



THE DRAFT ARTICLES ON  
THE LAW OF TRANSBOUNDARY AQUIFERS

...Conscious of the importance for humankind of life supporting groundwater resources in all regions of the world,

# TRANSBOUNDARY AQUIFERS OF THE WORLD

- UPDATE 2012 -  
1 : 50 000 000

Special Edition  
for the 6<sup>th</sup> World Water Forum,  
Marseille

March 2012

## ABOUT THIS MAP

This map is about Transboundary Aquifers (TBAs). It shows the state of information presently available on the occurrence and extent of TBAs world-wide. The intention of the map is to provide a global overview of these important shared water resources and to encourage further assessment through the use of the most recent inventory results of many active working groups around the world; details on the procedures preparing this map are available in the section "Map compilation and labelling". The assessments and inventories of TBAs across the world, followed by information exchange among aquifer-sharing States are considered prerequisites for appropriate TBA management. This map is assumed to contribute to awareness raising on the importance on the management of shared aquifer resources and build the needed global knowledge base.

Since its establishment IGRAC has been involved in TBA management activities within the frameworks of the UNESCO Transboundary Waters Assessment Programme (TWAP), the World Aquar and the International Shared Aquifer Resources Management (ISARM) initiative led by UNESCO-IPW and IAH.

The back side of this map is dedicated to an equally important instrument in the management of TBAs: the draft articles on the law of transboundary aquifers. These contain a number of principles that are essential in guiding countries to formalise international cooperation managing transboundary aquifers.

## THE ROLE OF INTERNATIONAL LAW AND AGREEMENTS

In 2008, the UN International Law Commission (ILC) adopted a set of draft articles on the law of transboundary aquifers, including a preamble and the commentaries. The draft articles were then transmitted to the UN General Assembly (GA), which adopted the same year Resolution /A/RES/63/121 on the law of transboundary aquifers and the draft articles. The Resolution "Encourages the States concerned to make appropriate bilateral or regional arrangements for the proper management of their transboundary aquifers, taking into account the provisions of these draft articles", meaning that States can already refer to the draft articles on the law of transboundary aquifers as a reference and as guidelines. The ILC and the GA have thus filled a gap that existed in international law regarding transboundary aquifers.

A resolution of the GA is a non-binding text, however it has a moral authority. The Resolution on the law of transboundary aquifers is until now the only global instrument on this topic. It can already be considered by States as a reference and as guidelines.

The draft articles on the law of transboundary aquifers apply to the utilisation of transboundary aquifer systems; and to the measures for the protection, preservation and management of such aquifers or aquifer systems. In addition, the draft articles apply to "other activities that have or are likely to have an impact upon such aquifers or aquifer systems".

The draft articles codify the two core principles of international water law: equitable and reasonable use, and the obligation not to cause significant harm. According to the equitable and reasonable utilisation principle aquifer States "shall utilize transboundary aquifers or aquifer systems in a manner that is consistent with the equitable and reasonable accrual of benefits". Aquifer States "shall [also] aim at maximizing the long-term benefits derived from the use of water", allowing more specifically to the case of non-recharging aquifers. The establishment of a comprehensive utilisation plan by the aquifer States is required and has to take into account the present and future needs, as well as available alternative water resources. Finally the utilization level of a transboundary aquifer should not prevent continuance of its effective functioning. The equitable and reasonable utilisation principle requires the consideration of "relevant factors for its implementation. An indicative list of factors is provided. The agreement on the relative weight of these factors and their respective weight are determined by the negotiations among the concerned States.

The no harm rule addresses here significant harm caused by an aquifer State and due to the utilisation of the transboundary aquifer, and/or also due to other activities; States are likely to be held liable for such harm. The draft articles codify the two core principles of international water law: equitable and reasonable use, and the obligation not to cause significant harm. According to the equitable and reasonable utilisation principle aquifer States "shall utilize transboundary aquifers or aquifer systems in a manner that is consistent with the equitable and reasonable accrual of benefits". Aquifer States "shall [also] aim at maximizing the long-term benefits derived from the use of water", allowing more specifically to the case of non-recharging aquifers. The establishment of a comprehensive utilisation plan by the aquifer States is required and has to take into account the present and future needs, as well as available alternative water resources. Finally the utilization level of a transboundary aquifer should not prevent continuance of its effective functioning. The equitable and reasonable utilisation principle requires the consideration of "relevant factors for its implementation. An indicative list of factors is provided. The agreement on the relative weight of these factors and their respective weight are determined by the negotiations among the concerned States.

