



The 5th Biennial GEF International Waters Conference

Pre-Conference Technical Workshops

Transboundary and Local Aquifer Systems Technical Workshop



Water
Resources
Programme



IAEA / UNDP / GEF **The Nubian Aquifer Project**



Prof. Dr. Ahmed Khater
National Water Research Center (NWRC)
Egypt.



Structure :

- ◆ **Shared Aquifers and Transboundary Cooperation**
- ◆ **The Nubian Sandstone Aquifer System**
- ◆ **The IAEA / UNDP / GEF: Nubian Aquifer Project**
- ◆ **Concluding Remarks**

1- Shared Aquifers and Transboundary Cooperation

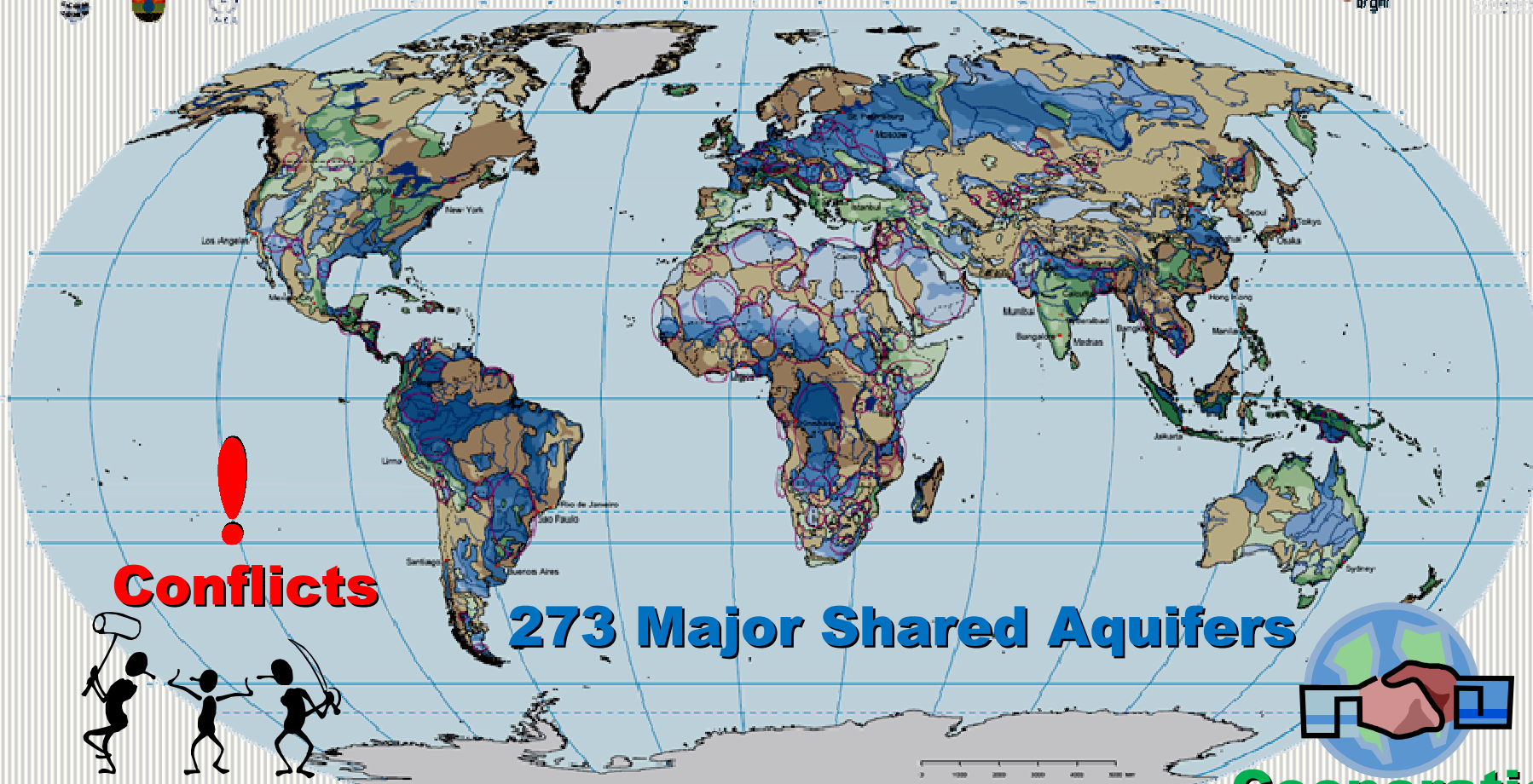
There is increasing concern over the potential for conflict over international waters, and a substantial work has already been done on transboundary surface water systems.

