

Experts Consultation Meeting
Transboundary aquifers
Hydrogeology and International Law
UNESCO, Paris, 07 to 09 March 2005

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With a contribution from Mr Jac van der Gun

Meeting Report

In the frame of its commitment to support the work of the Special Rapporteur of the International Law Commission on the issue of Transboundary Aquifers, the International Hydrological Program of UNESCO convened a meeting on “Transboundary Aquifers/Hydrogeology and International Law” with a particular focus on the Americas, 7-9 March 2005, in Paris, France.

The meeting was attended by groundwater experts, hydrogeologists and lawyers (See Annex 2 List of Participants), involved in transboundary aquifers issues and programs, in order to identify regional priorities, characteristics of transboundary aquifers and state practices in the Americas, and to create a common language between lawyers and hydrogeologists.

Day 1

The meeting was opened by *Mr A. Szöllosi-Nagy*, Deputy Assistant Director-General for Natural Sciences, Secretary, International Hydrological Programme. In his address, *Mr Szöllosi-Nagy*, underlined the importance of the on-going support to the UN-ILC work on an International Groundwater Framework Instrument. UNESCO has adopted water as a first priority and the groundwater activities, including the ISARM initiative represent a large and growing section under the IHP’s projects. He emphasized the importance of good water governance and in exposing examples of UNESCO/IHP’s activities he mentioned the focus on conflict resolution and the UNESCO PCCP project as one significant approach to enhance capacity in management of internationally shared water resources. He also mentioned the role of IHP in education and capacity building in the water sector.

He was followed by *Ambassador Yamada*, Special Rapporteur of the International Law Commission on the topic of “Shared natural resources”. Ambassador Yamada expressed his appreciation of the opportunity he had to attend the meeting, and of the scientific and technical support he is receiving from UNESCO.

The agenda was then adopted. Mr Bo G. Appelgren was elected as chairman. Ms Raya Stephan, Mr Jac van der Gun and Mr Richard Paisley were designated as rapporteurs.

Subsequently each of the meeting participants introduced himself.

Two first presentations introduced to the participants the UNESCO International Hydrological Program, which had convened the meeting.

Ms Aureli presented the Program itself and focused on the groundwater resources activities. She was followed by Ms Raya Marina Stephan who presented the UNESCO/IHP ISARM (Internationally Shared Aquifer Resources Management) Project and its recent regional developments, as well as the cooperation with the Special Rapporteur of the UN-ILC with ad-hoc group of experts.

This was followed by a series of individual presentations by the participants on regional projects, bilateral and national situations regarding groundwater. They are summarised as follows:

Mr. Nelson da Franca Ribeiro dos Anjos presented the development of ISARM in the Americas. 25 countries are actively participating in the project, and have established a network of national coordinators. This has allowed the identification of 60 transboundary aquifers. *Mr da Franca* insisted on the growing importance of the legal issue in the ISARM project in the Americas, especially since the second workshop which took place in El Paso, Texas, November 2004.

Mr. Luiz Amore spoke about the Guarani Aquifer Project, and the lessons learnt from the management of a groundwater system. The objective of the Guarani project is to support Argentina, Brazil, Paraguay and Uruguay to jointly elaborate and implement a coordinated institutional framework for managing the transboundary Guarani Aquifer System for current and future generations. Among its achievements to date, is the initiation of good management practice in identified “hot spots”, and the improvement of the knowledge on the aquifer.

Mr. Lloyd Woosley spoke on the subject of transboundary groundwater resources along the United States/Mexico border: challenges and opportunities from an American perspective. The international border between the United States and Mexico has experienced significant economic expansion, population growth, and urban development. Unsustainable groundwater development has caused severe environmental degradations. In recent years, awareness has grown on the need for information on transboundary aquifers. In the US, it has led to the establishment of the Good Neighbor Environmental Board (GNEB), an independent Presidential advisory board, that operates as an advisory group. Another recent initiative is the introduction to the Congress of the U.S.-Mexico Transboundary Aquifer Assessment Act. This act represents a multi-disciplinary, bi-national, scientific approach to help address complex, interrelated transboundary groundwater issues.

Mr Luis Antonio Rascon Mendoza spoke on the subject of groundwater resources management between the United States and Mexico from a Mexican perspective (CILA). He focused on the Hueco-Bolson aquifer, and the CILA (Comision Internacional de Limites y Aguas) agreement. The purpose of this agreement is the publication of a bi-national report with data exchanged through CILA, and the joint development of an aquifer model.

