

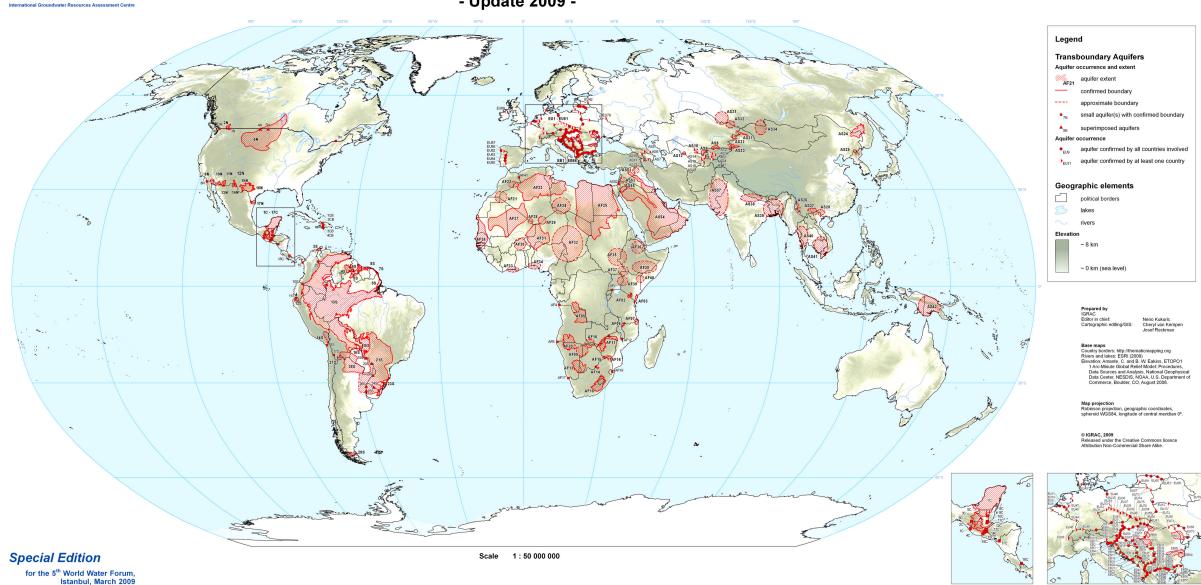
Transboundary Aquifers of the World





Scale 1: 25 000 000 Central America









TRANSBOUNDARY AQUIFERS OF THE WORLD

- UPDATE 2009 -1:50 000 000

Special Edition

for the 5th World Water Forun

*Aquifers do not cross the borders; they were there before the borders" (Eszter Havasné Szilágyi, 1948 - 2008)

This map is about Transboundary Aquifers (TBAs). It shows the present state of informa-tion regarding 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 their further assessment. The map is based on the most recent inventory results of many active working groups around the world; details on the map preparation procedure are available in the section 'Map compilation and labelling" further on this page

Globally, the wast majority of countries share (individual) aquifers (and/or aquifer systems) with their neighbours. Political, socio-economical, cultural and other differences among countries make the assessment and the management of internationally shared aquifers more difficult, compared with national ones. Insufficient knowledge of transboundary aquifers and ask of coordinated management can lead to understend changes in ground-water flow, level, volume and dissolved substances. Therefore, an appropriate assessment of transboundary aquifers is required to prevent or mitigate groundwater problems and to improve the overall benefit from groundwater.

Cooperation and information exchange among aquifer-sharing States is a prerequisite for paperpriate TBA assessment and management. 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

The back side of the map contains an overview of the main TBA aspects and the outline of a general assessment methodology. Such a methodology is needed to guide a use through the assessment steps, pointing out the specifics of various aquifer issues in the internation al context. Additionally, it will simplify comparison among TBAs and encouraga the sharing of experiences gained des webrer. Contributions to the development of a general TBA assessment methodology would also be very much appreciated.