Groundwater too flows across geopolitical boundaries. Conflicts over groundwater quantity and quality are likely to develop as the resource is increasingly demanded under growing population pressure, over-exploitation, human induced pollution and climate change.

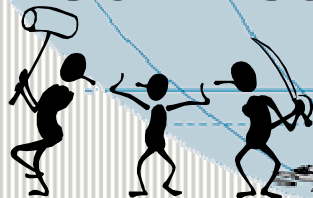


Groundwater Resources of the World

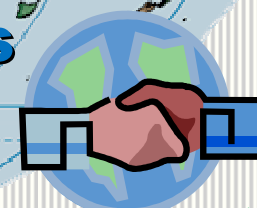
- Transboundary Aquifer Systems -



Conflicts



273 Major Shared Aquifers



Water ignores political boundaries

Cooperation

◆ **Transboundary cooperation is imperative for the sound management of shared aquifers.**

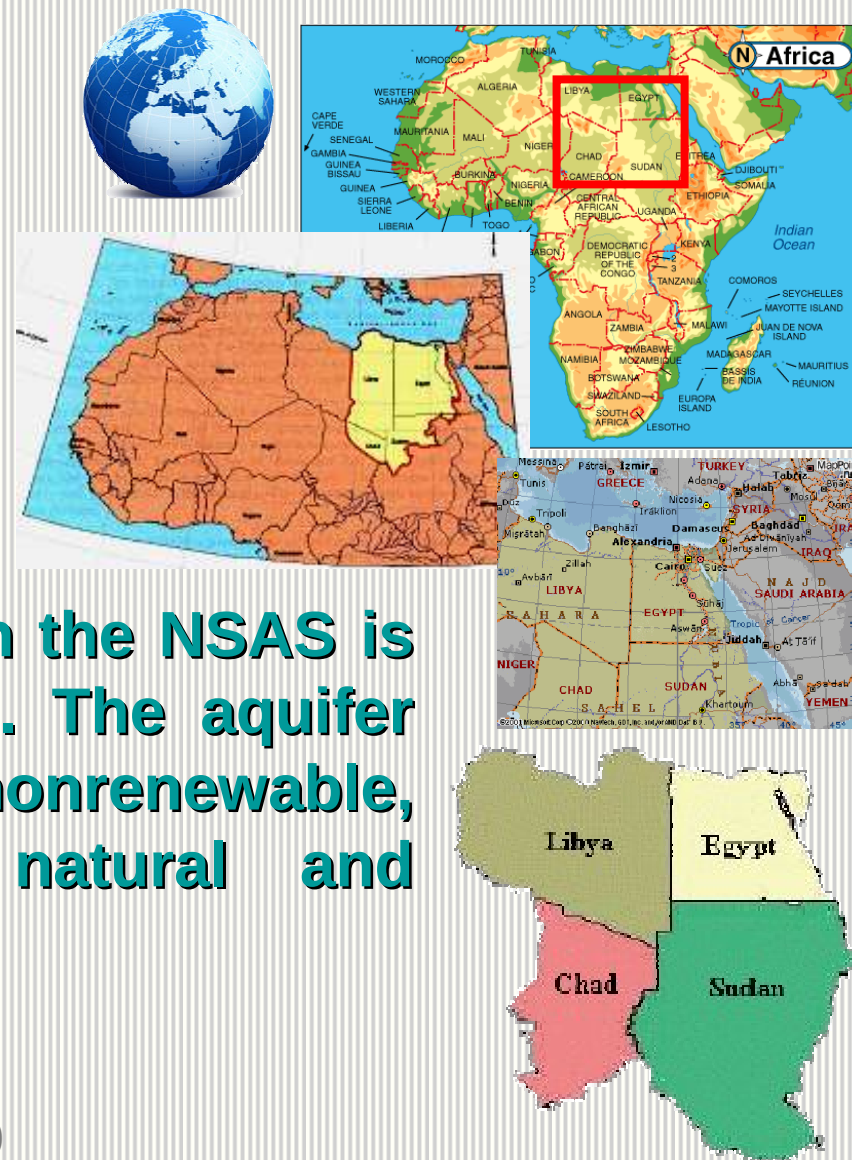
1- Shared Aquifers and Transboundary Cooperation

Frameworks for the management of shared aquifers should integrate technical, legal, institutional, socio-economic and environmental aspects.