Mr Richard Kyle Paisley made a presentation on Transboundary groundwater in Canada with particular emphasis on British Columbia. His presentation included an overview of groundwater regulation in British Columbia, transboundary groundwater governance in Canada, and issues surrounding the transboundary “Abbotsford-Sumas” Aquifer that Canada shares with the United States.

Ms. Adele Hurley spoke on the subject of transboundary groundwater issues in the Great Lakes between Canada and the USA. She focused on the *process* of achieving sustainable management of groundwater resources and offered a tool kit of “lessons learnt”.

Ms. Lilian del Castillo Laborde discussed the role of national and international law in the sustainable development of groundwater in Argentina. She presented the hydrogeological regions of Argentina, and gave a very complete view of the water legal framework of the country at the federal and provincial levels. At the federal level, groundwater is still an incidental topic, while some provinces have specific regulations for groundwater. She also mentioned the inter-jurisdictional compacts and the international agreements on water, where no provision on groundwater exists.

Mr. Carlos Alejandro Arcelus spoke on the topic of domestic and transboundary groundwater issues in Uruguay. He presented the general aspects of the water legal framework of the country, and the main issues regarding groundwater management. Groundwater belongs to the public domain, and its exploration and development has to be authorised. He also exposed the Guarani Aquifer Management Plan in Uruguay, and the Raigon Aquifer sub-projects.

The last speaker for the first day, *Ms. Marcella Nanni* gave an overview of the legal aspects of groundwater management from a domestic and international perspective. Upon the participants request she presented the contents of the Bellagio Draft treaty. She also presented the tripartite consultation mechanism established for the SASS (Système Aquifere du Sahara Septentrional) between Algeria, Libya and Tunisia.

Lively and active debates took place between and after the presentations. The main issues raised are the following:

- The importance for the international community to unify the terms used (international/transboundary/multilateral...)
- The importance of data when dealing with any transboundary issue : the Parties need to agree on a minimum data and minimum understanding. This is essential for confidence building.
- The emerging awareness in the national and international level of groundwater identity as a special natural resource with particular features that require particular rules
- Such meetings and workshops are very useful in bringing people together, they get to talk together and to know each other. It is important in the case of the Guarani Aquifer.
- Lawyers have to get to understand science and hydrology to be able to regulate.
- The need to address quantity and quality issues of groundwater in a comprehensive approach and with specific rules in each case

On the importance of the monitoring in a transboundary groundwater situation the following comment was developed and emphasised:

Transboundary aquifer monitoring should be objective-based, that is designed to answer specific questions. The process for designing and implementing such a coordinated, transboundary effort should follow specific steps:

Step 1. Specify the priority questions that need to be answered by the monitoring program.

Establish a transboundary scoping team to define the priority *data-information objectives* (DIOs). i.e., the priority questions to be answered by the monitoring program, and the corresponding *data-quality objectives* (DQOs), i.e., the degree of accuracy needed for the answers, for all transboundary monitoring.

Step 2. Design the monitoring program.

After the DIOs and DQOs are agreed upon by all pertinent parties, a team of scientists can then proceed with developing the design of the monitoring program. DIOs will guide the selection of the monitoring/sampling approach, monitoring/sampling periods, and monitoring/sampling frequency and duration. DQOs are critical for the selection of appropriate sampling methods (clean hands (ppb) vs. dirty hands (ppm) protocols), laboratory methods (detection levels), and quality-assurance/quality control (QA/QC) requirements (type and number of field QC samples, documentation and record keeping).

Step. 3 Implement the monitoring program and communicate results to all interested parties.

The establishment of an objective-based, coordinated transboundary monitoring approach will result in the creation of a consolidated, scientifically-defensible, documented, publicly-available database. This offers numerous important scientific, diplomatic, regulatory, economic, and public-relations benefits:

1. Provides assurance that answers to important, pre-determined questions can be derived from the monitoring data.
2. Enables multiple parties (regulatory, resource management, and science agencies in the affected countries; third-party organizations; and public volunteers) to participate and contribute resources to the monitoring program, thus providing economic, public trust, and other efficiencies and benefits.
3. Limits the possibility that more than one organization will be monitoring the same site or well for the same parameters at different times which not only represents

- an inefficient use of limited monitoring funds, but can result in conflicting results and interpretations.
4. Requires the establishment and use of common data exchange standards and common field, laboratory, and QA/QC protocols and standards. Also results in the documentation of associated metadata to support future third-party review of the monitoring data by agencies in the affected countries, the courts, or all interested parties.
 5. Establishes the scientific heritage that government agencies, resource managers, scientists, non-governmental organizations, and the public will need to understand, explore, and mine to develop new information and interpretations for addressing questions that were not intended for the original data.
 6. Fosters an environment of cooperation, collaboration, buy-in, and confidence in the monitoring results and interpretations.