TRANSBOUNDARY AQUIFER ACTIVITIES AT IGRAC

The assessment of global ground water resources is one of the core activities of the Inter dwater Resources Assessment Centre (IGRAC). Next to the assessmen IGRAC - as UNESCO/WMO ground water centre - facilitates and promotes global sharing of information and knowledge. In both activities, transboundary aguifers take a promi

Transboundary aquifers activities at IGRAC are carried out in the framework of the ISARM programme, an UNESCO-led multi-agency global initiative for identification, assessment and sound management of internationally-shared groundwater resources. IGRAC participates in the SARM Core Group and maintains the ISARM portal at www.isarm.net. However, the most prominent IGRAC transboundary activity so far is its contribution to ISARM regional activities. To gether with OAS (Organisation of American States) and UNESCO-IHP regional activities. Together with OAS (Organisation of American States) and UNESCO-HP. GRAC has played a major role in the development of the first allas of transboundary aquifers of the Americas. Further on, ISRAC (in cooperation with UNESCO-HP and SADC) assisted in the delineation of transboundary aquifers in Southern Africa. Finally, together with INWEB and UNESCO-HP, IGRAC contributed to UNECE-led assessment of transboundary aquifers in South East Europe.

In the framework of the GEF (Global Environment Facility) IW LEARN project, IGRAC set up an international forum on transboundary aquifers, compiled groundwater information from various GEF IW projects and conducted a workshop on transboundary aquifers at the GEF IW conference in Cape Town in 2007. At present, IGRAC is involved in the preparation of several GEF transboundary aquifers projects.

IGRAC assisted the UN International Law Commission in preparing draft articles for the first global legal agreement on transboundary groundwater. Further more, the centre has been engaged in development of ISARM transboundary aquifers cours e material. The first been engaged in development of ISARM transboundary aquifers course material. The first course on transboundary aquifers was conducted as a side-event of the 4th International Symposium on Transboundary Maters Management (Thessaloniki, 2008). At the same symposium loRAC presented a paper discussing the hydrogeological aspect of a methodology for assessment of internationally-shared aquifers (see further on this page). ISRAC presented a view on other, non-technical aspects of TBA assessment and management during the 3rd Conference on Management of Shared Aquifer Resources in Africa (Tripoli, John 2018).

TRANSBOUNDARY AQUIFERS: MAIN ASPECTS

The ISARM framework document (UNESCO, 2001) distinguishes five aspects of transboundary aquifers, namely: hydrogeological, legal, socio-economical, institutional and environmental aspect. Obtaining a common view on the hydrogeological situation (meaning essentially aquifer extent and characteristics) is necessary for an assessment of the socio-economical and environmental impact, which should eventually lead to institutional arrangements and legal agreements.

Over the last few years. TBA projects and inventories have yielded valuable information on particularly the hydrogeological aspect of transboundary aquifers. The produced re-ports also contain valuable examples of innovative institutional arrangements, socio-economical frameworks and environmental impacts. During the same period, the UN In-ternational Law Commission (ILC) prepared articles for the first law of transboundary aqui-

Thanks to all of these efforts and gained knowledge, the main TBA aspects can be further maints to all of lines entires and galled knowledge, the main that specifically deliberated in the delaborated, shaping a general methodology for the assessment of transboundary aquiffers. This methodology is needed to guide a user through the assessment steps, pointing out the specifics of various aquiffer aspects in the international context. Moreover, the methodology should simplify comparison among TBAs and encourage the use of experiences gained elsewhere. The following paragraphs provide an updated overview of the main TBA aspects and the outline of general TBA guidelines.

From the hydrogeological point of view, there is no difference between internationally shared and national aquifers. Yet, there is some difference between a national and international assessment of groundwater resources. The main difference is not technical (most often the same techniques are used) but methodological, because some issues (such as classification and data harmonisation) require more attention internationally than nation-

The hydrogeological TBA assessment can be seen as a set of several major activities,

- Delin eation and description
- Classification , diagnostic analysis and zoning
- Data harmonisation and information management

From inventory to assessment and management

Europe (UNECE).

South Eastern Europe (SEE) All aquifers in the region (EB1 to EB65)

The first two activities (delineation and description) can be clustered as 'inventory' or The list two activities (define and in description) can be discreted as interesting or characterisation, depending on the stage and the scale of activities, in any case, delinea-tion and description are primarily about collecting, combining and interpreting field infor-mation. Delineation of aquifer geometry (lateral extent and depth) can be very challeng-

