

OVERVIEW & SCOPE

- Short “potted history” of TARM - ISARM
- Analysis & assessment of transboundary aquifers – 5 perspectives
- IAH Work Programme: Facts & Figures on 37 Major Aquifers
- UN ILC Draft Articles – selected aspects for consideration
- Factors in Equitable & Reasonable Utilisation
- Frameworks to facilitate country level ownership to transboundary level cooperation
- Lessons Learnt for use in next steps
- Aquifer System Projections 15 to 20 years ahead
- Final Remarks

IAH TARM – UNESCO ISARM : SHORT HISTORY

- 1997 - IAH Congress, Nottingham, UK; IAH set up TARM Commission
- 1999 - Tripoli-I meeting, Beirut meeting
- 2000 – Argentina proposal to 14th Session of IHP, UNESCO: approval from governments of 143 countries
- 2000 – Cape Town IAH Congress TARM Commission regional meeting
- 2001 – Santa Fe meeting, Brazil National Congress
- 2002 – Tripoli II Meeting
- 2002 - Mar de Plata IAH Congress, Beirut Expert meeting
- **ISARM FRAMEWORK DOCUMENT**
- 2003 - Athens GWP, shared water, shared future, shared knowledge
- 2003 - Kyoto World Water Forum
- 2004 - Montevideo meetings: ISARM Coordination Group
- 2004 – Latin American Case Studies, underway
- 2004 – IAH Zacatecas Congress – interim update to Framework Document & conceptualisation of the GEF GWG Project
- **2004 to 2015 – multiplication of ISARM activities across the globe...!!**
- **2015 – IAH Commission on Transboundary Aquifers – phase II**