Day 2

After introductory words from the chairman and a brief recapitulation of the previous day's achievements, an interesting discussion developed on a number of relevant aspects, such as growing attention paid to legal aspects of transboundary aquifers; inconsistencies in terminology between lawyers and hydrogeologists; transboundary in both an international and a national context (in the case of federal States); scale of aquifers; the insufficient State practice to determine what rules apply to transboundary groundwater; the distinction between non-renewable and renewable groundwaters, the similarities between non-renewable and other mineral liquids such as oil, etc.

The morning programme was structured around five presentations. Two of them were global in perspective, another two had a national or regional focus (Paraguay and Europe, respectively), whereas a fifth one dealt with a number of selected regions scattered over the globe. Some information on each of these presentations will follow.

In his presentation 'Water and the IUCN Environmental Law Programme', *Mr Alejandro Iza* described the mission, organization and ongoing activities of the IUCN (International Union for Conservation of Natural Resources) and the mentioned programme. The IUCN unites some 1000 members (countries, organizations, including NGOs) and employs a similar number of people around the world. The environmental law network has around 900 members and is guided by a steering committee. It develops legislative tools, disseminates related information, responds to member demands and tries to link policy with practice. Attention is focused on the following regions: Central Asia, Africa and Indo-China.

A picture of 'Legal issues in groundwater in Paraguay' was given by *Ms Patricia Abed* from IDEA. Some legislation on water does exist in Paraguay, but not yet specifically on groundwater. Regarding ideas on groundwater ownership, evolution has taken place in

Paraguay towards the notion of state ownership. The general economic situation in the country does not allow any measures to be taken, they involve significant cost. Consequently, any form of financial compensation to neighboring countries in transboundary aquifer management is unfeasible.

Next presentation by *Ms Lena Salame* was on the PCCP project ('From Potential Conflict to Co-operation Potential'). This project is a contribution of UNESCO to WWAP with the objective to strengthen the capacity of key players in transboundary management and conflict resolution. The outputs include a chapter in the World Water Development Report, a UNESCO report and the contents of a website and a CD-ROM. The tracks of the current project phase are: research, education, technical assistance and awareness raising.

After this, *Mr Jean-François Donzier* gave an impression of the 'International Network of Basin Organizations' (INBO). This network organization counts 158 full members (institutions) in 52 countries in the Americas, Europe and Africa. The objectives are to promote links between water resources management organizations and to facilitate exchange of experiences. The network promotes integrated approach to water resources management and a number of principles in basin management (e.g. the need for cooperation agreements in the case of transboundary water resources). In addition, the European Water Framework Directive was briefly reviewed.

The final presentation of the morning programme was 'The European Council on Environmental Law contribution to sustainable management of water resources' by *Mr Henri Smets*. It addressed a number of important statements and issues by the Council, e.g. rethinking laws made under previous non-scarcity conditions regarding water; groundwater as a commodity; uncertainties due to observational difficulties; and the importance of water pricing and other economic instruments.

The presentations triggered a lively discussion, among others on the following:

- To what extent is the European experience relevant to the rest of the world? Will all countries have to follow the same path or not? Some concepts and practices are 'context sensitive' and therefore may not be applicable in some regions. General principles may be shared, but realities may differ enormously.
- Polluter pays principle and other economic instruments for management.
- Need for 'checks and balances' and for flexible application of measures.
- Interbasin transfers.
- Should groundwater and surface water be addressed separately or jointly as related water bodies
- River basin may not always be the appropriate unit to deal with groundwater.
- The relevance or not of local management and local decision making

After lunch, *Ambassador Chusei Yamada's* presentation 'Codification of the law on transboundary groundwaters by the UN International Law Commission' reviewed and commented a large number of aspects of the present version of the draft articles. There is still a lot of debate in the ILC on general principles such as equitable use, reasonable use and the obligation not to cause harm. It is scheduled to have a first version of the convention ready by 2006, then it will be submitted to governments for commenting,

while 2 or 3 years later the second version may be ready for negotiation at a diplomatic conference.

Later in the afternoon, *Ms Mariko Kanawo* gave an explanation on ‘ ‘Monitoring” and “technical assistance to the developing states” in the draft articles’. This was done on the basis of existing texts of conventions and other legal arrangements, put together in a draft paper that was circulated.