2- The Nubian Sandstone Aquifer System (NSAS)

The NSAS covers about 2.2 million km², in the North East corner of Africa, extending across the borders of Egypt, Libya, Sudan and Chad.

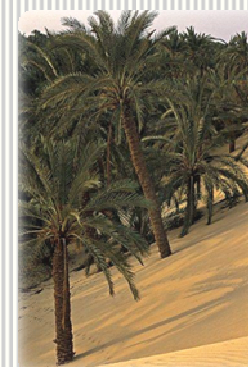
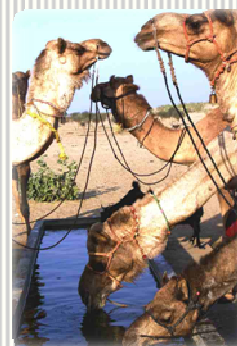


The volume of water stored in the NSAS is estimated to be 373,000 km³. The aquifer system is considered nonrenewable, depleting slowly through natural and artificial processes.

2- The Nubian Sandstone Aquifer System (NSAS)

All four countries shares similar conditions of arid climate, scarce surface water resources, persistent droughts and a fragile ecosystem.

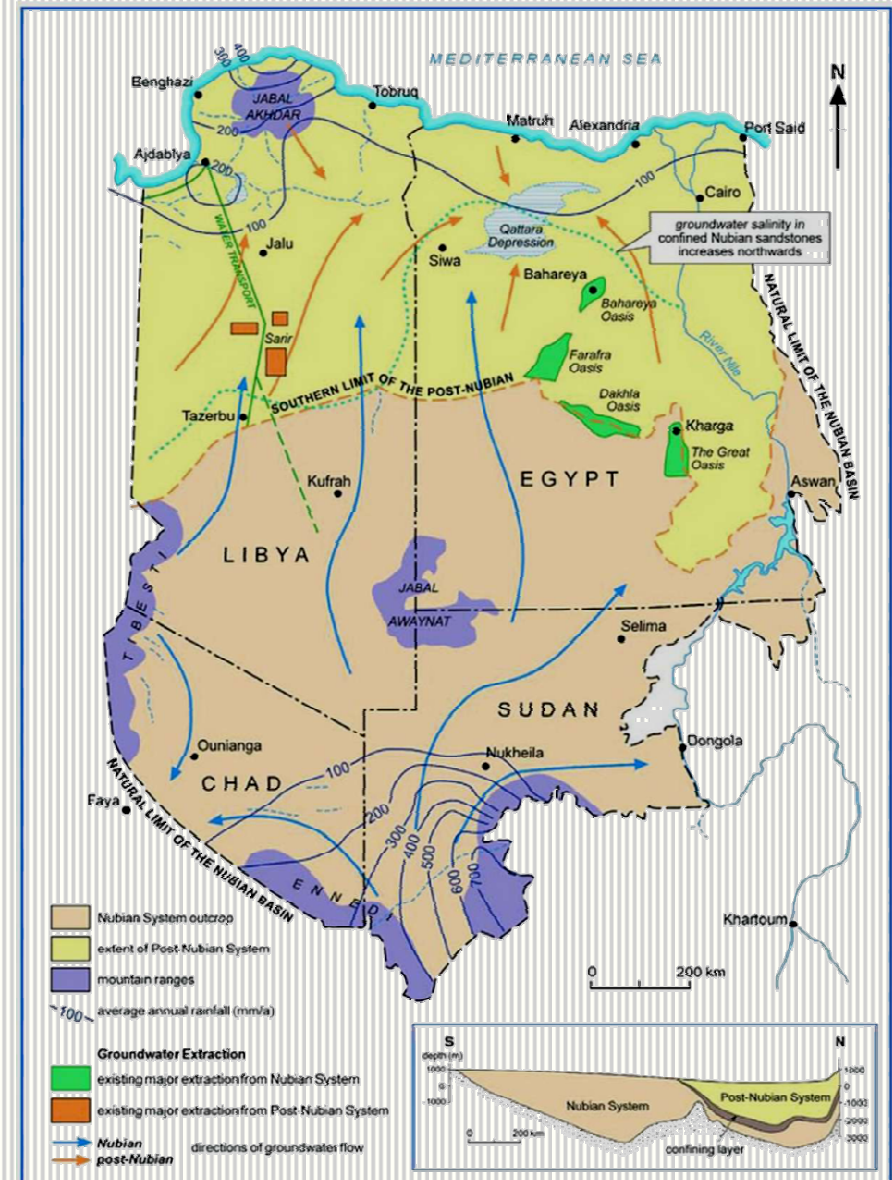
Groundwater has been identified as the major future source of water to meet growing demands. Each country has thus given top priority to linking NSAS groundwater development to national development goals.