ANALYSIS FRAMEWORK FOR TRANSBOUNDARY AQUIFERS

Inventory, classification, codification

UN GA Resolution: on the Use of Transboundary Aquifers

Scientific-Hydrogeological Scope

Legal Aspects

Socio-Economic Aspects

Institutional Aspects

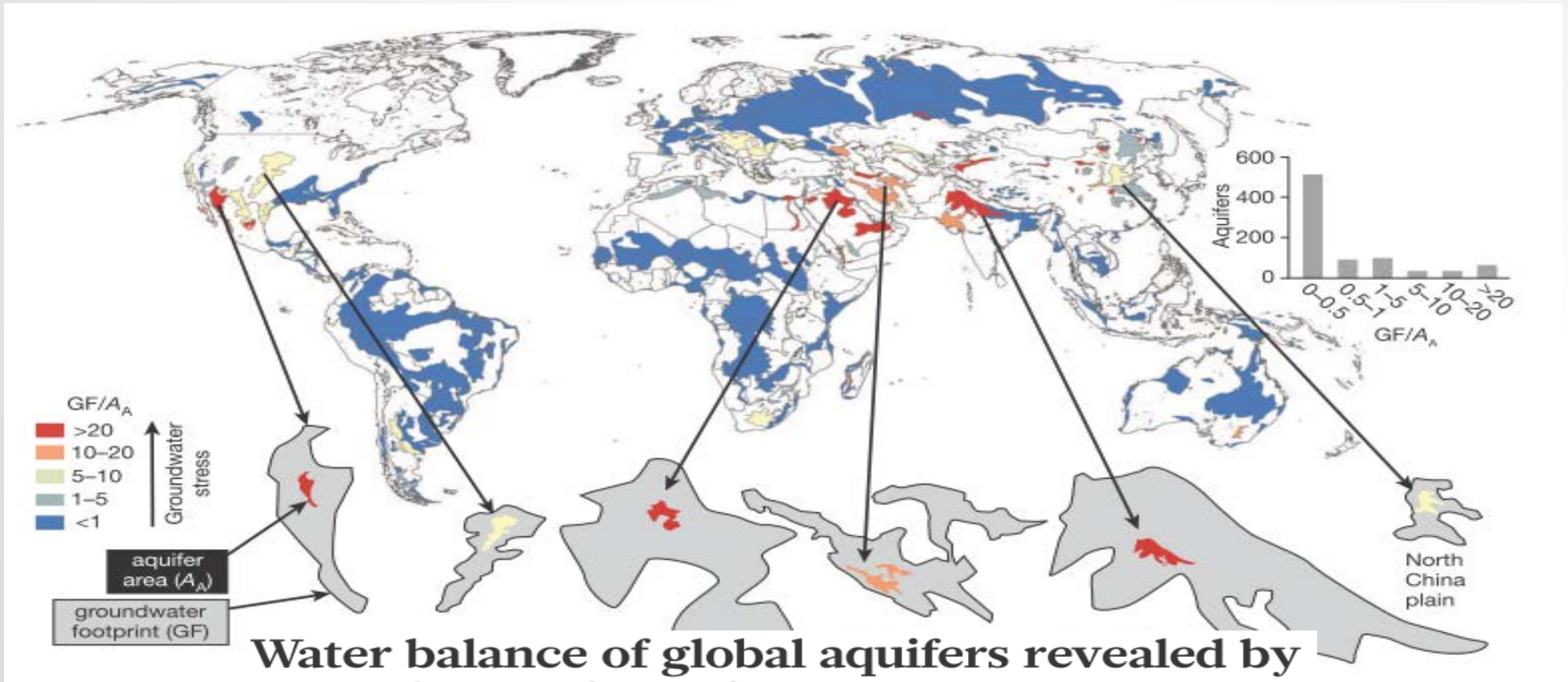
Environmental Aspects

Transboundary Aquifers

Continuing focus, but more effort is needed

Sharing countries will work together... to ensure the continued, sound *functioning* of aquifer systems and will reduce the *risks to the integrity* of an aquifer system

IAH "FACTS & FIGURES" FOR 37 MAJOR AQUIFERS OF THE WORLD



June 16, 2015 7:10 pm

Global water supplies are ‘in distress’, scientists warn

Clive Cookson, Science Editor

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Dead almond trees in California's Central Valley, which has a 'highly stressed' aquifer

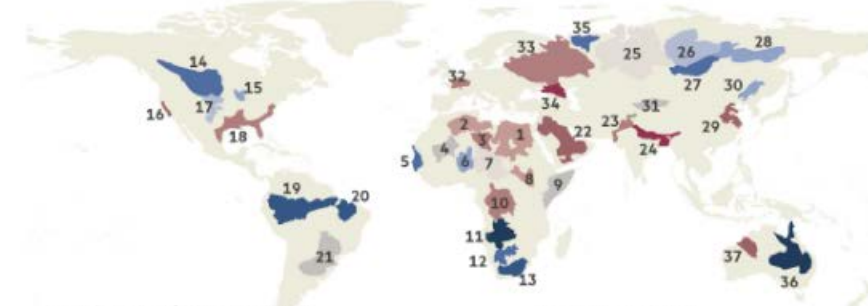
More than a third of the world's biggest aquifers, a vital source of fresh water for millions, are "in distress" because human activities are draining them, according to satellite observations.

Scientists from Nasa, the US space agency, and the University of California, Irvine, analysed 10 years of data from the twin Grace satellites, which measure changes in groundwater reserves by the way they affect Earth's gravitational pull.

"Twenty-one of the world's 37 biggest aquifers have passed sustainability tipping points . . . they are being depleted," said Jay Famiglietti, the study leader.

"Over a third [13] are so bad that they are experiencing exceptionally high levels of stress."