During the subsequent discussion, Ambassador Chusei Yamada was congratulated with the quality of the present document and a large number of comments were given which are summarized as follows:

- In the case of groundwater, the reasonable use is different from sustainable use: sustainable use brings in an additional element.
- The factors of the equitable and use principle are difficult to apply, and should be more adapted to groundwater (e.g to add the spatial distribution)
- Exchanging data is a complex process, data is not always available. Even in the case it is available, its standardization may take years.
- The local level (e. g the land use) should be emphasized. The main problems in aquifer management are related to human activities at the local level.
- Monitoring is difficult to implement, and the first step is to establish common parameters. Some parameters should be added to the monitoring. Parameters outside the aquifers such as land use patterns, abstraction rates should be considered.
- The human use for drinking purposes is to be emphasized

The participants were requested to send their comments after the meeting in a written form by e-mail.

Day 3

The day started with a brief recapitulation of the presentations and debates of Day 2.

The morning session included the last presentations, two of them concerned transboundary aquifers and waters, two others focused on Europe while the last concerned the specific situation of Saudi Arabia. A last speaker from the UNESCO Division of Ethics presented a project on the precautionary principle.

Mr Jac van der Gun was the first speaker of the morning. In his presentation on “On transboundary and other international aquifers: what physical transboundary interactions may need to be controlled”, he insisted on the functions of an aquifer, which is more than only a source of water, and he gave a classification of international aquifers. He also said some words about IGRAC (International Groundwater Resources Assessment Centre) established under a UNESCO and WMO initiative (www.igrac.nl). *Mr Sergei Vinogradov* gave an overview of transboundary aquifers in Europe under mainly the UN

ECE Water Convention. He also presented the International Water Law Research Institute of the University of Dundee (Scotland), which will soon be affiliated to UNESCO. He was followed by *Mr Venkat Lakshmi* who spoke about “Specific issues on transboundary waters” such as global climate change, and remote sensing. The presentation of *Mr Jochen Sohnle* focused on “Groundwater in European State practice”. He described inter-state agreements on water which also cover groundwater and the legal principles they refer to. *Ms Simone Scholtz* from the UNESCO Social and Human Sciences Sector, Division of Ethics of Science and Technology presented the research project on the precautionary principle initiated by her division, the report of which will be soon available. And finally *Mr Ali Altokhais* presented the groundwater situation in Saudi Arabia from a domestic and a transboundary point of view. Saudi Arabia counts eighteen identified aquifer, some them contain renewable and the others non-renewable groundwater. Some of them are transboundary such as the Disi Aquifer on the border with Jordan, and others on the borders with Koweit, the UAE, Bahrein and Oman. The Ministry of Water and Electricity was established in 2002 and it deals with all water and wastewater issues. Saudi Arabia is currently suggesting guidelines for the management of transboundary aquifers including the following:

- sustainable management
- quality protection
- keeping a neutral zone along the border to minimize adverse effects on the other country
- prohibition of selling water to a third State

The morning debate raised again the difficult issue of different definitions between lawyers and hydrogeologists. Questions were also addressed to *Mr van der Gun* on the aquifer models.

After lunch, *Ms Raya Stephan* and *Mr Jac van der Gun* presented a summary of the meeting and a series of recommendations, which were adopted as the meeting’s recommendations.

Recommendations of the Meeting:

1. Attend to the need for continued regional and local consultations on legal frameworks in the Americas in exchange with other regions (ISARM).
2. Translate concepts into “management tailored” mechanisms for aquifers.
3. Enhance and support development of domestic groundwater legislation in American countries in parallel with other regions for implementation of transboundary aquifers management.
4. Initiate a regionally based, globally scoped consultation program (ISARM).
5. Promote and introduce integrated hydrogeological and legal debates and consensus on transboundary aquifers management (international meetings/workshops).
6. Promote management units for groundwater/aquifer
7. Introduce socio-economics including land management linkages to transboundary aquifers management.
8. The lack or inadequacy of data and information should not be used as an excuse to postpone action that should be taken in respect of a transboundary aquifer, including the development (and adoption) of legal frameworks and the creation of institutional mechanisms

Annex 1 The draft articles on the law of transboundary aquifers

The participants were invited to send their comments and recommendations after the meeting on the draft articles presented by Ambassador Yamada. They are compiled below.