2- The Nubian Sandstone Aquifer System (NSAS)

During the past four decades, the sharing countries have made efforts to develop the Aquifer. Each country has thus its specific experience.

Sharing these experiences within a cooperation framework is of vital importance to sustainable development of the NSAS.



2- The Nubian Sandstone Aquifer System (NSAS)

In the early 1970s, Egypt and Libya initiated a process for the NSAS countries to cooperate in managing the NSAS.

In 1992, it was formalized with the creation of the Joint Authority for the Management of the NSAS System. Sudan joined in 1996. Chad followed in 1999.

1972 -1974

Regional project to assess groundwater resources in the Nubian Sandstone Aquifer (Egypt, Libya and Sudan)

UNESCO
UNDP

1978 -1988

Transnational Project on the Major Regional Aquifer in North-East Africa (Egypt, Libya and Sudan)

UNDTCD
UNEP
UNDP

1992

Joint Authority for the Study and Development of the



JASAD - NSAS

The NSAS
Transboundary
Cooperation Mechanism

2- The Nubian Sandstone Aquifer System (NSAS)

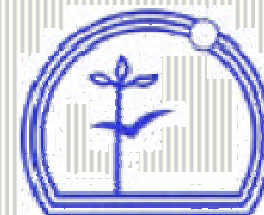
During the period 1994 – 2001, the Joint Authority and the NSAS countries have developed and implemented a major Regional Cooperation Program.

The Program was funded by the International Fund for Agricultural Development (IFAD) and executed by the Centre for Environment and Development for the Arab Region and Europe (CEDARE).

The results of the study have produced a Regional Strategy for the utilization of the aquifer system.



JASAD - NSAS



CEDARE



2- The Nubian Sandstone Aquifer System (NSAS)

The Regional Program involved data collection, verification, harmonization, standardization and storage in a unified information system format.

A regional model of the Nubian System has also been developed to analyse the regional behaviour of the aquifer system, to simulate aggregated national development scenarios and predict the related aquifer response.

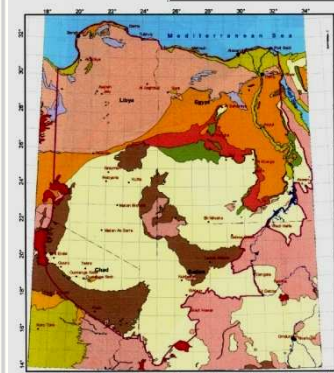
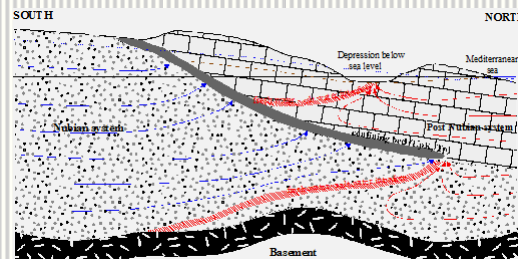
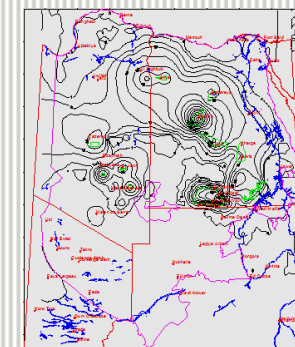
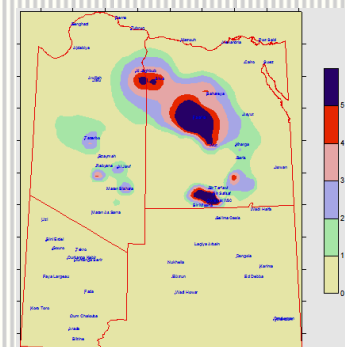
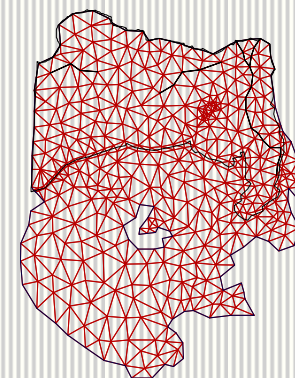