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other aquifer States of the water in that aquifer or aquifer system, without their express consent.

## PART THREE: PROTECTION PRESERVATION AND MANAGEMENT

Article 10: Protection and management 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 an aquifer or aquifer system, as well as that released through its discharge zones, are sufficient to protect and preserve such ecosystems.

## Article 11: Recharge and discharge zones

1. Aquifer States shall identify the recharge and discharge zones of transboundary aquifers or aquifer systems that exist within their territory. They shall take appropriate measures to prevent and minimise detrimental impacts on the recharge and discharge zones.  
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 and related ecosystems.

## Article 12: Prevention, reduction and control of pollution

Aquifer States shall, individually and, where appropriate, jointly, prevent, reduce and control pollution of their transboundary aquifers or aquifer systems, including through the recharge process, that may cause significant adverse impacts on the recharge and discharge zones.  
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 and related ecosystems.

## Article 13: Monitoring

1. Aquifer States shall monitor their transboundary aquifers or aquifer systems. They shall, wherever possible, carry out these monitoring activities jointly with other aquifer States concerned and, where appropriate, in collaboration with competent international organizations. Where monitoring GWBs and TBAs overlapping each other. For smaller overlapping TBAs and groundwater bodies, this differentiation has not been made.

## Article 14: Management

1. Aquifer States shall establish and implement plans for the proper management of their transboundary aquifers or aquifer systems. They shall, at the request of any of them, enter into consultations concerning the management of a transboundary aquifer or aquifer system. A joint management mechanism shall be established, wherever appropriate.  
2. Aquifer States shall use agreed or harmonized standards and methodology for monitoring their transboundary aquifers or aquifer systems. They should identify key parameters that they will monitor based on an agreed conceptual model of the 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 aquifers or aquifer systems.

## Article 15: 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 provide that State with timely notification. 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 aquifers or aquifer systems.

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. 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 aquifers or aquifer systems.

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 FOUR: MISCELLANEOUS PROVISION

Article 16: Technical cooperation with developing States  
States shall, directly or through competent international organizations, promote scientific, educational, legal and other cooperation with developing States for the protection and management of transboundary aquifers or aquifer systems, including:  
(a) strengthening their capacity-building in scientific, technical and legal fields;  
(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 their transboundary aquifer or aquifer system;  
(g) providing advice in the preparation of environmental impact assessments;  
(h) supporting the exchange of technical knowledge and experience among developing States with a view to strengthening cooperation between them in managing the transboundary aquifer or aquifer system.

## Article 17: Emergency situations

1. For the purpose of the present draft article, "emergency" means a situation, resulting suddenly from natural causes or from human conduct, which affects a transboundary aquifer or aquifer system and poses an imminent threat of causing serious harm to aquifer States or other States.  
2. The State within whose territory the emergency originates shall:  
(a) without delay and by the most expeditious means available, notify other potentially affected States and competent international organizations of the emergency;  
(b) 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.  
3. Where an emergency poses a threat to vital human needs, aquifer States, notwithstanding draft articles 4 and 5, may take measures that are strictly necessary to meet such needs.  
4. 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 emergency response personnel, emergency response equipment and supplies, scientific and technical expertise and humanitarian assistance.

## Article 18: 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 conflict and shall not be used in violation of those principles and rules.

## Article 19: Data and information vital to national defence or security

Nothing in the present draft article obliges a State to provide data or information vital 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.

## MAP COMPIATION AND LABELLING

The map presented, encapsulates information provided by various organizations and projects dealing with transboundary aquifer assessments and/or management at regional and continental scales. Informal sources are given in the table below. It is an update of the 2009 "Transboundary Aquifers of the World Map" (IGRAC 2009). The guiding principle during the compilation of this 2012 map was to stay as close as possible to the information provided by the individual sources, while presenting the information as appropriately as possible for the chosen scale of the map (1 : 50,000,000). In a few cases where aquifers coming from different sources were overlapping and non-congruent, delineations with the highest level of certainty were chosen.