1. Comments:

Scope of the present Convention (article 1)

The former wording of this article mirrored the 1997 UN Convention and its present reformulation seems to be wider taking into account that ‘utilization’ is the unspecific category including every activity while ‘use’ relates to a particular usage, meaning that it could be ‘uses’ outside the scope of the Convention. Then, ‘utilization’ is comprehensive, including every ‘use’ related to a transboundary aquifer, better for a set of rules addressing aquifers holistically.

Use of terms (article 2)

The definition of ‘aquifer system’ (a series of *more than two* aquifers) seems to exclude that two aquifers may form part of a system. The wording should be *two or more aquifers*.

The words ‘negligible’ and ‘non-negligible’, associated to the contemporary recharge needed for an aquifer to be ‘non-recharging’ or ‘recharging’ are too vague. What is non-negligible for one state may be negligible for another.

A definition for ‘managing’ (used in Art. 3) or ‘management’ is missing. It is to be noted that the term is not understood in the same way everywhere. In some contexts ‘manage’ means plan and regulate, while in others it refers to the operation of hydraulic infrastructure. For instance, in Russian *upravlenye*, of which the English translation is ‘management’, means operation (of dams, irrigation facilities and the like).

A definition for ‘sustainability’ as employed in connection with an aquifer (Art. 5) is also missing. It is very difficult to determine what is sustainable as a general rule. Each state might have its own interpretation.

It seems unnecessary to say ‘Party to the present Convention’ because the Convention only applies to State Parties and it does not appear any special circumstance that requires those words in this paragraph: ‘Aquifer State’ means a State in whose territory any part of a transboundary aquifer or aquifer system is situated even if it is not a Party to the Convention. Duties for ‘Emergency situations’ as established in Article 19 will not apply to a non-Party State.

Bilateral and regional arrangements (article 3)

Para 1: For the purpose of managing a transboundary aquifer or aquifer system, the aquifer states concerned are encouraged to enter into arrangements with respect to the aquifer (or aquifer system) or part thereof, or a project, programme or use, but they are no longer encouraged to do so when the arrangement adversely affects, to a significant extent, water use by one or more other aquifer states. Does this mean that an aquifer state should not enter into an arrangement that affects other states? If this is the case, the sentence would be redundant. The paragraph is not clear (the same applies to the last sentence).

To stress the importance of this suggestion the paragraph should finish after ‘use’ in the sixth line. The a paragraph would read: If the arrangement adversely affects.....
The possibilities of adverse effects could be the following paragraph, with an amended wording.

Which is the rationale of entitling only adversely affected aquifer States with the possibility to become party to an aquifer arrangement? Why not in any case?

Para 2: It should be rephrased so as to make it clear that harmonization relates to arrangements pre-dating the convention. For arrangements intervening subsequently, states should feel free to agree on the adoption of more stringent measures.

Para 3: This paragraph enounces the principle of subsidiarity, applicable to the present Convention; indispensable for the uninterrupted application of existing special agreements but only if they are compatible. This could originate potentially controversial situations when trying to decide about the compatibility of different clauses

Relation to other conventions and international agreements (article 4)

This article reveals the growing visibility of groundwater, the cross regulation by different international instruments, the demand for new comprehensive legal principles addressing water bodies and their interrelationship.

Equitable and reasonable utilization (article 5)

Paragraph 1: The question arises whether it is convenient to replicate in a stricter mode the same scheme than in the 1997 Watercourse Convention. As the Special Rapporteur makes it clear, this article includes only the rights of aquifer States. There are no limitations regarding preservation, protection, no harm or any other in this article. The no harm rule is included in Article 7, but there are no duties of protection or preservation in another section.

According to the commentary, the expression ‘accrue equitably’ or ‘equitable utilization’ refers to ‘the equitable *allocation* of benefits to be derived from aquifers’, but this is not really clear from the text. A more detailed formulation of the principle should be perhaps useful.

If allocation is suggested in 'equitable', is proportionality suggested in allocation? Could this paragraph be read as substituting 'equitably' for 'allocated according to the volume of the aquifer in the States concerned'. The rule regarding the volume of the deposit is applicable to the exploitation of shared gas and oil. It could be considered for the allocation of underground water.

Paragraph 2 :

- a) In this paragraph the sustainability of recharging aquifers is envisaged without reference to any parameter. Relevant factors are incorporated in Article 6 for equitable and reasonable utilization, and according to the commentary 'reasonable' includes 'sustainable'. The interpretation is not that evident in the text and sustainability is not a crystal clear concept. It could mean time-factor (sustainable in time), quantity (recharge, depletion), or quality (pollution, physical conditions, etc.). Moreover the 'renewable' character of aquifers is limited and it does not match with the demands of marine living resources.
- b) The explicit mention of 'the water contain therein' in non-recharging aquifers stresses the idea of the volume of the aquifer as an utilization parameter, though the concept is not included in the draft Convention. The indication to maximize the long-term benefits is also accurate for rechargeable aquifers. The recommendation to adopt joint development plans is irreproachable.