Inventory of transboundary aquifers in the region

Inventory identified 65 transboundary aquifers in the region, distinguishing two main types: karst aquifers ranging from a few tens to hundreds of square kilometres and alluvial aquifers with greater areal extent (up to some thousands of square kilometres). In some countries transboundary karst groundwater covers between 60 and 100% of the total water use (e.g. in countries located in the Dinair region), while for transboundary alluvial groundwater the proportion varies from 15 to 70% (e.g. along the river Danubel). Karst aquifers and related ecosystems are highly valure able to pollution from different pressure factors. That was one of the reasons for a new initiative takes to improve access and any amongest of these reasons for a new initiative takes to improve accessed and management of these reasons for a new initiative takes to improve accessed and management of these reasons for a new initiative takes to improve accessed and management of these reasons for a new initiative takes to improve accessed and management of these reasons for a new initiative takes to improve accessed and management of these reasons for a new initiative takes to improve accessed and management of these reasons for a new initiative takes to improve accessed and management of these reasons for a new initiative takes to improve accessed and management of these reasons for a new initiative takes to improve accessed and management of these reasons for a new initiative takes to improve accessed and management of these reasons for a new initiative takes to improve accessed and management of these reasons for a new initiative takes to improve accessed and management of these reasons for a new initiative takes to improve accessed and management of these reasons for a new initiative takes to improve accessed and management of these reasons for a new initiative takes to improve accessed and management of the second and management of the second and management and management of the second and management of the second and management of the seco

The project aims to develop a sustainable, integrated management methodology for regional transboundary karst aquifers with the Dinaric Karst Aquifer System as a test case. The project preparation phase started in September 2008 and will result in the proposal for a full size project in September 2009.

tiative taken to improve assessment and management of these resources

Source: UNESC O/INWEB, 2007: http://www.inweb.gr Source: DIKTAS Project 2009:: http://dinaric.iwlearn.org

Initiator: UNESCO and GEF
Activity: UNESCO in GEF
DIKTAS (Dinaric Karst Transboundary Aquifer System) project

Developing a proposal for transboundary groundwater assessment in Southern Africa

ing in hydrogeologically complex formations. Additionally, aquifer-sharing states may come up with various delineation criteria, suggesting for instance hydrological, geological or hydrogeological characteristics as a basis for delineation. The second activity (description) includes both hydrogeological characteristics (characteristics (characteristics techaracteristics recharacteristics recharacteristics repense mechanism and hydraulic properties) and anthropologic influences (such as abstraction and pol-

ution). This part of assessment (delineation and description) always contains some de-

The second group of activities (classification, diagnostic analysis and zoning) provides the stakeholders with information necessary for decision-making, such as on problems that may develop and opportunities that will be lost in the absence of coordinated groundwater resources development and management. Further, the stakeholders need to know

which aquifers are likely to be the most responsive ones to transboundary aquifer management, and which zones within such aquifers should be targeted for the highest positive

Finally, data harmonisation and information management are essentially technical activities related to harmonisation of formats, classifications, terminologies, reference systems and levels, software and hardware specifics, etc. Yet, internationally they are very much

determined by political, organisational, legal, cultural and economical differences. Be

determined by political, organisational, legal, cultural and economical differences. Be-cause of this additional dimension and importance in the international context, data har-monisation and information management should be seen as a part of the TBA assessment process. Moreover, these activities ask for intensive and substantial cooperation; working together on TBA assessment is the best opportunity for building trust and mutual under-standing among the involved parties.

www.isarm.net

The environmental aspect of transboundary aquifer management is increasingly consider

ered important and has developed in parallel with the three dimensions of sustain ability:

In the first dimension, the environmental aspect is strongly connected with ground-water resources depletion and the dilemma of compromising the use for future generations. Aquifers are regarded as resource pools that need to be developed and

In the second dimension, the environmental aspect of transboundary aquifers is associated with the fact that various ecosystems are groundwater dependent (e.g.

wetlands and river systems which are sustained through their baseflow). People ncreasingly acknowledge the role of ecosystems services in sustaining life, as is the increasingly acknowledge the role of ecosystems services in sustaining life, as is the case with the natural attenuation capacity of aquifers. Other aquifer functions like storage, buffering, habitat and transport capacities are all crucial in ecosystem processes. In this context, ground water is valued for its in-situ non-consumptive use. In a transboundary context, it is easy to understand that large-scale interventions in the environment in one state may have large effects on the functioning of ecosystems in

neighbouring states. It implicates that in the delicate task of determining an optimal

and equitable ground water allocation, the ground water demand of these ecological functions should be taken into account and assigned a high priority. In other words,

which part of the groundwater flow is environmentally committed?