Figure (4-1)



2- The Nubian Sandstone Aquifer System (NSAS)

The IAEA projects related to the NSAS:

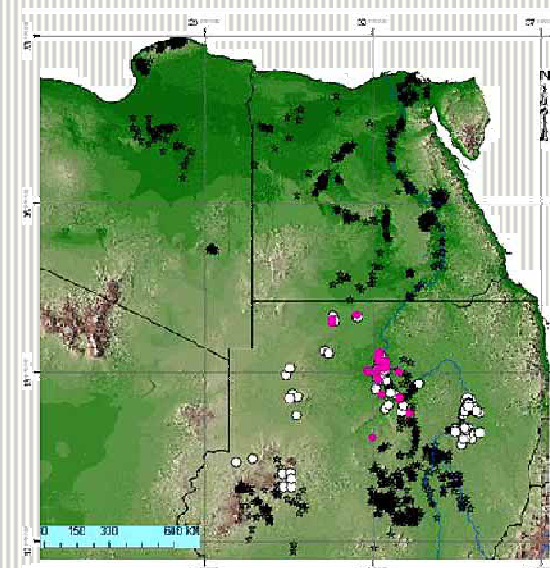
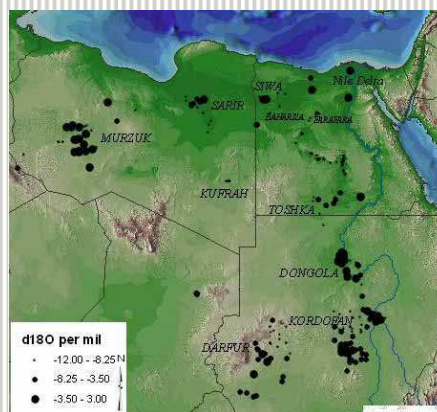
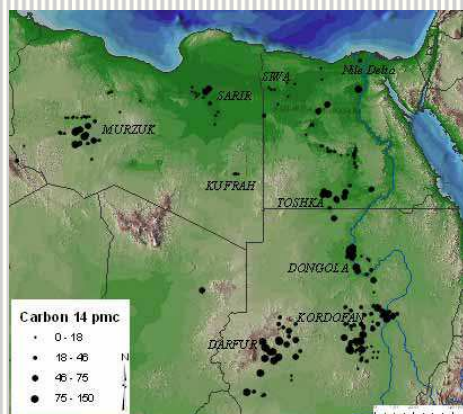
Project	Date	Project Title	Project Site
SUD/8/002	Early 1970s	Radioisotopes in Hydrology	East Kordofan; Darfur; El Geizira
SUD/8/004	Early 1980 and 1990s	Isotopes in Hydrology	Kordofan; El Geizira, Nile valley between Khartoum and Dongola
SUD/8/005	Early 1990s	Use of isotopes in groundwater assessment	Nile River and El Geizira
EGY/8/016	1999 - 2003	Using isotope techniques to study water resources	Farafra and Bahariya Oases
RAF8/010	1990s	Water resources in the Nile Valley	The Nile Valley in Sudan and Egypt
RAF8/022	Late 1990s	Isotopes in groundwater resources development	The Nile valley in Sudan and Egypt
RAF8/037	Ongoing since 2003	Sustainable Development of the Nile Basin Water Resources	The Nile Valley in Sudan and Egypt and up stream countries

Since 2003, the IAEA has been implementing a regional technical cooperation project to promote and support the development of a framework for the sustainable management and use of the NSAS among the Nubian system countries.