Paragraph 3

The duty to enter into consultations for the application of these rules is an obligation added to those included in Articles 7 and 8. It could be a first paragraph in Article 8 if there is a purpose to draw a clear distinction between rights and duties.

Equitable and reasonable utilization (articles 5 and 6)

If a groundwater system lies entirely inside one country, then it is commonly agreed that the corresponding groundwater resources belong to that country. If, however, a groundwater system crosses an international boundary, two (or more) neighboring countries may claim user rights to the groundwater included. Intuitively, many people will support the opinion that a country's claim to the groundwater of a transboundary aquifer is stronger to the extent a larger part of this aquifer (by area, by stored volume or by annual volume of recharge) is located within that country. Therefore, it does make sense to interpret 'equitable use of transboundary groundwater' as a shared use based on the proportionality of each country's share with either the area (the simplest criterion) of the aquifer within its territory, or the stored groundwater volume (the most correct criterion in the case of non-renewable groundwater) within its territory, or the average annual recharge volume (most correct criterion in the case of renewable groundwater) received within its territory.

On the factors (article 6) and in order to comply with the different items of the item 1 from (a) to (g), studies and data are needed that the majority of the countries do not have. Moreover, the item 2 is not clear on the issue of weight. The issue is not an easy one and should be simplified.

Obligation not to cause harm (article 7)

The formula used in paragraph 1 of this draft Article is the same employed in Article 7 of the Watercourses Convention. Groundwater pollution should be treated differently than surface water pollution. The effects of groundwater pollution are long-lasting, difficult to get rid of and sometimes irreversible. In the light of this, thought should be given to further discussions as to the approach to be taken (perhaps stricter standards?).

The provision on compensation in this article should be eliminated.

Data Sharing and Exchange (article 9)

The Convention should emphasize the need for the application of common data collection and laboratory protocols by all users of a transboundary aquifer as well as common data exchange standards and provisions for metadata (data about data) on the when, where, and how data were collected. This will enable those considering using the data for a specific purpose to evaluate the relevance and applicability of the data. This is very important when the use of transboundary data by future generations of scientists and resource managers is considered. Hydrologic and other scientific records must be documented, perpetually maintained and preserved, and not destroyed because:

- It is the record of observations or phenomena which will never happen again;
- It is part of a long-time series of hydrologic records needed for detecting sometimes subtle changes in local-, regional-, national- and global-scale phenomenon;
- It forms part of the scientific heritage that future generations will wish to understand; and
- It forms a scientific data and information base that future generations will explore and mine for new information and interpretations that were never intended by the collector of the original data.

Monitoring (article 10)

In the present document, monitoring is very much limited to the internal state and properties of an aquifer, no mention is made of 'external' monitoring variables. If we really want to manage an aquifer, then this is not sufficient. Groundwater management tries to control change; however, changing groundwater conditions tend to have external causes or 'drivers'. Changes in these drivers explain changes in groundwater systems. Furthermore, there may be a very significant delay in time between the variations in the drivers and the resulting changes in the groundwater system - which means that after an alert on undesirable change of the drivers state there may be still time for timely

corrective interference (this is particularly important in the cases of groundwater pollution!). Therefore, it is extremely important to include 'external drivers' in the monitoring programme of transboundary aquifers. Examples of relevant 'external drivers' are: abstraction of groundwater (rates and patterns); land use (patterns); pollution sources (types, rates and patterns); water levels and water quality of connected surface water bodies.

Hydrologic monitoring parameters should include each key component of the water budget, specifically surface- and ground water inputs, surface- and ground-water outputs, and the resulting change in aquifer storage. Water-quality parameters to be monitored must be beyond basic hydrochemistry of the aquifer and include pathogens and anthropogenic contaminants.

The section on monitoring appears as a programmatic section that will need special agreements for its implementation. It would be advisable to constitute permanent bodies for this task, or at least permanent consultation mechanisms in order to exchange the results of monitoring activities. The technical and institutional aspects become indispensable implementing tools and monitoring is but one aspect of cooperation among aquifer States.

If articles 9 and 10 are in line with existing developments and trends regarding the basis for any decision relating to the management of a transboundary aquifer, it might not be necessary however to mention international organisations as potential partners in the effort of monitoring resources.