In the third dimension, the environmental aspect of transboundary aquifers is based on an ethical and aesthetical motivation for the preservation of nature (including

water). So metimes people value the non-use aspects of natural environments simpl for their existence. They consider it beautiful and feel the need to protect it (also for

Ideally, an environmental assessment of transboundary aquifers incorporates all these dimensions. It analyzes where the environmental groundwater functions are located and how we value them.

From a purely economic perspective, groundwater resources should be allocated in such a way as to provide the highest return on investments. However, because of the essential role of (ground) water in sustaining human life, social issues like equity and water rights come into play. Accordingly, groundwater allocation for domestic water supply is normally

prioritized over allocation for food production and ground water use for food production is

Access to and control over groundwater resources of one particular aquifer is often asym-metrically distributed among the various users. Aquifer-sharing States should be prepared to discuss the issue of a possible asymmetrical distribution.

Aquifers are diffusive in nature and hence hydrogeological effects of interventions in the aquifer at a particular location can migrate through the aquifer to other locations. For

example, a spillage of toxins may be transported to down-gradient locations with moving groundwater. Hence, a groundwater user at location A may affect the groundwater avail-groundwater. Hence, a groundwater user at location A may affect the groundwater avail-ability and quality at location B. The first groundwater user is said to cause economic ex-ternalities (like non-compensated extra pumping or treatment costs) inflicted upon users at location B. When these locations are in differ ent states, it becomes clear that the issue of economic externalities has great importance in transboundary aquifer management.

managed and groundwater is valued in its extractive, consumptive, and productive

Botswan a, Namibia and South Africa Stampriet Kalahari / Karoo (AF13)

preferred over industrial use.

The Stampriet Kalahari /Karoo Artesian Basin is situated in

nie siampriet kalanani/karoo Artesian Basin is situaled in arid and semi-arid parts of Southern Africa (Kalahari Desert). Total aquifer area in Namibia, Botswana and South Africa is estimated at 166 000 km². The aquifer boundaries in Namibia have been determined by exten-sive exploration drilling, while the exact extent of the

aquifer in the other two countries is less well known.
Groundwater is found in a multi-layered aquifer system composed of unconsolidated to semi-consolidated Kalahari sands and silts which are underlain by Karoo sand-

A conceptual model of the aquifer system is accepted by all countries involved, but quantitative information about groundwater volume and quality is scarce. Future water demand, highly dependable on the socio-economic developments in the respective countries, is difficult to predict. At present, Namibia is the main user of groundwater for stock watering, small urban water supplies and increasingly for irrigation purposes. In Bots wan and South Africa, shallow groundwater is used by local communities for drinking water and stock water supplies.

The major issue for all three countries is to obtain a proper understanding of the ource potential of the aquifer and to establish a sound international water man-

ISARM-SADC
Orange-Sengu River Basin Commission (ORASECOM)
In July 2007 a decision was taken to carry out a trilateral investigation
of the Stampriet Kalahari/Karoo Artesian Basin. Following a meeting
organized by UNESCO, a detailed project proposal related to two pilot
areas was prepared for an anticipated period of 4 years.

Source: Kirchner, J., 2008: Stampriet Kalahari/Karoo Aquifer Study along the Namibia-Botswana-South Africa Boundary Area, Draft Project Proposal, SADC

Externalities are often indirect and hidden and it is therefore hard to determine who caused them, and to what extent. Furthermore, it is often difficult if not impossible to express externalities in monetary terms. For instance, how should drying of a wetland be related to individual far mers when the groundwater table decline (causing the drying) is a result of the accumulation of many small drawdowns? And further, how to valuate the consequent loss of the wetland's biodiversity?

Organisational settings of ground water management range from state-planned management to collective actions at grass-root level. The authorisation of these settings, regard-less of their level, rarely cross es national bord ers.

Institutionalising transboundary groundwater management is an ongoing process of social learning. It is generally recommended to start this process at a low-profile and low-risk level, to learn by doing and subsequently using gained knowled ge to tackle incrementally more complex and sensitive issues. In each of these process phases, different institutional instruments may be required.

Institutional instruments may be regulatory (like licensing, allocation and property right laws and binding agreement and policies), economic (subsidies, tradable ground water use and pollution rights, pricing of ground water and electricity) or advisory (enabling access to information, expertise, funding and creating awareness, trainings and non-binding agree

There is no unique and sharply defined form an institutional structure should take to best facilitate transboundary aquifer management. Nevertheless, it is clear that it needs to be context-specific and based on the hydrogeological, socio-economic, political and cultural aspects within the countries involved. Crucial for success of the institutionalisation is that the process is based on trust and mutual benefits.