Trends in groundwater storage from Nasa Grace mission (2003-2013)



- | | |
|---|-----------------------------------|
| 1 Nubian Aquifer System (NAS) | 20 Maranhao Basin |
| 2 Northwestern Sahara Aquifer System (NWSAS) | 21 Guarani Aquifer System |
| 3 Murzuk-Djado Basin | 22 Arabian Aquifer System |
| 4 Taoudeni-Tanezrouft Basin | 23 Indus Basin |
| 5 Senegalo-Mauritanian Basin | 24 Indus-Ganges-Brahmaputra Basin |
| 6 Iullemeden-Irhazer Aquifer System | 25 West Siberian Basin |
| 7 Lake Chad Basin | 26 Tunguss Basin |
| 8 Sudd Basin (Umm Ruwaba Aquifer) | 27 Angara-Lena Basin |
| 9 Ogaden-Juba Basin | 28 Yakut Basin |
| 10 Congo Basin | 29 North China Aquifer System |
| 11 Upper Kalahari-Cuvelai-Upper Zambezi Basin | 30 Song-Liao Basin |
| 12 Lower Kalahari-Stampriet Basin | 31 Tarim Basin |
| 13 Karoo Basin | 32 Paris Basin |
| 14 Northern Great Plains Aquifer | 33 Russian Platform Basins |
| 15 Cambro-Ordovician Aquifer System | 34 North Caucasus Basin |
| 16 Californian Central Valley Aquifer System | 35 Pechora Basin |
| 17 Ogallala Aquifer (High Plains) | 36 Great Artesian Basin |
| 18 Atlantic and Gulf Coastal Plains Aquifer | 37 Canning Basin |
| 19 Amazon Basin | |

Source: UC Irvine

By comparing their satellite-derived groundwater loss rates to the limited data on groundwater availability, the researchers found huge discrepancies in projected times to total depletion of the aquifers.

UN ILC DRAFT ARTICLES -

- Articles 4 - equitable and reasonable utilization of transboundary aquifers and Article 6 - obligation not to cause significant cross-border harm.
- **Article 5 - factors relevant to equitable & reasonable utilisation**
- Article 11 - recharge and discharge zones
- Article 12 - prevention, reduction and control of pollution.
- Article 15 - planned activities

These provisions have coincidence with SADC Water Protocol & the 1997 UN Convention

"AQUIFER SYSTEM STATES WILL TAKE INTO ACCOUNT ALL RELEVANT FACTORS, INCLUDING:"

- (a) population dependent on the aquifer system in each aquifer State;
- (b) social, economic needs, present and future, of the aquifer States;
- (c) natural characteristics of the aquifer or aquifer system;**
- (d) the contribution to the formation and recharge of the aquifer system;
- (e) existing and potential utilization of the aquifer system;
- (f) actual & potential effects of the utilization of the aquifer system in one aquifer State on other aquifer States;
- (g) availability of alternatives to a particular utilization of the aquifer or aquifer system;
- (h) development, protection and conservation of the aquifer system & costs of measures;
- (i) the role of the aquifer system in the related ecosystem.**

Based on Article 5 – Factor relevant to equitable and reasonable utilisation

FROM COUNTRY LEVEL OWNERSHIP TO TRANSBOUNDARY LEVEL COOPERATION & REGULATION

TECHNICAL & SCIENTIFIC	
1. existence of baseline data – satellite images. common maps, etc	for consistent identification of the transnational aquifer system
2. definition of aquifer boundaries	for definition of trans national extent
3. general directions of the flow systems (in 3D)	to establish upstream / downstream (& vertical) relations
4. regions of vulnerability to pollution hazards	to determine land uses that might impinge on quality
5. access to simulation models that test alternate scenarios	to negotiate alternate development options
6. resource & quality monitoring network	to detect changes from baseline conditions
INSTITUTIONAL & LEGAL	
7. permitting system and aquifer use rights	for national policy administration
8. legal powers to control production	for managing impact across key administrative boundaries
9 powers to licence & supervise drilling companies	to ensure minimum construction standards and to limit the extent of overcrowding of production wells
10. legal power for fines & penalties	to ensure institutional supervisory authority
11. use of economic instruments & setting up of water markets	to enable institutions to use ‘stick & carrot’ and allow market based ‘cap & trade’ options