Protection of recharge and discharge zones (article 13)

In paragraph 2: The activities at the origin of 'detrimental impacts on the discharge process' do not necessarily take place 'within' discharge zones. If this is the case, some rewording of the sentence might be needed.

Management (article 15)

This article is extremely important and indicates the path for the implementation of the rules incorporated in the Convention. The indication of joint management plans and mechanisms are interesting hints to encourage the establishment of permanent agencies. However there is no definition of management.

While all would agree that an aquifer management plan is the best tool for ensuring equitable utilization, adequate conservation and protection, and for guiding groundwater mining if a decision is made in this sense, it is somehow strange to see an obligation to undertake to establish and implement plans being placed on the aquifer states, and then (second sentence) an obligation to enter into consultations concerning aquifer management which may include the setting-up of a joint body (this also duplicates Art. 8). The sequence of events seems somehow wrong. Logically, the steps should be as follows:

1. data collection, processing and exchange as a starting point (everybody agree on the fact that this is a necessary step);
2. based on the data, assessment of the conditions of the aquifer system;
3. consultations (and possibly agreement) on what should be done and where;
4. designation of a joint institutional mechanism, and agreement on the nature, composition, functions and powers basis of the joint mechanism, on how decisions should be made within the mechanism, and on the legal force of such decisions;
5. agreement on 'hot spots' (critical areas), which should coincide with the core area of jurisdiction of the joint mechanism;
6. development of management plans for the 'hot spots', possibly as one of the functions of the joint body.

Assessment of potential effects of activities (article 16)

This article is extremely important and indicates the path for the implementation of the rules incorporated in the Convention. The indication of joint management plans and mechanisms are interesting hints to encourage the establishment of permanent agencies.

Planned activities (article 17)

The very important object of this Article is the duty to notify planned activities, paragraph 1, and to enter into consultations and negotiations in case of disagreement, paragraph 2. Accordingly it could be entitled 'Notification of planned activities' which would be similar to Article 12 of the 1997 Convention.

The explicit or implicit consent of the notified State and its consequences are not developed at this stage of the Draft, as well as the effects of the notification and consultation process.

The provisions in this draft article might need some qualification with respect to the activities which are subject to notification. In fact, groundwater is present in numerous development activities, particularly in industrialized countries.

Scientific and technical assistance (Article 18)

For some participants, this article is considered as a relevant section, while others considered that there is no need for an international legal instrument on groundwater to sanction what states and international organizations already do upon request.

Emergency situations (article 19)

Paragraph 1: The duty enounced in this paragraph could be framed in the general principle of cooperation among aquifer States.

Paragraph 3: This paragraph seems unnecessary. It incorporates a total waiver to be evaluated by the State alleging the emergency situation already dealt with by the 1969

Vienna Convention on the Law of Treaties which considers lawful non-compliance of treaties under circumstances of necessity, force majeure, fundamental changes and others.

2. Recommendations:

Aquifer Sustainability

The Convention should incorporate the concept of sustainability whereby all parties using a transboundary aquifer accept the consequences of reduced ground-water pumpage for the benefit of maintaining and protecting associated riparian ecosystems (increased base flow) and associated wetland ecosystems (increased water-levels in shallow aquifers).

Adaptive Management

The Convention should incorporate the concept of adaptive management as there will rarely be sufficient scientific data to quantify or characterize the water budget, hydrodynamic system, water quality, and water-dependent ecosystems for the purposes of assessing the potential effects of alternative management actions intended to resolve complex natural-resource utilization issues. Adaptive management, however, does rely on scientifically-defensible, systematic, long-term monitoring data.

Source Water Assessment and Protection

The Convention should incorporate the concept of international cooperation for source water assessment and protection of transboundary aquifers. Information on the benefits and basic concepts of source water assessment and protection can be found at: <http://www.epa.gov/safewater/protect/swbasics.html>.

Harmonization

Thought could also be given to the fact that a shared resource is managed more effectively if the states concerned harmonize their policies and legislation and the measures they introduce in order to deal with certain situations.

Social use and human supplies

More attention and emphasis should be given to the social use and the human supply of water in the draft articles.