It is often said that the large number and dispersed nature of groundwater users compliit is often said that the ladge further and uspessed hadre or goodinewater bases compared cate monitoring of groundwater use and rule compliance. Hence, because of this lack of shard 'monitoring possibilities, good groundwater management is primarily dependent on the soft; non-binding influencing of the behaviour of those users. The same is true for transboundary groundwater management and institutional arrangements. They will only be effective as long as the people are willing to adhere to the rules. The TBA map on the front page is one of the means to raise awareness and influence behaviour

Legal agreements among aguifer-sharing States are usually a part of their institutional tegal agreements anning aquine-sisianing states are usually a pait of internit institutional marangements. International laws, protocols and guidelines can be very instrumental in specification of concrete legal agreements among two or more states that share a particular aquifer. Despite an increased dependency on groundwater resources, transbound any aquifers have received, until recently, little attention in international law. While regulations for transboundary surface waters are quite well developed, this was -until recentlynot the case for transboundary ground water. Ho wever, there seems to be a change.

In 2002, the ILC had included the topic of "Shared Natural Resources" in its program. Be-

At its 60th session (May-July 2008) the UN ILC adopted at second reading a full set of draft

The ILC transmitted the draft articles to the UN General Assembly with the following rec-

- To adopt a resolution taking note of the draft articles on the law of transboundary aquifers and to annex these articles to the resolution;
- To recommend to States concerned to make appropriate bilateral or regional arrangements for the proper management of their transboundary aquifers on the basis of the principles enunciated in these articles:
- To consider, at a later stage, the elaboration of a convention on the basis of the

Monitoring for environmental protection

The total area of Middle Heliongjiang-Amur river basin amounts to 100 000 km². The Chi-nese part, called the Sanjiang plain, has an ea-of 45 000 km² while the Russian part covers 55 000 km². The basin is an important eco-nomic region for bot Northeast China and the Far East of Russia. The basin has extensive aq-uifers, containing good quality groundwater.

In 2003, in the framework of the ISARM legal aspect area, UNESCO-IHP set up a multi-disciplinary ad-hoc group of experts to provide scientific and technical support to the UN International Law Commission (LIC) on hydrogelogy and transboundary aquifers issues. The UN ILC is the UN body in charge of the codification and progressive development of

In Level 2003, and 2008, ILC worked on the issue of transboundary aquifers with the techni-cal and scientific support of the expert group and organisations such as UNESCO FAO, UNESC, UNEP and GEF, IGRAC, IAH, Organization of American States (OAS), French-Swiss Geneva Aquifer Au thority and Gu arani Aquifer System Project.

articles on the law of transboundary aquifers, including a preamble and commentary. The draft articles are intended to offer States a framework for their agreements on trans-boundary aquifers. They are divided into four parts: 1) introduction, 2 general principles, 3) protection, preservation and management and 4) miscallaneous provisions. The text is available in all UN languages at http://untreaty.un.org/fic/reports/2008/2008report.htm.

ss-section of the Middle Heilongjiang ur river basin.

The UN General Assembly adopted on 11 December 2008 the Resolution A/RES/63/124

uiters, containing good quality groundwater. Groundwater of this basin is the primary resource for drinking water and irrigation in the area for both countries. For example, Klamusze City in China and Khabarovsk City in Russia depend on groundwater in Reyoundwater in Middle Heilongjiang-Amur river basin is found in a large aquifer system built up of unconsolidated Quaternary rocks and older consolidated rocks. Groundwater flow pattern in the basin is shown in the Figure.

The groundwater resources of Heilongjiang-Amur river basin were evaluated by each country separately, according to their own national standards and methods. So far, the groundwater recharge of the whole basin and the groundwater discharge including withdrawal are in a balance. It is estimated that the runoff flux across the boundary and flowing from China to Russials about 1.52 × 10 m²/a.

The Chinese government has been working on protection of water resources in the Songhua and Heliong River, and has also established relevant programs for pollution control. Following high level meetings, China and Russia appointed responsible de-partments for monitoring. The joint monitoring of transboundary waters of China dad Russia has laid down a solid foundation for the cooperation in environmental protec-tion between both countries.