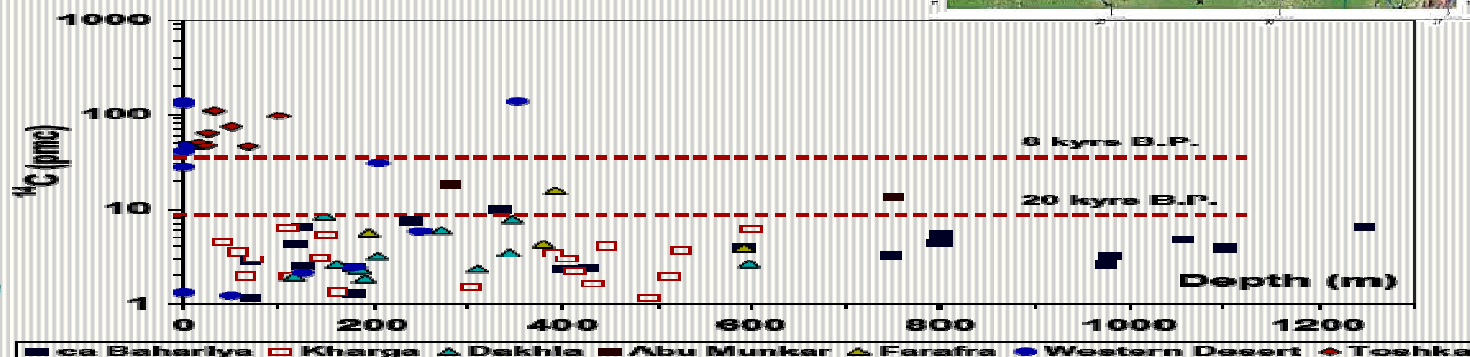


2- The Nubian Sandstone Aquifer System (NSAS)

The 2003 project, together with other past IAEA activities, has helped to improve the overall understanding of the NSAS and to set the basis for a broader Nubian Project.

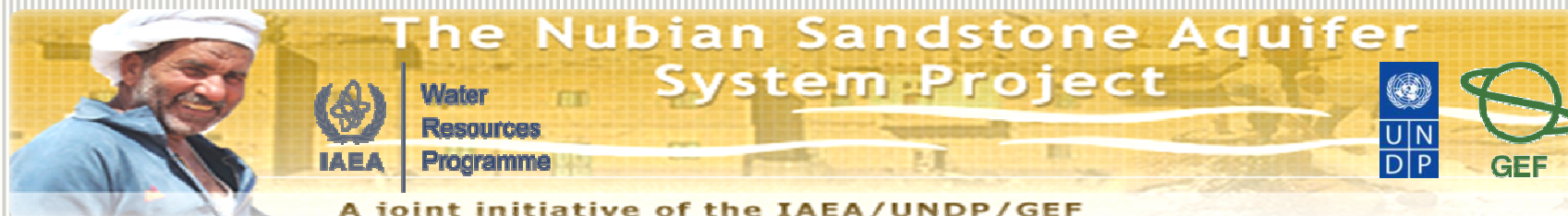


Water
Resources
Programme



3- The IAEA / UNDP / GEF: Nubian Aquifer Project

With growing pressures to increase abstraction from the NSAS, unclear knowledge of the transboundary impacts, represents potential threat that if unchecked, could lead to deterioration of the system or even lead to transboundary conflict.



In response, the IAEA/UNDP/GEF Nubian Project has been launched in July 2006 and now in full progress. The project has four immediate objectives are to:

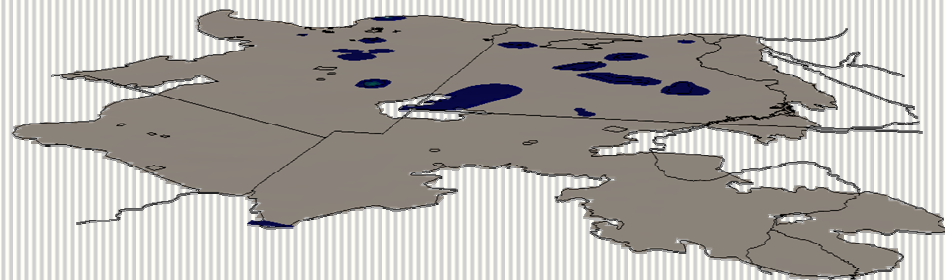
1. Prepare and agree on a Shared Aquifer Diagnostic Analysis (SADA) to jointly identify and understand threats to the NSAS and their root causes;

