



# Isotope hydrology:

## Water resources assessment and management



**IAEA**

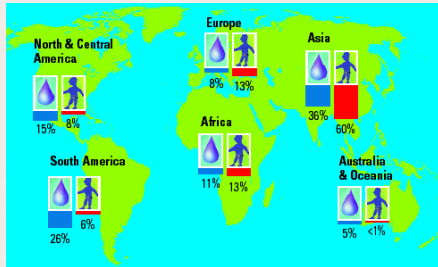
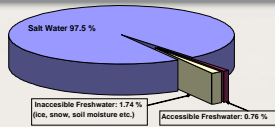
International Atomic Energy Agency

Luis Araguás

Isotope Hydrology Section



## Unequal distribution and stress on limited freshwater resources




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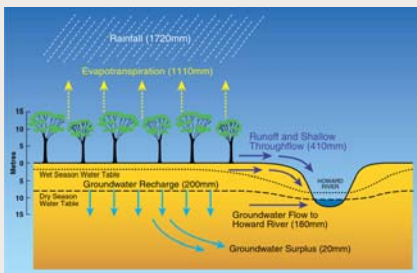
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## Water resources assessment



- Quantify resources
- Water balances
- Water quality
- Interactions
- Flow paths
- Recharge
- Age of water
- Vulnerability etc.




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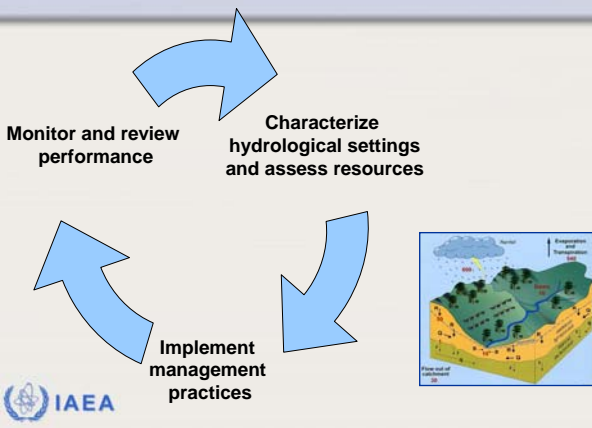
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## Water resources management




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## Programme vision

The Water Resources Programme assists Member States in assessing and managing their water resources in all aspects, with isotope hydrology as an integral part of their scientific and institutional strengths, and it is a premier programme within the UN system



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## Key features of the Programme

➤ Responds to scientific aspects of the Global Water Agenda arising out of international initiatives

- ↪ Improved understanding of the water cycle
- ↪ Sustainable exploitation of water resources
- ↪ Improved data and capacity for monitoring the quantity and quality of water resources



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## Collection and dissemination of global isotope data



Global networks monitoring precipitation, river runoff, ice, water vapour, etc.

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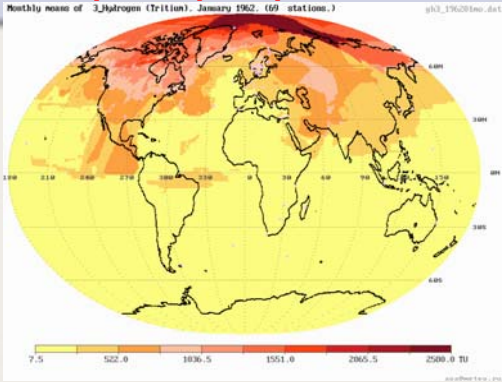
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### Map isotopes in precipitation



IAEA Long-term O-18 and monthly tritium concentrations in precipitation 1960-2008

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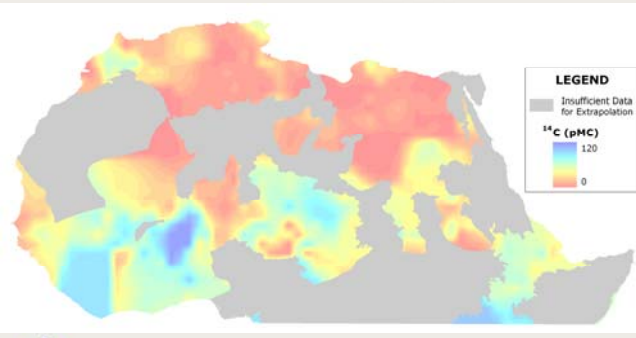
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### Mapping Northern Africa old groundwaters



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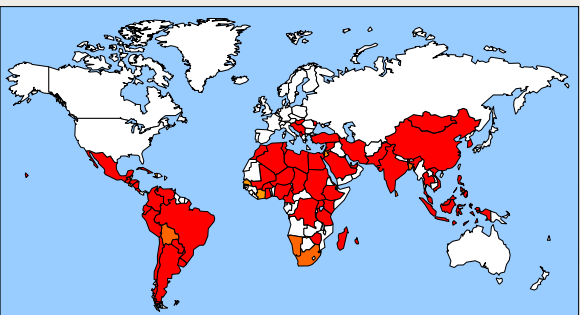
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### Direct support to Member States through Technical Cooperation