Source: Zeisheng, H. et al., 2006: Transboundary Aquifers in Asia with Special Empha-

Region	Jource	Region code
World	WHYM AP (2006)	n/a
The Americas	UNESCO (2007)	N, C, CB & S
Europe	UNECE (1999)	EU
South Eastern Europe	INW EB (2009), UNECE (1999, 2007)	EB
Caucasus	UNECE (2007)	AS
Asia	ISARM-Asia/UNESCO (2006)	AS
Arabian Peninsula	UNESCO/ACSAD (1988)	AS
Africa	ISARM-Africa/UNESCO (2004)	AF
Southern Africa	ISARM-SADC (2007)	AF
Northern Africa		
- lulle meden	OSS/UNEP/GEF (2008a)	AF
- North-Western Sahara	OSS/UNEP/GEF (2008b)	AF
- Nubian Sandstone	IAE A/UNDP/G EF (2007)	AF
- Medit erran ean Afric a	IEM ED/CIDOB (2008)	AF

the continent of region and a number to learning time adjust rises. In enumbering sequence is exhibe as closely as possible numbering in the source materials. The numbering sequence in Asia and the Caucasus, for the sample, start with the CACENA numbers of the Caucasus, followed by China's 1884, the Arab 1884 and She to other Asian 1884, in Africa, the numbering start six with the off the CACENA numbers of Africa 2005, followed by the rise of Africa 2005, seed in the numbering sequences, as the numbers of aquities which occur in different sources simultaneously become obsociety when the sources are or orbified.

(Transboundar) Aquifer Resources Management - Their Signincance and sustainable or analogement is a manifer work floorument, LMSCO - IHP-VII, Serie on Groundwards No. 1, Paris, Southern Series on Groundwards No. 1, Paris, Southern Series on Groundwards of Series Series and Develop Policy, Groundwards and Develop Policy, Groundwards (Series Series Ser

Any designation employed and the presentation of material throughout this publication

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The map presented here brings together information provided by various organisations and projects dealing with transboundary aquifer assessment and/or management at regional and continental scales (direct information sources used for the map are given in the table below).

as appropriately as possible for the chosen scale of the map (1:50 000 000). Accord-ingly, a few aquifer boundaries were adjusted (simplified) and small aquifers are rep-resented by a symbol instead of exact boundaries.

The TBA map shows aquifer extent (if known), for aquifers with an area larger than 6000 km². Smaller aquifers are represented with squares. If the exact aquifer bounda-ries are known and acknowledged by all sharing countries they are delineated with solid red lines. If not, they are delineated with dashed red lines.

Ouite limited information is available on extent of TBAs for some parts of Europe and Asia Small (filled or half-filled), circled are used to depict aquifers whose extent is not known. A filled circle represents an aquifer whose occurrence is confirmed by all countries involved; if an aquifer is not recognised by all countries, it is depicted by a half-filled circle.

8S Yrenda-Toba-Tarije

C Estero Real Río Negro

AF23 Northwest Sahara Aqu (NWSAS) AF24 Mourzouk-Djado Basir AF25 Nubian Sandstone Aq

AF26 Senegalo-Mauretania

AF30 Liptako-Gourma Aquife AF31 Irhazer-Iullemed en Bas AF32 Lake Chad Basin

S25 Yalu River Valley S26 Nu River Valley S27 Upriver of Zuo Ri

AS38 Southern of Himala

AF33 Tano Basin AF34 Keita Basin

Angola, Namibia Angola, Botswana, Namibia, Zambia

Ozambique, zenora — lalavi, Mozambique Jotswana, Namibia, South Africa Jotswana, South Africa, Zimbabw Mozambique, South Africa, Zimb Namibia, South Africa, Zimb Namibia, South Africa Mozambique, Swaziland

had, Egypt, Libyan Arab Jamahiriya, Sudan

Cambodia, Lao People's Democratic Republic, Thalland, Viet Nam

Iraq, Syri a, Turkey Israel, Jord an, Lebanon, Palestinian Territory,

45 000

40 000 60 000 560 000

Chad. Lybia. Tunesia

Information sources

MAP COMPILATION AND LABELLING

Region	Source	Region Code
World	WHYM AP (2006)	n/a
The Americas	UNESCO (2007)	N, C, CB & S
Europe	UNECE (1999)	EU
South Eastern Europe	INW EB (2009), UNECE (1999, 2007)	EB
Caucasus	UNECE (2007)	AS
Asia	ISARM-Asia/UNESCO (2006)	AS
Arabian Peninsula	UNESCO/ACSAD (1988)	AS
Africa	ISARM-Africa/UNESCO (2004)	AF
Southern Africa	ISARM-SADC (2007)	AF
Northern Africa		
- lulle meden	OSS/UNEP/GEF (2008a)	AF
- North-Western	OSS/UNEP/GEF (2008b)	AF
Sahara		
- Nubian Sandstone	IAE A/UNDP/G EF (2007)	AF
- Medit erran ean Afric a	IEM ED/C IDOB (2008)	AF

