate, competent international organizations, immediately take all practicable measures necessitated by the circumstances to prevent, mitigate and eliminate any harmful effect of the emergency;

(*b*) States shall provide scientific, technical, logistical and other cooperation to other States experiencing an emergency. Cooperation may include coordination of international emergency actions and communications, making available trained emergency response personnel, emergency response equipments and supplies, scientific and technical expertise and humanitarian assistance.

3. Where an emergency poses a threat to vital human needs, aquifer States, notwithstanding draft articles 4 and 6, may take measures that are strictly necessary to meet such needs.

Commentary

(1) Draft article 16 deals with the obligations of States in responding to actual emergency situations that are related to transboundary aquifers. It is to be contrasted with draft article 11 which deals with the prevention and mitigation of conditions that may be harmful to aquifer States. The 1997 Watercourses Convention contains a similar provision in article 28. In the case of aquifers, emergencies might not be as numerous and destructive as in the case of watercourses. However, 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 Banda 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 address such situations.

(2) Paragraph 1 gives the definition of "emergency". The commentary to paragraph 1 of article 28 of the 1997 Watercourses Convention explains that the definition of "emergency" contains a number of important elements, and includes several examples that are provided for purposes of illustration. As defined, an "emergency" must cause, or pose an imminent threat of causing, "serious harm" to other States. The seriousness of the harm involved, together with the suddenness of the emergency's occurrence, justifies the measures required by the draft article. The expression "other States" refers to both aquifer and non-aquifer States that might be affected by an emergency. These would usually be the States in whose territories either aquifers or the recharge or discharge zones are located. The situation constituting an emergency must arise "suddenly". However, the provision covers the case where the "emergency" can be expected by weather forecast.

(3) As the emergency situation would pose "an imminent threat of causing serious harm", the State in whose territory the emergency originates is obligated under paragraph 2, subparagraph (*a*) (i) to notify, "without delay and by the most expeditious means available", other potentially affected States and competent international organizations of the emergency. A similar obligation is contained, for example, in the 1986 Convention on early notification of a nuclear accident, the 1982 United Nations Convention on the Law of the Sea and a number of agreements concerning transboundary aquifers. "Without delay" means immediately upon learning of the emergency, and the phrase "by the most expeditious means available" means that the most rapid means of communication that is accessible is to be utilized. The States to be notified are not confined to aquifer States, since non-aquifer States may also be affected by an emergency. The subparagraph also calls for the notification of "competent international organizations". Such an organization would have to be competent to participate in responding to the emergency by virtue of its constituent instrument. Most frequently, such an organization would be one established by the aquifer States to deal, *inter alia*, with emergencies. Finally, the situation may result either "from natural causes or from human conduct". While there may well be no liability on the part of a State for the harmful effects in another State of an emergency originating in the former and resulting entirely from natural causes, the obligations under paragraph 2, subparagraphs (*a*) and (*b*) would nonetheless apply to such an emergency.

(4) Paragraph 2, subparagraph (*a*) (ii) requires that a State within whose territory an emergency originated "immediately take all practicable measures … to prevent, mitigate and eliminate any harmful effect of the emergency". The effective action to counteract most emergencies resulting from human conduct is that to be

[534] *Ibid.*, para. 38 *c*.

[535] See footnote 416 above.

taken where the industrial accident, vessel grounding or other incident occurs. However, the paragraph requires only that all "practicable" measures be taken, meaning those that are feasible, workable and reasonable. Further, only such measures as are "necessitated by the circumstances" need to be taken, meaning those that are warranted by the factual situation of the emergency and its possible effect upon other States. Like paragraph 2, subparagraph (*a*) (i), paragraph 2, subparagraph (*a*) (ii) foresees the possibility that there will be a competent international organization, such as a joint commission, with which the States may cooperate in taking the requisite measures. And finally, cooperation with potentially affected States (again including non-aquifer States) is also provided for. Such cooperation may be especially appropriate in the case of contiguous aquifers or aquifer systems or where a potentially affected State is in a position to render cooperation in the territory of the aquifer State where the emergency originated.