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### Mitigation of arsenic contamination of groundwater in Bangladesh

Millions exposed to arsenic in groundwater with serious health risks

Isotopes established natural, pre-irrigation origin of arsenic poisoning, and helped to locate arsenic-safe water

Influenced government's policy on protecting and managing clean, deep groundwater



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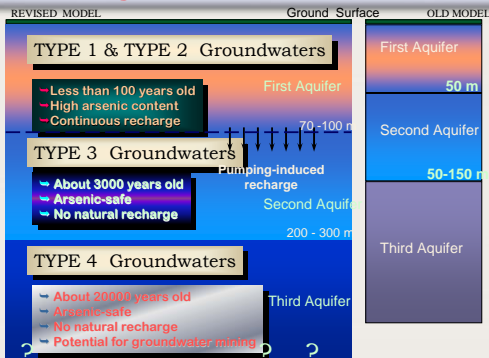
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### Isotope data provided a means to map arsenic-safe groundwater



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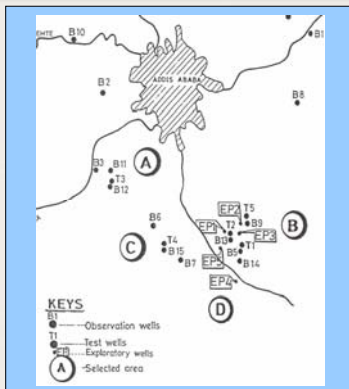
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### Expansion of drinking water supply for Addis Ababa, Ethiopia



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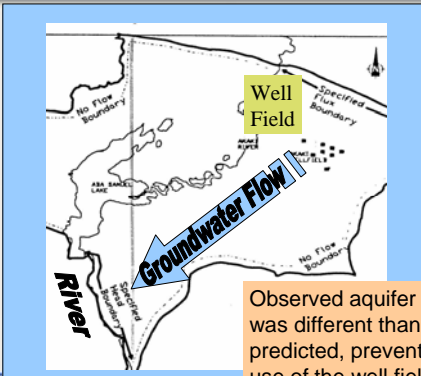
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**A groundwater well field was developed with a \$40 million investment**



Observed aquifer response was different than that predicted, preventing the use of the well field!

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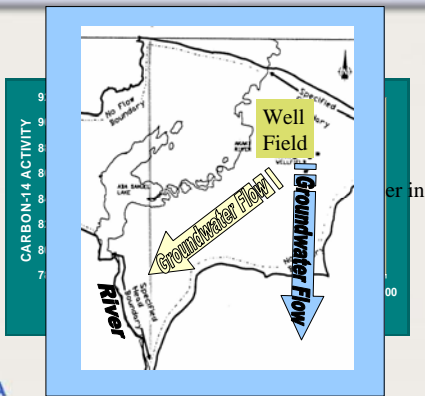
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**Groundwater mapping in Addis Ababa**



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**Guarani transboundary aquifer**

- Largest aquifer in the Americas
- Shared by Argentina, Brazil, Paraguay and Uruguay → 1,200,000 km<sup>2</sup>
- Goal: developing a common institutional framework for managing and preserving the Guarani Aquifer.



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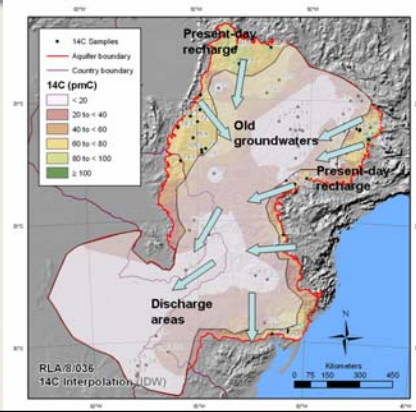
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## Groundwater types in the Guarani



Distribution of carbon-14 activities (pMC) showing main flow patterns, recharge and discharge areas

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## Education/Training in Isotope Hydrology

A collage of educational materials related to isotope hydrology. It includes a slide titled 'Isotope Hydrology' with a table of contents (Introduction, Fundamentals, Applications, Case Studies, Conclusions). Another slide is titled 'Environmental isotopes in the hydrological cycle: Principles and applications' by G. Hoffmann. A third slide is in Spanish: 'Ciclo hidrológico y los isótopos ambientales' by R. H. Muñoz. A fourth slide is titled 'Programa hidrológico internacional'. There is also a photo of two people in a field and the IAEA logo.

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## Technical videos on field and lab methods

A collage of technical videos from the IAEA Water Resources Programme. It features a large video cover titled 'Introduction to Water Sampling and Analysis for Isotope Hydrology'. Other video thumbnails include 'INSTALLING, RUNNING AND MAINTAINING THE LIQUID-WATER STABLE ISOTOPE ANALYSER'. The IAEA logo is visible at the bottom left.

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