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.

5. If an aquifer State is requested by another aquifer State to provide data and information relating to an aquifer or aquifer system 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.

6. 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.

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

8. If an aquifer State is requested by another aquifer State to provide data and information relating to an aquifer or aquifer system 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.

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17. 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.

For EU countries (plus Switzerland and Norway), this global map also displays transboundary Groundwater Bodies (GWBs) as defined by the Water Framework Directive (WFD). Within this framework 20 Member States are obliged to delineate groundwater bodies (managerial units) and identify the risk of failing to achieve "good status" by 2015. In many cases, aquifers are subdivided into transboundary bodies while occasionally groundwater bodies may contain multiple aquifers.

Mapping of TBAs and transboundary GWBs must be seen as a technical step in a wider and often political process between countries towards shared natural resources management. The map contains a number of aquifers and groundwater bodies that are not politically recognised by all countries (some examples can be found in Central Asia). Additionally, this map shows transboundary aquifers where insufficient hydrogeological information results in different non-conform delineations across borders. This is among other things the case for some of the TBAs at the Russian/Kazakhstan border and for several groundwater bodies transgressing the border between Austria and Hungary.

Solid red borders indicate that the aquifers' boundaries are known and confirmed by all sharing countries. If boundaries are only approximately known, it is highlighted by dashed red lines. Limited information is available on the extent of TBAs in some parts of Africa and Asia. In these cases, the transboundary aquifers are presented by circular or elliptical shapes. The size and position of these shapes indicate the assumed size and position of the actual aquifers. Examples can be found in West and Central Africa, under the umbrella of ISARM TBA-identification and tagging only recently started here. Transboundary aquifers and groundwater bodies smaller than 6,000 km<sup>2</sup> are represented by symbols instead of exact delineations (even if delineations are well-known). For more detailed delineations of these smaller aquifers in Europe, Caucasus and Central Asia, please refer to the 2<sup>nd</sup> UNECE assessment (UNECE, 2011) and use unice.org. Small TBAs with unknown extent are presented by crosses. In the Americas and Europe, various transboundary aquifers and groundwater bodies are identified as overlapping or superimposing each other. For the larger TBAs and transboundary GWBs, the map differentiates between TBAs overlapping each other and transboundary GWBs and TBAs overlapping each other. For smaller overlapping TBAs and groundwater bodies, this differentiation has not been made.

All TBAs and transboundary GWBs on this map are labelled. Currently, various inconsistent versions of numbering and labelling exist. To avoid confusion, the map uses the ISARM numbering system. Labels from the various sources, new labels were adopted specific to this map. For the aquifers of the Americas, labels are exactly the same as used by the Organization of American States (OAS). For the other regions, a code was created comprised of two letters to identify the continent or region and a number to identify the aquifer. The labels are given in the table on the right hand side.

The knowledge on transboundary aquifers is still limited. Accordingly, individuals and organisations (national and international, governmental and non-governmental) are welcome to provide comments and suggestions about this map.



## REFERENCES

Braune E. and Xu (2011). Transboundary Aquifer Utilization and Management in Southern Africa, ISARM-SADC since 2005, A Position Paper for the UNESCO Cluster Office, Harare, UNESCO Chair in Groundwater, University of the Western Cape, Bellville, Cape Town, South Africa  
Fahnestock, M. (1990). Global Water Issues. Conference on Human Development, United Nations Development Programme (UNDP) / GEF (2007). Nubian Sandstone Aquifer System (NSAS) Technical Baseline Meeting, ATIA/R/03/6, p.10 (43 pages) – Vienna  
IEMED/CIOOB (2008). Groundwater Resources in the Mediterranean Region: importance, Uses and Sharing. In Mediterranean Yearbook Meet., p. 96-105  
IGRAC (2009). Transboundary Aquifers of the World, Update 2009, 1:50,000,000. Special edition for the 5th World Water Forum, Istanbul

INWEG (2011). Inventory of Internationally shared Aquifers, International Network of Water Environment Centres for the Balkans, Available from: [http://www.inweg.org/index.php?option=com\\_aquifers\\_djAccessed 30 Dec 2011](http://www.inweg.org/index.php?option=com_aquifers_djAccessed 30 Dec 2011)

ISARM-Africa / UNESCO (2004). Managing Shared Aquifer Systems in Africa, IHP-VI Series on Transboundary Aquifers, ISARM – Africa

Kuluric N., Gun van der J. and S. Vask (2008). Towards a Methodology for the Assessment of Internationally Shared Groundwaters, 4<sup>th</sup> International Symposium on Transboundary Waters Management - Thessaloniki, 2008.