(5) The obligation of immediate notification to other States of any natural disasters or other emergencies that are likely to produce sudden harmful effects on the environment of those States is suggested in Principle 18 of the Rio Declaration.[536] Several regional conventions provide for the obligation of notification without delay to the potentially affected States, regional commission or agency and other competent organizations. They are, for example, the 2000 Revised Protocol on Shared Watercourses in the Southern African Development Community, the 2002 Tripartite Interim Agreement Between the Republic of Mozambique, the Republic of South Africa and the Kingdom of Swaziland for Co-operation on the Protection and Sustainable Utilisation of the Water Resources of the Incomati and Maputo Watercourses, the 2003 Convention on the sustainable management of Lake Tanganyika and the 2003 Protocol for Sustainable Development of Lake Victoria Basin. The 2003 African Convention on the Conservation of Nature and Natural Resources sets out the right of the State party to be provided with all relevant available data by the other party in whose territory environmental emergency or natural disaster occurs and is likely to affect the natural resources of the former State.

(6) Some of the conventions have established mechanisms or systems for the early notification of emergency situations. The Convention on the Protection and Use of Transboundary Watercourses and International Lakes provides that "[t]he Riparian Parties shall without delay inform each other about any critical situation that may have transboundary impact" (art. 14) and provides for the obligation to set up, where appropriate, and to operate coordinated or joint communication, warning and alarm systems. The 1994 Convention on cooperation for the protection and sustainable use of the river Danube establishes "coordinated or joint communication, warning and alarm systems" (art. 16) and provides for the obligation to consult on ways and means of harmonizing domestic communication, warning and alarm systems and emergency plans. The 1998 Agreement on cooperation for the protection and sustainable use of the waters of the Spanish–Portuguese hydrographic basins[537] provides for the obligation of the parties to establish or improve joint or coordinated communication systems to transmit early warning or emergency information.

(7) Paragraph 2, subparagraph (*b*) sets out the obligation of assistance by all States regardless of whether they are experiencing in any way the serious harm arising from an emergency. Groundwater scientists and administrators are unanimous in recognizing the need for joint efforts by all States to cope effectively with an emergency. Assistance required would relate to coordination of emergency actions and communication, providing trained emergency response personnel, response equipments and supplies, and extending scientific and technical expertise and humanitarian assistance.

(8) UNESCO-IHP has the project entitled "Groundwater for Emergency Situations". The aim of the project is to consider natural and man-induced catastrophic events that could adversely influence human health and life and to identify in advance potential safe, low vulnerability groundwater resources which could temporarily replace damaged supply systems. Secure drinking water for endangered populations is one of the highest priorities during and immediately after disasters.

(9) Paragraph 3 provides for exceptions to the obligations under draft articles 4 and 6 in an emergency. Aquifer States may temporarily derogate from the obligations under those draft articles where water is critical for the population to alleviate an emergency situation. Although the 1997 Watercourses Convention does not contain such a clause in the case of aquifers, special account should be taken in an emergency situation of vital human needs. For example, in the case of natural disasters, such as earthquakes or floods, an aquifer State must immediately satisfy its population's need for drinking water. In the case of watercourses, States could meet such a requirement without derogation from the obligations, as the recharge of the water to the watercourses would likely be sufficient. However, in the case of the aquifers, the States concerned would not be able to do so, as there would be no recharge or little recharge. Accordingly, States must be entitled to exploit the aquifer temporarily without fulfilling their obligations under draft articles 4 and 6. However, the present article deals only with the temporary derogation. There might be cases where States would not be able to fulfil the obligations in other draft articles also in an emergency. In such a case, States could invoke such circumstances precluding wrongfulness in general international law, such as *force majeure*, distress or necessity.