The super imposed aquifers in the Americas are represented by triangles. Some information was available about superimposed aquifers in Europe as well, but (unlike or the Americas) not on the original source map (UNECE, 1999). Following the quiding principle, no superposition is shown for the aquifers in Europe. For the same reason,

All aquifers on the map are presented with a label. For the aquifers of the Americas the adjuly as of the map are presented with a labels are exactly the same as used by the Organization of American States (OAS). For the other continents, a code was created by putting to gether two letters to identify the continent or region and a number to identify the aquifer itself. The numbering

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EB41 Jablanica , Former Yugoslav Republic of Mace

NO.	Aquiter Name	Snanng countries	Type:	Area [
	Pelagonija/Florina	Greece, Former Yu goslav Republic of Macedonia	1	
	Gevgelija/Axios-Vardar	Greece, Former Yugoslav Republic of Macedonia	1	
B49	Dojran Lake	Greece, Former Yugoslav Republic of Macedonia	1	
	Sandansky-Petrich	Bulgaria, Greece, Former Yugoslav Republic of Macedonia	1	
	Gotze Delchew / Agistro-Orvilo	Bulgaria, Greece	2	
	Nastan-Trigrad	Bulgaria, Greece	2	
	Smolyan	Bulgaria, Greece	2	
B54	Rudozem	Bulgaria, Greece	2	
	Erma R eka	Bulgaria, Greece	2	
B56	Svilegrad/Orestiada	Bulgaria, Greece, Turkey	1	
B57	Evros/Meric	Greece, Turkey	1	>
B58	Topolovgrad karst waterbearing massif	Bulgaria, Turkey	2	. >
B59	Malko Tamovo kasrt waterbearing massif	Bulgaria, Turkey	2	. >
	Upper Pleistocenesomes alluvial fan	Hungary, Romania	1	
B61	Lower Pleistocene Mures alluvial fan	Hungary, Romania	1	>
	Lower Pleistocene somes alluvial fan	Hungary, Romania	1	
	Middle Sarmatian Pontian	Republic of Moldova. Romania	1	
	Sarm atian	Bulgaria, Romania	i	
	Upper Ju rassic-Lower Cretaceous	Bulgaria, Romania	1	
	Lainsitz-Trebon pan	Austria. Czech Republic	1	
	Bayrisch-Oberösterr. Molassebecken		2	
	•	Austria, Germany	- 4	
	Seewinkel / Hansag	Austria, Slovaki a		
EU4	Raabnitz-Lafnitz-Strem-Pinka Tal / Örség Nm Part	Austria, Hungary	1	
FLIS	Günz-Rabnitz-lvk a Tal / Alpokalja	Austria, Hungary		
	Fertő / Neusiedler	Austria, Hungary	1+2	
	Unters Murtal / Prekomursko Polje	Austria. Slovenia		
	Hard Rock	Belgium, France	3	
	Schelde Basin Aquifer Sys tem	Belgium, Netherlands	1	
	Roerdal Slenk System	Belgium, Netherlands	· i	
	Hard Rock	Belgium, Netherlands	2	
U12		Belarus, Poland		
	Q,Pg2+Pg3,Cr2,A+Pt1 Cheb Pan	Belarus, Ukrain e	1+2	>1
		Czech Republic, Germany	1	
	Decinsky Sn eznik Dolni Krmenice and Krimice Cretac eous	Czech Republic, Germany	1	
	Upper Ploucnice Cretaceous	Czech Republic, Germany	1	
	Miocene Sediments of Zitava Pan	Czech Republic, Germany, Poland	1	
	Glaciofluvial Sediments in Frydlant Off- spur	Czech Republic, Poland	1	
	Police Pan and Hronov-Porici Cretaceous	Czech Republic, Poland	1	
:U37	Kralik Ramp	Czech Republic, Poland	1	
U38	Glacial Sediments of Zulov Hilly Country and Zlata Hora Mountains	Czech Republic, Poland	1	
U39	Glacial Sediments of Zulov Hilly Country and Zlata Hora Mountains	Czech Republic, Poland	1	
U40	Fluvial and Glacial Sediments in the Opava River Catchm. Area	Czech Republic, Poland	1	>
U41	Fluvial Sediments in the Thaya River Catch. Area / Alluvium of Morava	Czech Republic, Slovakia	1	>
U42	Silurian-Ordovician Layer	Estonia, Latvi a, Russia	1	>1
	Ribe-Formation / Braunkohlensande	Denmark, Germany	1	>
U44	Sediments of Quaternary and Pliocene	France, Germany	1	,
	Oberrh eingraben Mitte/Süd	France, Germany, Switzerland	1	,