3- The IAEA / UNDP / GEF: Nubian Aquifer Project

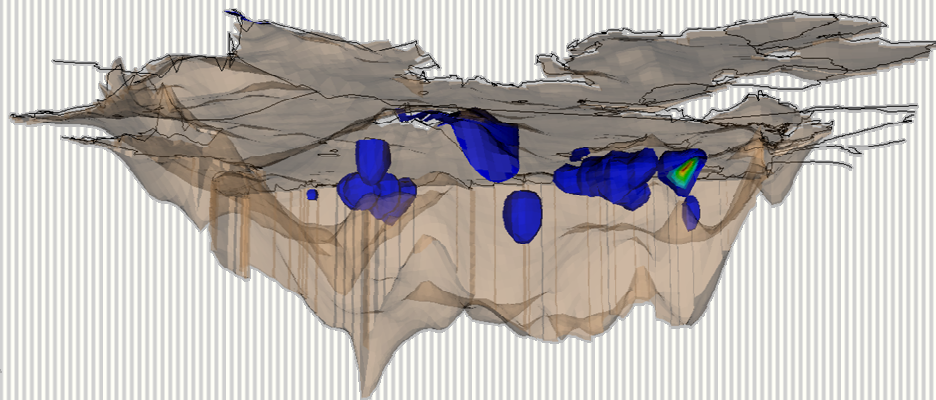
- 2. Address and fill key gaps in the methodologies, data and capacity needed for strategic planning decisions, using appropriate technical approaches with focus on isotopic techniques;**
- 3. Undertake the preparation of a Strategic Action Programme (SAP) to outline the necessary legal, policy and institutional reforms needed to address the priority threats and their root causes as identified in the SADA;**
- 4. Enhance the framework for developing an agreed legal and institutional mechanism towards a joint four-partite management of the shared NSAS.**

3- The IAEA / UNDP / GEF: Nubian Aquifer Project

The project has developed a new regional model of the Nubian System with the objectives to identify and make a through understanding of the system's transboundary issues and impacts.

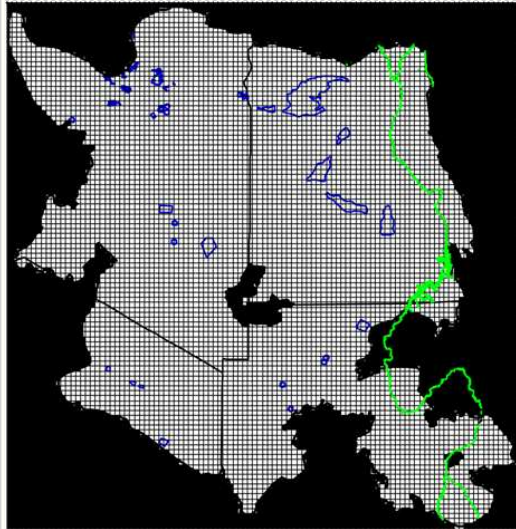


Old 2D Model

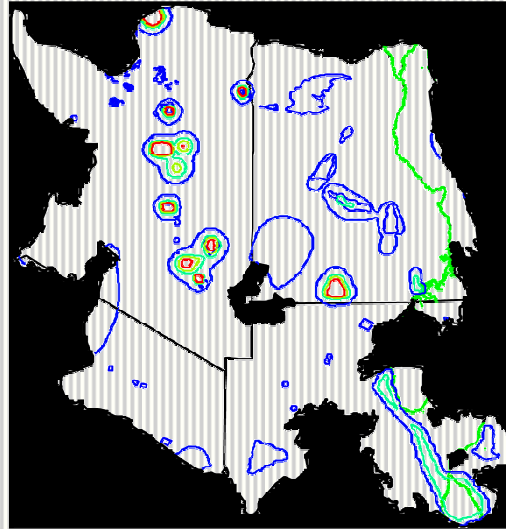


New 3D Model

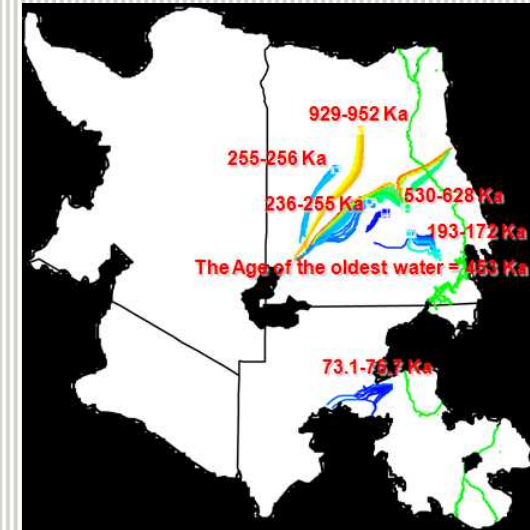
3- The IAEA / UNDP / GEF: Nubian Aquifer Project



