Isotope hydrology:

Water resources assessment and management

Luis Araguás
Isotope Hydrology Section
Unequal distribution and stress on limited freshwater resources

![Pie chart showing distribution of freshwater resources](image)

- Salt Water 97.5%
- Inaccessible Freshwater: 1.74% (ice, snow, soil moisture etc.)
- Accessible Freshwater: 0.76%

Water resources assessment

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

Water resources management

- Characterize hydrological settings and assess resources
- Monitor and review performance
- Implement management practices
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.

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

Collection and dissemination of global isotope data

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

Isotope data provided a means to map arsenic-safe groundwater

Expansion of drinking water supply for Addis Ababa, Ethiopia
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!

Groundwater mapping in Addis Ababa

Guarani transboundary aquifer

- Largest aquifer in the Americas
- Shared by Argentina, Brazil, Paraguay and Uruguay → 1,200,000 km²
- Goal: developing a common institutional framework for managing and preserving the Guarani Aquifer.
**Groundwater types in the Guarani**

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

**Education/Training in Isotope Hydrology**

- Train more than 100 scientists each year
- JIIHP – joint programme with UNESCO for capacity building
- Build analytical capacity in Member States through equipment and standards
- Teaching/training materials
- Technical videos on field and lab methods