FROM COUNTRY LEVEL OWNERSHIP TO TRANSBOUNDARY LEVEL COOPERATION & REGULATION

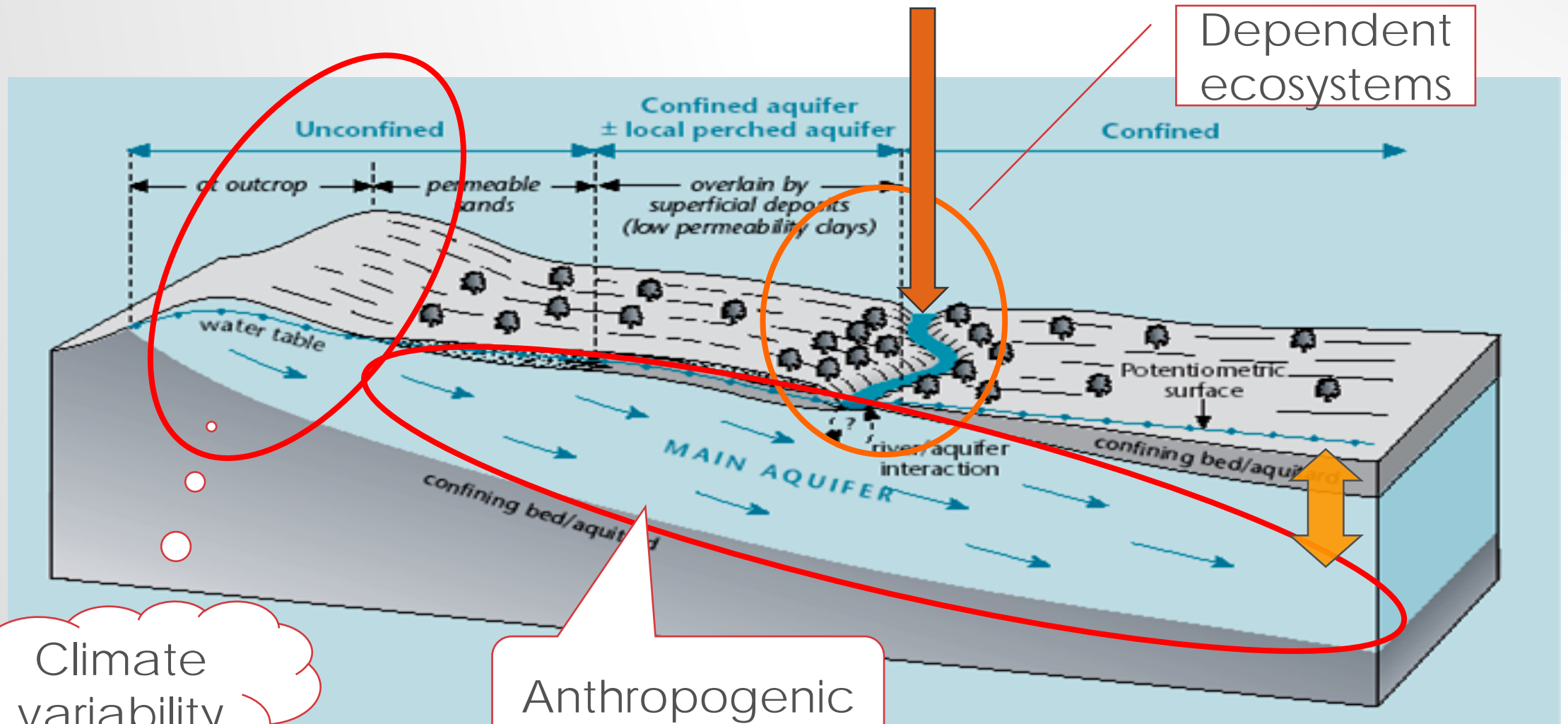
12. acquisition of cross sectoral links ie in water and land use	to address the multi sectoral aspects of aquifer resources
13. operation of 'polluter pays' & 'user pays' approach	to ensure change of behaviour among stakeholders
14. access to apex levels in government	to engage in bi or multi national negotiations
15. access to community level agencies to address local issues	to keep in focus the local nature of resource use, within the transnational context
POLITICAL	
16. linkage to national & trans national food production priorities	to consider the linkage between aquifer resources & food production priorities
17. linkage to municipal and urban water needs	to manage the water footprint on aquifers
18. reward system for avoidance of future negative impacts	to implement the 'prevention is better than cure' strategy
OPERATIONAL	
19. national & transnational assemblies for stakeholders	to ensure platforms for dialogue exist
20. perspective on a time span that much exceeds one term of office of elected officials	to respond to the slow & long term nature of aquifer responses