OSS / UNEF / GEF (2008a). Iullemmeden Boundary limits, Managing hydrological risk in the Iullemmeden Aquifer system, <http://iullemmeden.iwarn.org/gis/boundary.jpg/view> (Accessed 30 Dec 2011)

OSS / UNEF / GEF (2008b). The Aquifer System (Main Basins Aquifers) - Connaissance Du Systeme Aquifer, North-Western Sahara Aquifer project documents, p. 2  
Pulido and A. Auret (2008). Transboundary Aquifers: A Global Program to Assess, Evaluate and Develop Policy, Groundwater, Vol. 43 (5), pp 661-668

ISARM-SADC (2007). Terms of reference for Establishment of a TBA NETWORK in SADC, ISARM-SADC meeting, Pretoria

SADC (2011). Exploratory Brochure for the Southern African Development Community (SADC) Hydro-geological Map & Atlas, Technical Assistance to the Southern Africa Development Community (SADC) and Cooperating Partners, European Union and G72

Stephan R. M. (2011). The Draft Articles on the Law of Transboundary Aquifers: The Process at the UN ILC International Community Law Review, vol.11, p.223-235.

UNECE (1999). Inventory of Transboundary Groundwater, UN/CEC Task Force on Monitoring and Assessment Volume 1, Leykstad

UNECE (2007). Our Waters: Joining Hands Across Borders, First Assessment of Transboundary Rivers, Lakes and Groundwaters, Part 3 Section II, New York/ Geneva

UNECE (2011). Second Assessment of Transboundary Rivers, Lakes and Groundwaters, Economic Commission for Europe, Convention on the Protection and Use of Transboundary Watercourses and International Lakes, ISBN 978-92-1-117052-8

UNESCO (2006). Transboundary Aquifers in Asia With Special Emphasis to China (44 pages)

UNESCO (2007). Sistemas Acuíferos Transfronterizos en la América – Evaluación Preliminar, Serie ISARM América N°1, Montevideo/ Washington DC

UNESCO/ACASAD (1988). Hydrogeological Map of the Aral Region and Adjacent Areas, 15,000 000 UNESCO/GBR (2004). WHYPMAP, Groundwater Resources of the World 1:50,000,000. Special Edition for the 32nd International Geological Congress, Florence/Italy - Paris/ Hannover

UNESCO/GBR (2006). WHYPMAP, Groundwater Resources of the World 1:50,000,000. Special Edition for the 32nd International Geological Congress, Florence/Italy - Paris/ Hannover

UNESCO/GBR (2006). WHYPMAP, Groundwater Resources of the World 1:50,000,000. Special Edition for the 32nd International Geological Congress, Florence/Italy - Paris/ Hannover

UNESCO/GBR (2006). WHYPMAP, Groundwater Resources of the World 1:50,000,000. Special Edition for the 32nd International Geological Congress, Florence/Italy - Paris/ Hannover

UNESCO/GBR (2006). WHYPMAP, Groundwater Resources of the World 1:50,000,000. Special Edition for the 32nd International Geological Congress, Florence/Italy - Paris/ Hannover

UNESCO/GBR (2006). WHYPMAP, Groundwater Resources of the World 1:50,000,000. Special Edition for the 32nd International Geological Congress, Florence/Italy - Paris/ Hannover

UNESCO/GBR (2006). WHYPMAP, Groundwater Resources of the World 1:50,000,000. Special Edition for the 32nd International Geological Congress, Florence/Italy - Paris/ Hannover

UNESCO/GBR (2006). WHYPMAP, Groundwater Resources of the World 1:50,000,000. Special Edition for the 32nd International Geological Congress, Florence/Italy - Paris/ Hannover