Article 17. Protection in time of armed conflict

Transboundary aquifers or aquifer systems and related installations, facilities and other works shall enjoy the protection accorded by the principles and rules of international law applicable in international and non-international armed conflicts and shall not be used in violation of those principles and rules.

[536] See footnote 301 above.

[537] See footnote 519 above.

Commentary

(1) Draft article 17 concerns the protection to be accorded to transboundary aquifers and related installations in time of armed conflict. The 1997 Watercourses Convention contains an article regarding the same subject and the basic idea of the present article is the same. 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 17 does no more than to refer to each of these categories of principles and rules.

(2) Draft article 17 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. The draft article's principal function is to serve as a reminder to all States of the applicability of the law of armed conflict to transboundary aquifers.

(3) 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 in times 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 17 makes it clear that the rules and principles governing armed conflict apply, including various provisions of conventions on international humanitarian law to the extent that the States in question are bound by them. For example, the poisoning of water supplies is prohibited by the Hague Convention 1907 (IV) respecting the Laws and Customs of War on Land and article 54 of the 1977 Protocol additional to the Geneva Conventions of 12 August 1949, and relating to the protection of victims of international armed conflicts (Protocol I), while article 56 of that Protocol protects dams, dikes and other works from attacks that "may cause the release of dangerous forces and consequent severe losses among the civilian population". Similar protections apply in non-international armed conflicts under articles 14 and 15 of the Protocol additional to the Geneva Conventions of 12 August 1949, and relating to the protection of victims of non-international armed conflicts (Protocol II). Also relevant to the protection of water resources in time of armed conflict is the provision of Protocol I that "[c]are shall be taken in warfare to protect the natural environment against widespread, long-term and severe damage" (art. 55). In cases not covered by a specific rule, certain fundamental protections are afforded by the "Martens clause". That clause, which was originally inserted in the Preamble of the Hague Conventions respecting the Laws and Customs of War on Land of 1899 and 1907 and has subsequently been included in a number of conventions and protocols, now has the status of general international law. In essence, it provides that even in cases not covered by specific international agreements, civilians and combatants remain under the protection and authority of the principles of international law derived from established custom, the principles of humanity and the dictates of public conscience. Paragraph 2 of draft article 5 of the present draft articles provides that in reconciling a conflict between utilizations of transboundary aquifers, special attention is to be paid to the requirement of vital human needs.

Article 18. Data and information concerning national defence or security

Nothing in the present draft articles obliges a State to provide data or information the confidentiality of which is essential to its national defence or security. Nevertheless, that State shall cooperate in good faith with other States with a view to providing as much information as possible under the circumstances.

Commentary

(1) Draft article 18 creates a very narrow exception to the requirement of draft articles requiring provision of information. The same rule is provided in the 1997 Watercourses Convention. States cannot realistically be expected to agree to the release of information that is vital to their national defence 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 18 therefore requires the State withholding information to "cooperate in good faith with other 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. The 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 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 18 is without prejudice to the obligations of the planning State under draft articles 4 and 6.

(2) The inclusion of this draft article was one of the most contentious issues discussed in the Commission. Some members were of the view that such a provision could lend itself to abuse and had difficulty imagining a situation where national security issues should take precedence over the other provisions of the draft articles. They were of the view that such an article should not be included. It was also stressed that article 31 of the 1997 Watercourses Convention limited the discretion of the State for exemption to a much higher extent. It requires the data and information to be vital (and not essential) to its national defence and security. Other members expressed the view that such protection was of utmost importance to States and would be called for by the Sixth Committee. They argued that, in many circumstances, the draft articles required States to share more information than

was strictly necessary for the protection of the aquifer and aquifer system. Moreover, they were of the view that the protection of information vital to national security would not unduly interfere with the functioning of the other provisions of the draft articles.