LESSONS LEARNT FOR USE IN NEXT STEPS

- ▶ National legislation focuses on internal country management – seldom has explicit provisions for transboundary management
- ▶ Transboundary Diagnostic Analyses reveal those aspects of national regulations that may need adjustment or enactment, eg after the TDA, the Guarani required new regulation on thermal properties of the aquifer in Brazil
- ▶ It is seldom that national instruments exist which enable transboundary investments for Strategic Action Programme (SAP) actions to be made
- ▶ Countries will benefit if the provisions of the Draft Articles are used as a benchmark of their domestic regulations for addressing transboundary issues, thus harmonising the relative parts rules required to adopt a common SAP

AQUIFER SYSTEMS – THE BASIS OF THE ILC ARTICLES

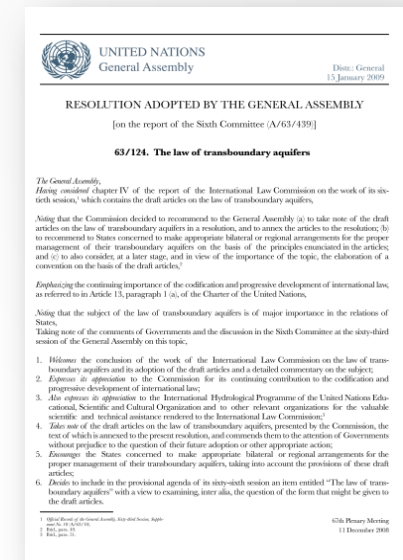
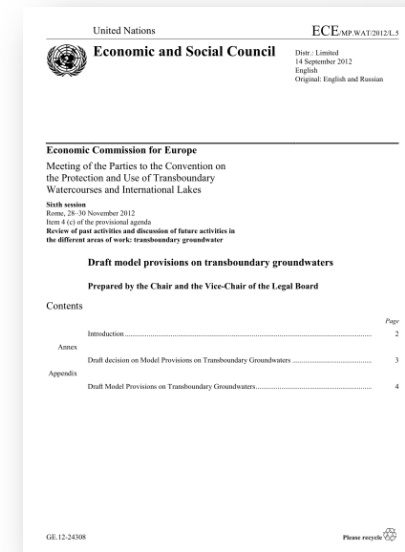
TRENDS CAPTURED THROUGH 15 TO 20 YEARS PROJECTION OF **RECHARGE – STORAGE – DISCHARGE**



FINAL REMARKS

- Over 300 transboundary aquifers found across all Continents
- The largest contain enough freshwater to provide for the whole planet for 200 years (eg Guarani, Nubian, Rum-Saq)
- Many contain hydrogeothermal energy, can store and deliver potable water, can purify water in the natural filtration process
- Some contain useful dissolved minerals, some can be used to sequester CO₂, and some are linked to shale gas reservoirs
- Better understanding, protection, conservation and good governance is urgently needed, through well developed cooperation mechanisms, scientific collaboration, and evolving transboundary agreements

FINAL REMARKS



- ▶ The UN International Law Commission has formulated Draft Articles on the Use of Transboundary Aquifers comprising 18 Articles, adopted in the UN General Assembly, for Member States to take note of them
- ▶ Other regional cooperation agencies, eg the UN ECE, have adopted the full scope of the Articles into their instruments – thus validating their application
- ▶ Coupled with the SADC Provisions there is a good opportunity to benchmark the planned Cooperation Mechanisms through the Draft Articles



THANKS FOR YOUR ATTENTION !!

QUESTIONS ??

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