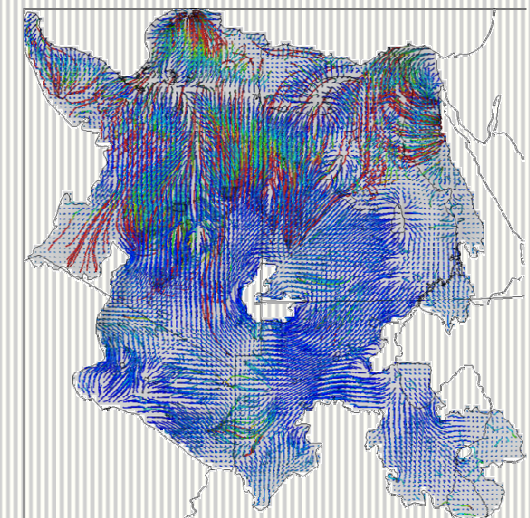
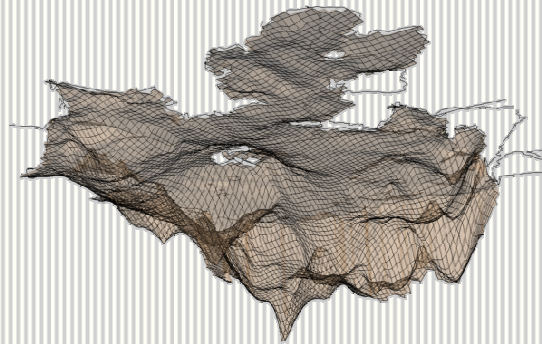
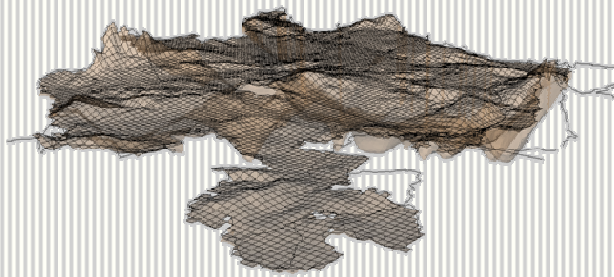
Model Grid



Drawdown Extent 2060



Calibrated Water Age



Current Flow Paths

4- Concluding Remarks

- ◆ **Management of aquifer systems essentially aims at achieving specific goals. Goals may be defined at different levels and can be achieved by different policies. Policies are generally based on driving forces related to socio-economic development.**
- ◆ **Within a national context, most management issues can be addressed under the single national constitution. Obviously, this is not the case regarding the management of shared aquifers where national policies may have to be adjusted.**

4- Concluding Remarks

- ◆ **In absence of joint management there is risk to impose high socio-economic cost and incur loss of resources. On the other hand, joint management should lead to identification of mutual opportunities for socio-economic development.**
- ◆ **Ecosystems conditions are shaped by hydrological features. In order to minimize environmental risks, monitoring and protection of shared aquifers should be developed and applied through institutional frameworks and cooperation mechanisms.**

4- Concluding Remarks

- ◆ **Management of shared aquifers should jointly integrate technical, legal, institutional, socio-economic and environmental aspects. One crucial concern is whether or not the aquifer is recharged.**
- ◆ **Countries sharing aquifer systems are encouraged to establish joint management frameworks, through appropriate lateral legal instruments derived from international treaties and harmonized local legislations and practices.**

4- Concluding Remarks

- ◆ **The four NSAS countries have already embarked on a process to cooperate that has been formalized in 1992 with establishing the Joint Authority for the Study and Development of the Nubian Sandstone Aquifer (JASAD/NSAS).**
- ◆ **The NSAS transboundary cooperation mechanism, represented by the Joint Authority, the practice of the countries sharing the aquifer system, and the continuous support from regional and international organizations provide successful example that could be followed in other shared aquifer systems.**



IAEA

Water
Resources
Programme



IAEA / UNDP / GEF

The Nubian Aquifer Project



Prof. Dr. Ahmed Khater
National Water Research Center (NWRC)
Egypt.

Thank You