ANNEX 2

Agenda

UNESCO-IHP Transboundary aquifers Hydrogeology and International Law

UNESCO Headquarters, 1 rue Miollis 75015 Paris, 7-9 March 2005.
7 March Room XV
8,9 March Room XVI

Monday 7 March 2005
Room XV

10h00 Opening of the meeting,

- ❖ Welcome from UNESCO, *Mr A. Szöllosi-Nagy*,
- ❖ Welcome, *Ambassador Chusei Yamada*,
- ❖ Presentation of the International Hydrological Program, *Ms Alice Aureli*,
- ❖ Adoption of the Agenda and election of the Chairman

10h30

- ❖ Objectives of the meeting: UNESCO-IHP ISARM project and cooperation with the UN ILC - Hydrogeology and International Law *Ms Raya Marina Stephan*

11h00

- ❖ Overview of groundwater issues in Americas/Short summary of ISARM Americas, *Mr Nelson da Franca Ribeiro dos Anjos*

11h30

- ❖ The Guarani Aquifer System, Hydrogeology and background for cooperation, *Mr Luiz Amore*

12h00

- ❖ Transboundary ground-water resources along the United States - Mexico border: challenges and opportunities , ***Mr Lloyd Woosley***

12h30 Lunch break
(on your own, at UNESCO's cafeteria)

13h30

- ❖ Groundwater resources management challenges and cooperation- International Commission Mexico-USA, ***Mr Luis Antonio Rascón Mendoza***

14h00

- ❖ Transboundary groundwater in Canada, ***Mr Richard Paisley***

14h30

- ❖ Great Lakes Basin, ***Ms Adele Hurley***

15h00

- ❖ Debate

15h30 Coffee break

15h45

- ❖ The role of national and international law in the sustainable development of groundwater- Overview in Argentina, ***Ms Lilian del Castillo Laborde***

16h15

- ❖ Domestic and transboundary groundwater issues in Uruguay-, ***Mr Carlos Alejandro Arcelus***

16h45

- ❖ Legal aspect of groundwater management : an overview, ***Ms Marcella Nanni***

17h15

- ❖ Debate

18h00 Closing of the day

18h30 Cocktail convened by UNESCO

Tuesday 8 March 2005

Room XVI

09h00

- ❖ Presentation of the work plan of the day, ***Chairman***

09h30

- ❖ The activities at the IUCN law center, ***Mr Alejandro Iza***

10h00

- ❖ Legal issues on groundwater in Paraguay, ***Ms Patricia Abed***

10h30

- ❖ UNESCO-PCCP- Water Cooperation Facility, ***Ms Lena Salame***

11h00 Coffee break

11h15

- ❖ The International Network of Basin Organisations, ***Mr Jean-Francois Donzier***

11h45

- ❖ The European Council on Environmental Law contribution to the sustainable management of water resources, ***Mr Henri Smets***

12h15

- ❖ Morning session debate

12h45 Lunch break
(on your own, at UNESCO's cafeteria)

14h00

- ❖ The work of the ILC on groundwaters, and the framework of the draft articles, *Ambassador Chusei Yamada*

15h00

- ❖ “Monitoring”, and “Scientific and technical assistance to the developing States” in the draft articles, *Ms Mariko Kawano*

16h00 Coffee Break

16h15

- ❖ Questions and debates

17h30 Closing of the day

Wednesday 9 March 2005

Room XVI

09h15

- ❖ Presentation of the workplan of the day, *Chairman*

09h30

- ❖ On transboundary and other international aquifers: what physical transboundary interactions may need to be controlled?, *Mr Jac van der Gun*

10h00

- ❖ The activities at the International Water Law Research Institute (University of Dundee)/ Transboundary groundwater under the UN ECE Water Convention, ***Mr Sergei Vinagrodov***

10h30

- ❖ Specific issues on transboundary waters, ***Mr Venkat Lakshmi***

11h00 Coffee break

11h15

- ❖ Groundwater in European State practice, ***Mr Jochen Sohnle***

11h45

- ❖ Sustainable development of groundwater in extremely arid regions, ***Mr Ali Al-Tokhais***

12h00

- ❖ The UNESCO-COMEST, and focus on the precautionary principle, ***Ms Simone Scholze***

12h15

- ❖ Questions and debate

12h30 Lunch break

(on your own, at UNESCO's cafeteria)

14h30

- ❖ Summary of the presentations and of the debates, ***Chairman and Rapporteurs***

15h00

- ❖ Questions and debates

16h00

- ❖ Recommendations and wrap-up, *Chairman and Rapporteurs*

16h30 Closing of the meeting

17h00 Farewell cocktail convened by UNESCO

Annex 3

List of Participants

UNESCO-IHP Transboundary aquifers Hydrogeology and International Law

UNESCO Headquarters, 1 rue Miollis 75015 Paris, 7-9 March 2005.
7 March Room XV
8,9 March Room XVI

Invited experts

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