UNESCO/GBR (2006). WHYPMAP, Groundwater Resources of the World 1:50,000,000. Special Edition for the 32nd International Geological Congress, Florence/Italy - Paris/ Hannover

UNESCO/GBR (2006). WHYPMAP, Groundwater Resources of the World 1:50,000,000. Special Edition for the 32nd International Geological Congress, Florence/Italy - Paris/ Hannover

| Label | Aquifer name                   | Sharing countries                           | Type <sup>a</sup> | Area [km <sup>2</sup> ] |
|-------|--------------------------------|---|-------------------|-------------------------|
| A50   | Karoo Sedimentary Aquifer      | Lesotho, South Africa                       | 2,3               | 165,900                 |
| A52   | Coastal Sedimentary Basin V    | Namibia, South Africa                       | 2,3               |                         |
| A53   | Coastal Sedimentary Basin VI   | Namibia, South Africa                       | 2,3               | 11,700                  |
| A54   | Rhyolite-Breccia Aquifer       | Mozambique, Swaziland                       | 1,3               |                         |
| A55   | SE Kalahari Brackish Aquifer   | Botswana, Namibia, South Africa             | 1                 | 85,100                  |
| A56   | Khakeha/Kray Dolomite          | Botswana, South Africa                      | 1,2               | 29,700                  |
| A57   | 6000 ft. Karoo Valley          | Botswana, South Africa                      | 1,3               | 60,000                  |
| A58   | Limpopo Basin                  | Mozambique, South Africa, Zimbabwe          | 2,3               | 20,000                  |
| A59   | Tuli Karoo sub-basin           | Botswana, South Africa, Zimbabwe            | 1                 | 14,300                  |
| A60   | Northern Kalahari /Karoo Basin | Angola, Botswana, Namibia, Zambia           | 1,3               | 144,400                 |
| A61   | Sive Aluvial                   | Botswana, Zimbabwe                          | 1                 | 11,500                  |
| A62   | Eastern Kalahari/Karoo Basin   | Botswana, Zimbabwe                          | 1                 | 39,600                  |
| A63   | Kwana and Etosha Basin         | Angola, Namibia                             | 1,2               | 202,400                 |
| A64   | Cuvelai-Kout Sub-basin         | Angola, Botswana, Namibia, Zambia, Zimbabwe | 1,3               | 91,000                  |
| A65   | Coastal Sedimentary Basin IV   | Angola, DR Congo                            | 1                 | 257,000                 |
| A66   | Medium Zambezi Aquifer         | Zambia, Zimbabwe                            | 1,3               | 10,700                  |
| A67   | Shire Valley Alluvial Aquifer  | Malawi, Mozambique                          | 1,3               | 6,200                   |
| A68   | Kranga Alluvial                | Mozambique, Zambia                          | 1,3               | 21,200                  |
| A69   | Land and Gravel Aquifer        | Mozambique, Zambia                          | 1,3               | 25,300                  |
| A70   | Coastal Sedimentary Basin III  | Mozambique, Tanzania                        | 1                 | 21,300                  |
| A71   | Karoo Sandstone Aquifer        | Mozambique, Tanzania                        | 1                 | 40,000                  |
| A72   | Kalahari/Hartmann Basin        | Zambia, DR Congo                            | 1                 | 15,700                  |
| A73   | Congo Intra-cratonic Basin     | Angola, DR Congo                            | 1                 | 257,000                 |
| A74   | Weathered basement             | Malawi, Tanzania, Zambia                    | 1,2,3             | 25,800                  |
| A75   | Karoo Carbonate                | CAR, Congo, South Sudan                     | 1,3               | 941,100                 |
| A76   | Tanganyika                     | Burundi, DR Congo, Tanzania, Rwanda         | 2,3               | 457,200                 |
| A77   | Dolomitic Basin                | Angola, DR Congo                            | 1                 | 21,300                  |
| A78   | Coastal Sedimentary Basin II   | Angola, DR Congo                            | 1                 | 2,300                   |
| A79   | Cuvette Centrale               | Congo, DR Congo                             | 1                 | 81                      |