(3) It is also noted that a suggestion was made to add the protection of industrial secrets and intellectual property to the text of the draft article, in line with article 14 of the draft articles on prevention of transboundary harm from hazardous activities.[538] However, some members considered that it was unclear whether such a protection was necessary or helpful in the case of transboundary aquifers and expressed concern that such an exemption might be too broad in the groundwater context. In any event, the existence of intellectual property could be one of the factors to be considered in determining what data is readily available under draft article 8.

Article 19. Bilateral and regional agreements and arrangements

For the purpose of managing a particular transboundary aquifer or aquifer system, aquifer States are encouraged to enter into a bilateral or regional agreement or arrangement among themselves. Such agreement or arrangement may be entered into with respect to an entire aquifer or aquifer system or any part thereof or a particular project, programme or utilization except insofar as the agreement or arrangement adversely affects, to a significant extent, the utilization, by one or more other aquifer States of the water in that aquifer or aquifer system, without their express consent.

Commentary

(1) The importance of bilateral or regional agreements and arrangements that take due account of the historical, political, social and economic characteristics of the region and of the specific transboundary aquifer must be stressed. The first sentence calls upon the aquifer States to cooperate among themselves and encourages them to enter into bilateral or regional agreements or 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.[539] It also corresponds to the "watercourse agreements" provided for in article 3 of the 1997 Watercourses Convention. In the case of surface watercourses, numerous bilateral and regional agreements have been concluded. However, in the case of groundwater, such international collective measures are still in an embryonic stage and the framework for cooperation remains to be properly developed. Therefore, the term "arrangement" has been added in this paragraph This paragraph also provides that the States concerned should have equal opportunity to participate in such agreements or arrangements.

(2) Such agreements or arrangements may be entered into with respect to an entire aquifer or aquifer system or any part thereof or a particular project, programme or utilization. When an agreement or arrangement is for the entire aquifer or aquifer system, all the aquifer States sharing the same aquifer or aquifer system are most likely to be involved except for some rare cases. On the other hand, when an agreement or arrangement is for any part of the aquifer or aquifer system or for a particular project, only a few of the aquifer States sharing the same aquifer would be involved. In any event, the second sentence obligates the aquifer States not to enter into an agreement or arrangement which would adversely affect the position of the excluded aquifer States without their express consent. It does not mean to give a veto power to those other States.

[538] *Yearbook ... 2001*, vol. II (Part Two) and corrigendum, pp. 166–167.

[539] United Nations Convention on the Law of the Sea, article 118 (Co-operation of States in the conservation and management of living resources) and article 197 (Co-operation on a global or regional basis).

Chapter VII

RESPONSIBILITY OF INTERNATIONAL ORGANIZATIONS

A. Introduction

77. At its fifty-second session (2000), the Commission decided to include the topic "Responsibility of international organizations" in its long-term programme of work.[540] The General Assembly, in paragraph 8 of its resolution 55/152 of 12 December 2000, took note of the Commission's decision with regard to the long-term programme of work, and of the syllabus for the new topic annexed to the Commission's 2000 report to the General Assembly on the work of its fifty-second sesson. The General Assembly, in paragraph 8 of its resolution 56/82 of 12 December 2001, requested the Commission to begin its work on the topic "Responsibility of international organizations".

78. At its fifty-fourth session, in 2002, the Commission decided to include the topic in its programme of work and appointed Mr. Giorgio Gaja as Special Rapporteur for the topic.[541] At the same session, the Commission established a working group on the topic.[542] The Working Group in its report[543] briefly considered the scope of the topic, the relations between the new project and the draft articles on responsibility of States for internationally wrongful acts adopted by the Commission at its fifty-third session,[544] questions of attribution, issues relating to the responsibility of member States for conduct that is attributed to an international organization, and questions relating to the content of international responsibility, implementation of responsibility and settlement of disputes. At the end of its fifty-fourth session, the Commission adopted the report of the Working Group.[545]

79. From its fifty-fifth (2003) to its fifty seventh (2005) sessions, the Commission had received and considered three reports from the Special Rapporteur,[546] and provisionally adopted draft articles 1 to 16 [15].[547]

[540] *Yearbook … 2000*, vol. II (Part Two), p. 131, para. 729.

[541] *Yearbook … 2002*, vol. II (Part Two), p. 93, paras. 461–463.

[542] *Ibid.*, para. 462.

[543] *Ibid*., pp. 93–96, paras. 465–488.

[544] *Yearbook ... 2001*, vol. II (Part Two) and corrigendum, p. 26, para. 76.

[545] *Yearbook … 2002*, vol. II (Part Two), p. 93, para. 464.

[546] Preliminary report: *Yearbook … 2003*, vol. II (Part One), document A/CN.4/532; second report: *Yearbook ... 2004*, vol. II (Part One), document A/CN.4/541; and third report: *Yearbook ... 2005*, vol. II (Part One), document A/CN.4/553.

[547] Draft articles 1 to 3 were adopted at the fifty-fifth session (*Yearbook … 2003*, vol. II (Part Two), p. 18, para. 49), draft articles 4 to 7 at the fifty-sixth session (*Yearbook ... 2004*, vol. II (Part Two), p. 46, para. 69) and draft articles 8 to 16 [15] at the fifty-seventh session (*Yearbook ... 2005*, vol. II (Part Two), para. 203).

B. Consideration of the topic at the present session

80. At the present session, the Commission had before it the fourth report of the Special Rapporteur (A/CN.4/564 and Add.1–2), as well as written comments received so far from international organizations and from governments.[548]

81. The fourth report of the Special Rapporteur, like the previous reports, followed the general pattern of the articles on responsibility of States for internationally wrongful acts.

82. The fourth report contained 13 draft articles. Eight draft articles corresponded to those contained in Chapter V of the articles on responsibility of States for internationally wrongful acts, under the heading "Circumstances precluding wrongfulness". Five draft articles dealt with the responsibility of a State in connection with the wrongful act of an international organization.

83. The Special Rapporteur presented the eight draft articles relating to circumstances precluding wrongfulness, namely, draft articles 17 to 24: article 17 (Consent),[549] article 18 (Self-defence),[550] article 19 (Countermeasures),[551]

[548] Following the recommendations of the Commission (*Yearbook … 2002*, vol. II (Part Two), pp. 93–96, paras. 464–488, and *Yearbook … 2003*, vol. II (Part Two), p. 18, para. 52), the Secretariat, on annual basis, has been circulating the relevant chapter, included in the Commission's report to the General Assembly on the work at its session, to international organizations asking for their comments and for any relevant materials which they could provide to the Commission. For comments from Governments and international organizations, see *Yearbook ... 2004*, vol. II (Part One), documents A/CN.4/545 and A/CN.4/547, and *Yearbook ... 2005*, vol. II (Part One), document A/CN.4/556. See also document A/CN.4/568 and Add.1 (reproduced in *Yearbook … 2006*, vol. II (Part One)).

[549] Draft article 17 reads as follows:

"*Article 17. Consent*

"Valid consent by a State or an international organization to the commission of a given act by another international organization precludes the wrongfulness of that act in relation to that State or the former organization to the extent that the act remains within the limits of that consent."

[550] Draft article 18 reads as follows:

"*Article 18. Self-defence*

"The wrongfulness of an act of an international organization is precluded if the act constitutes a lawful measure of self-defence taken in conformity with the Charter of the United Nations."

[551] Draft article 19 reads as follows:

"Article 19. Countermeasures

"Alternative A

"[...]

"Alternative B

"The wrongfulness of an act of an international organization not in conformity with an international obligation towards another international organization [or a State] is precluded if and to the extent that the act constitutes a lawful countermeasure taken against the latter organization [or the State]."