	Aquiter Name	Snanng countries	iype	Area [N
EU46	Venlo-Kreteld Aquiter	Germany, Neth erl ands	1	>3
	North-Germ any/Neth erl ands	Germany, Neth erl ands		>12
EU48	Lusatian Neisse (from the border of county Saxonia to the mouth of river Oder) / Pomeranian Region	Germany, Poland		6
EU49	Hochrhein	Germany, Switzerl and	1+2	
EU50	Szigetköz / Zitný Ostrov	Hungary, Slovaki a	1	- 2
EU51	Transdanubian / Alluvium of Danube	Hungary, Slovaki a	1+2	1
EU52	Ipoly Völgy / Alluvium of Ipel	Hungary, Slovaki a	1	
EU53	Karancs-Medves / Alluvium of Slaná	Hungary, Slovaki a	1	
EU54	Aggteleki Karszt / Alluvium of Bodva and Slovak Kars t	Hungary, Slovaki a	1+2	
EU55	Hemád Völgy / Alluvium of Homad	Hungary, Slovaki a	1	
EU56	Ronyva Vgy-Bod rogköz / Medzibodrozie and Alluvium of Robava	Hungary, Slovaki a	1+2	
EU61	Örség	Hungary, Slovenia		
EU63	Stipinai	Latvia, Lithuania		15
	Upper Permian-Famennian	Latvia, Lithuania		17
EU65	Katlesi-Plivinias / Suosos-Kupiskio Istros- Tatulos	Latvia, Lithuania		41
	Sven toji-Arunula / Sventosios-Upninky	Latvia, Lithuania		56
	Upper C retaceous	Lithuania, Russia		>7
	Shallow Groundwater (Q) (/1) / Qall,N,K2		1	33
	Badenian-Sarm atian (/3)	Republic of Moldova, Ukraine		>20
	Siturian-Cretaceous (/4)	Republic of Moldova, Romania		>20
	Lublin-Podlasie Region	Poland, Ukraine		18
	Mazursko-Podlashi Region	Lithuania, Poland, Russia		>7
	Mesozoic of West Tatra and adjacent Crystalline	Poland, Slovakia	1+2	
	Mesozoic of Belianske Tatry and Adjacent Crystalline	Poland, Slovakia	1+2	
EU76	Alluvium of Poprad	Poland, Slovakia	1	
	Mirensko-Vrtojbensko Polje	Italy, Slovenia	1	
EU79	Q,Pg3,Cr2,N1,Pg2,Cr1,C,D,Pt	Russia, Ukraine	1+2	
	Q,N1-2,Pg2-3,Cr2	Romania, Ukraine		>6
	Qair,iv,Pg+K2	Siovakia, ukraine		
	Nave de Haver / Cludad Rodrigo- Salamanca (U. H.02-19)	Portugal, Spain		- 1
	Toulóes / Moraleja (U. H.03-13)	Portugal, Spain		
	Mioplioquatenario de Elvas-C ampo Maior / Vegas Bajas (U. H.04-09)	Portugal, Spain		
	Mourão-Fic alho	Portugal, Spain	2	
EU86	Alluvões do Minho / Aluvial del Baio Miño	Portugal, Spain	1	

Portugal, Spain

Developing a framework for closer bi-national cooperation

Americas Mexico and the USA Santa Cruz (N12) & San Pedro (N13)

nation of additional study of bi-national aquifers.

Four transboundary Maurier, Assessment Act of 2006 Four transboundary basins and their associated aquifers are identi-ied for prioritized assessment among which Santa Cruz (12N) and an Pedro (13N).

Initiator: Internationally Shared Aquifer Activity:









