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TRANSBOUNDARY WATER RESOURCES MANAGEMENT IN THE SOUTHERN MEDITERRANEAN

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The Necessity of developing a global transboundary groundwater framework: Examples from the Southern Mediterranean

by

Mohamed Elrawady

Regional Water Resources Specialist

Centre for Environment & Development for the Arab Region & Europe (CEDARE)

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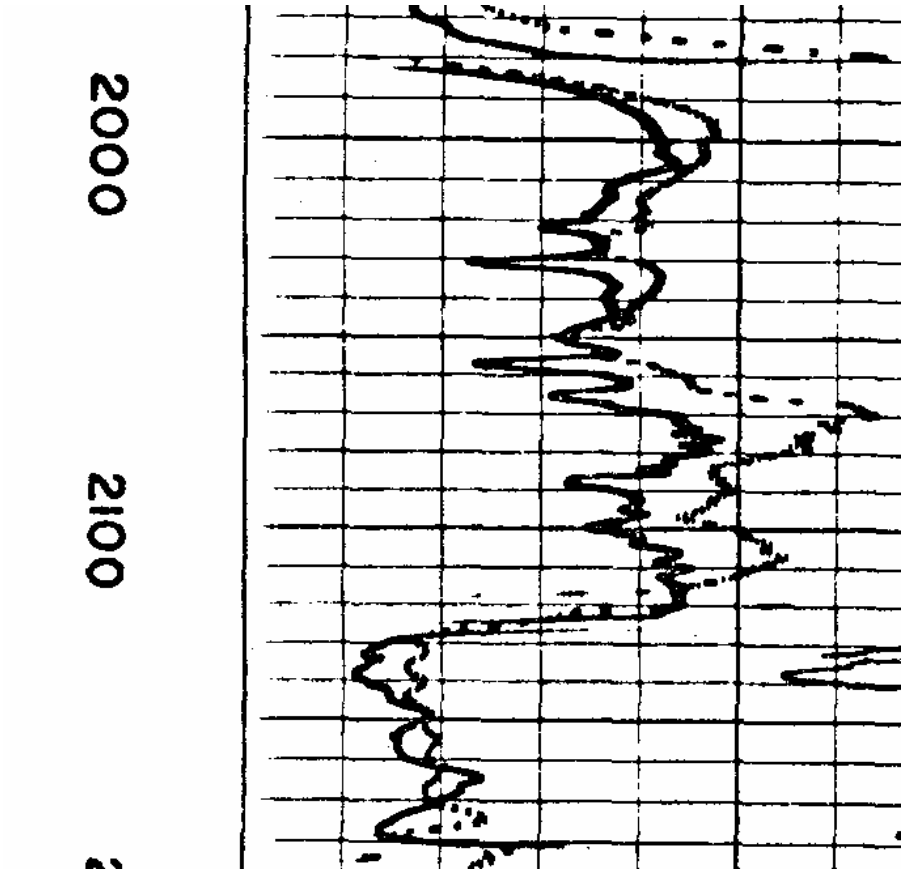
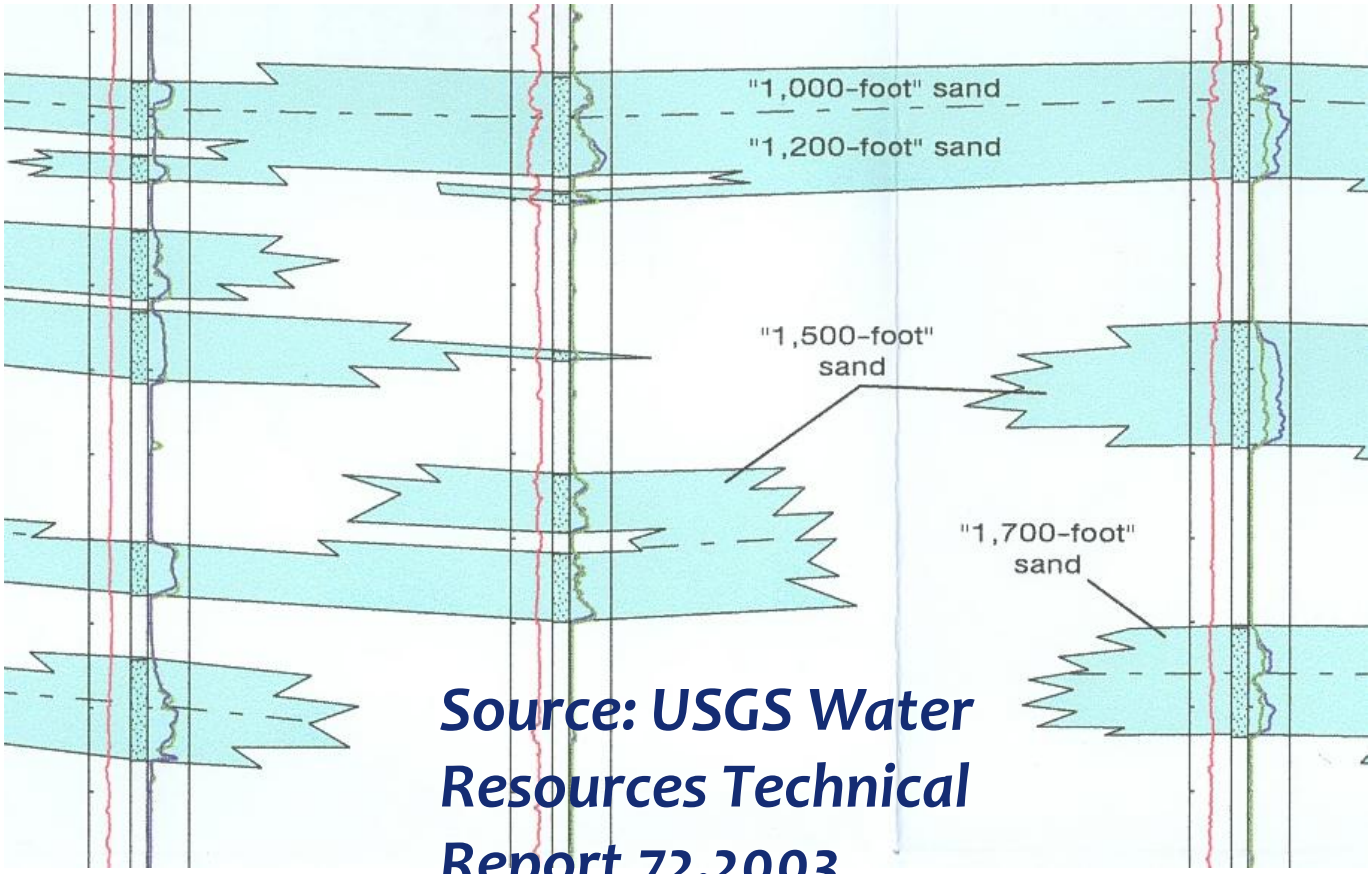
Introduction

- 1997 UN Convention doesn't entirely cover groundwater. It is still a surface water convention, as it covers groundwater only in connection to surface water, that doesn't cover non-renewable groundwater for example.
- Groundwater Assessment is associated with more uncertainty compared to surface water.

GW Uncertainty: Stratigraphy

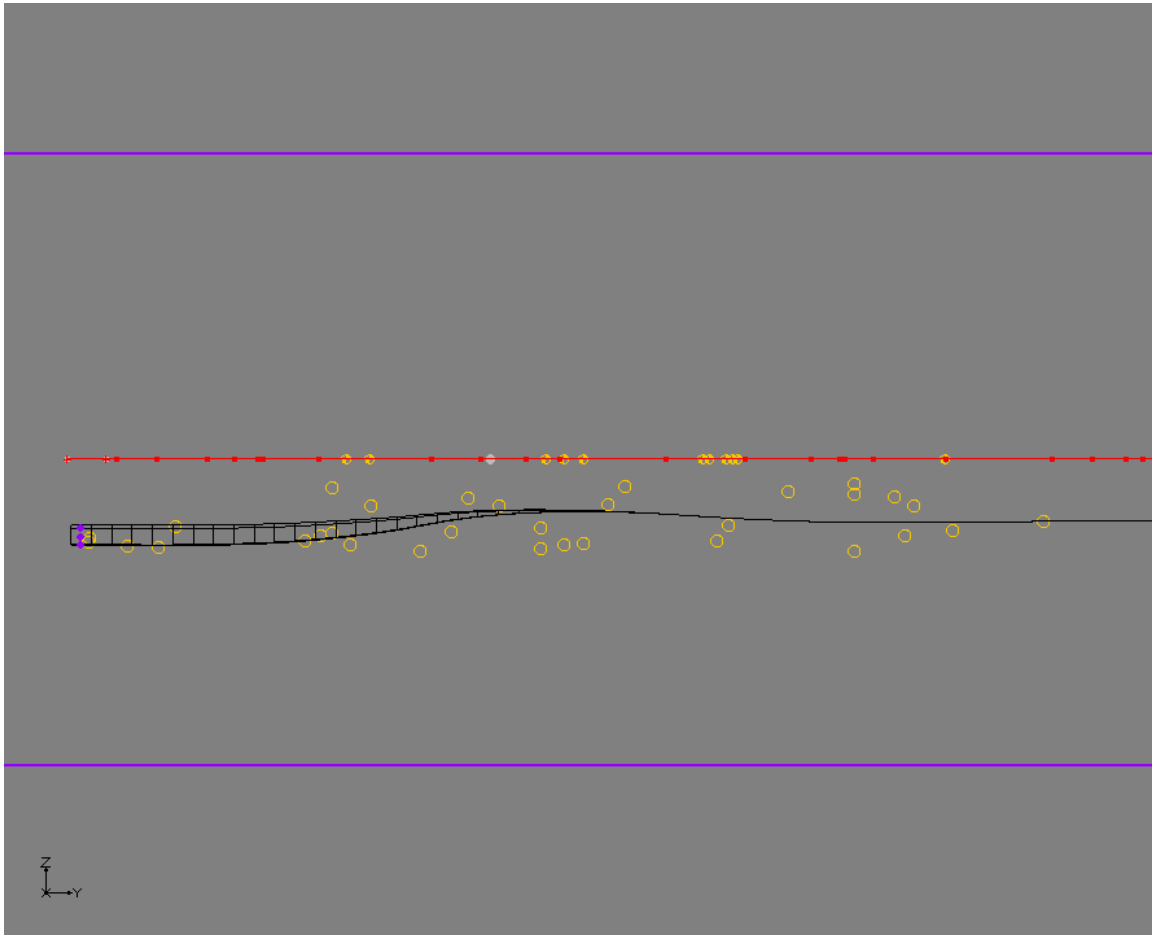


GW uncertainty: Horizontal extent



Source: USGS Water Resources Technical Report 72,2003

GW Uncertainty: Aquifer thickness



GW Uncertainty: Aquifer parameters

Transmissivity(T)= K*b (general form)

T=K(x)*b(x) (heterogenous soil)
T=K*b(x) (homogenous soil)
Where K is the saturated Hydraulic Conductivity , b is the thickness of confined aquifer.
There is a lot of uncertainty associated with T, as both K and b has high uncertainty.

GW Uncertainty: Aquifer parameters

Material	K(cm/s)
Gravel	10^{-1} - 10^{2}
Sand	10^{-3} - 10^{0}
Silty sand	10^{-5} - 10^{-2}
Silt, loess	10^{-7} - 10^{-4}
Clay	10^{-9} - 10^{-6}

GW Uncertainty: Aquifer parameters

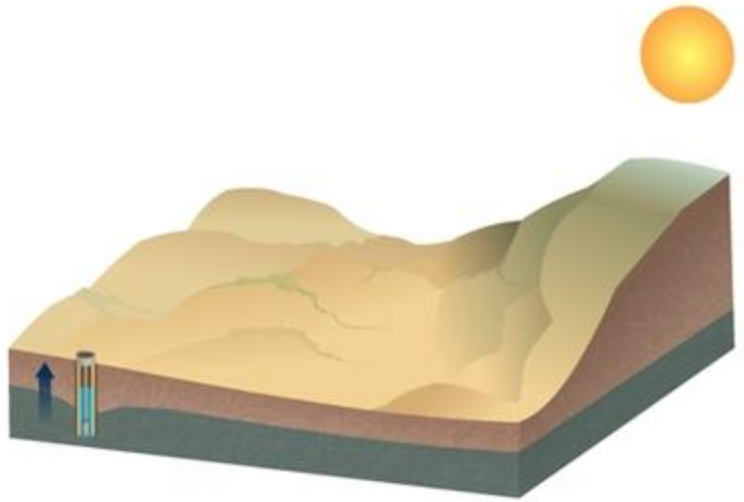
- The Inverse Problem.
- The Generalized parameterization method (GP)(Tsai and Yeh 2004, Tsai 2004) could be used to identify a certain parameter's heterogeneity as follows:

$$p_{GP} = \sum_{j=1, j\neq k} \beta_j \phi_j p_j + \left(1 - \sum_{j=1, j\neq k} \beta_j \phi_j p_j\right) p_k$$

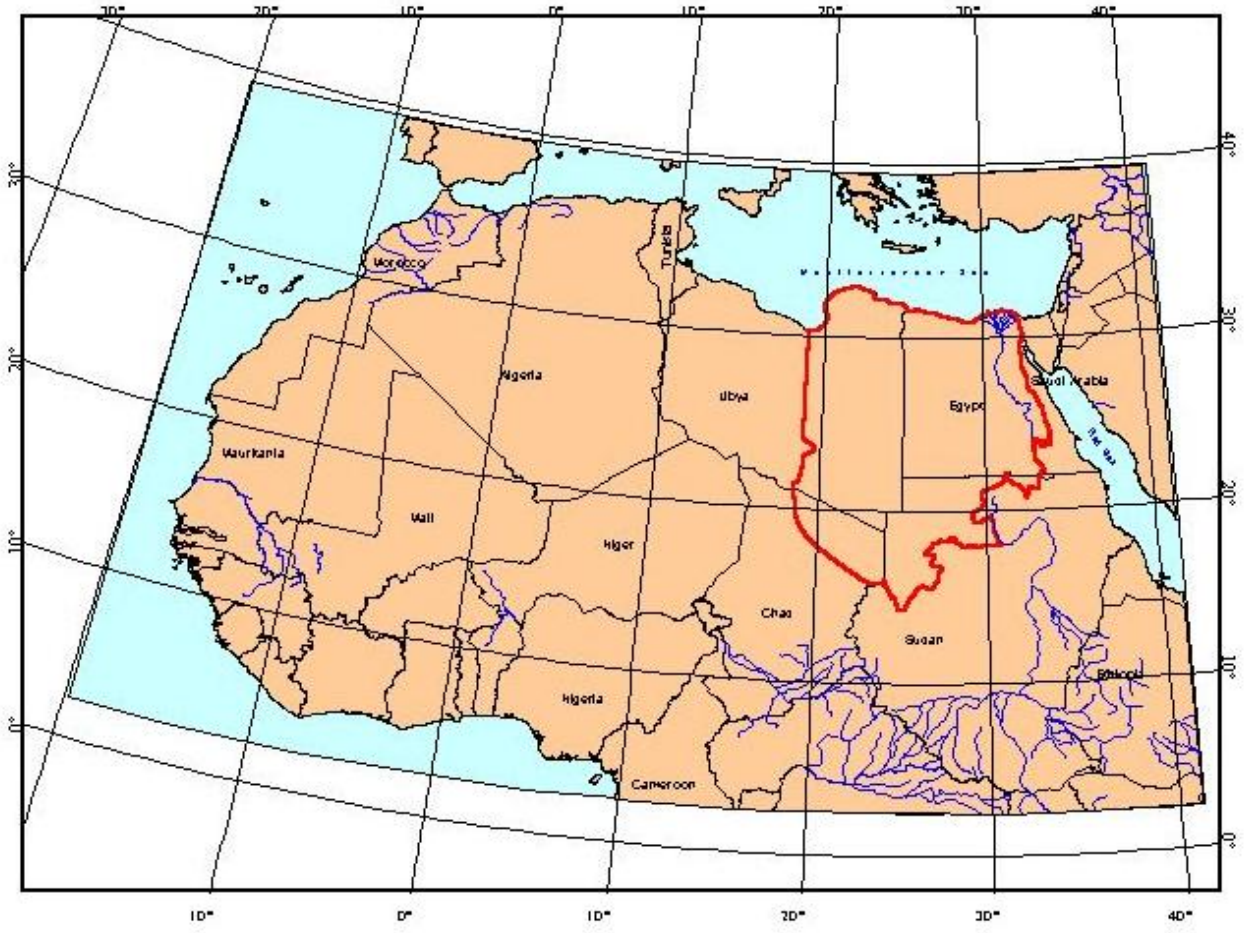
Non-Renewable Groundwater

- The development of a non-renewable groundwater resource involves the extraction of the fossil groundwater in a process that is usually referred to as "Groundwater Mining".

- The sustainable development of a depletable resource refers to prolonging the use of such resource as much as possible by applying relevant management tools and measures.



A Vision for the Future (NSAS)

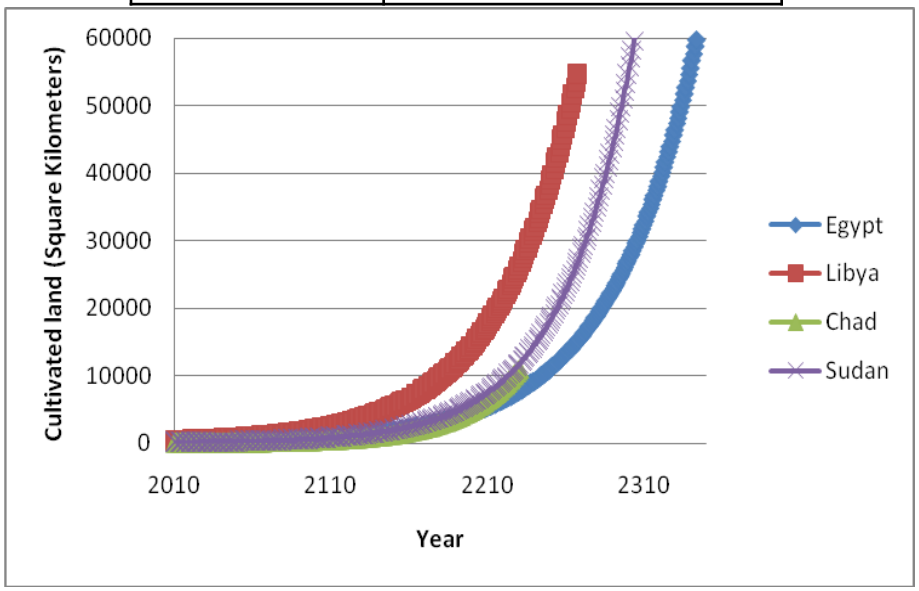


NSAS: Scenario development

Scenario	Theme	Beginning Year	End Year	Sustainability (Years)
1	Reaching up to WPI	2008	2068	60
2	Agricultural Resettlement	2008	2074	66
3	Industrial Resettlement	2008	2127	119
4	Aquifer Recharge	2008	2150	142

NSAS: Transboundary Scenario: Target Population

Country	Sustainability(end year)
Egypt	2348
Libya	2268
Chad	2231
Sudan	2311



NSAS: Transboundary Cooperation

- The four countries sharing the NSAS adopted a regional information network.
- Monitoring is continued through two agreements.
- A regional model and thematic maps have been developed.

Conclusion

A comprehensive Dialogue is the only way to come up with a satisfactory international document for Transboundary Groundwater

Thanks

e-mail: melrawady@cedare.int

Website: Water.cedare.int

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