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Abstract

International Atomic Energy Agency (IAEA)

Simulating a Meeting of the Board of Governors

"Ground Water Resource Exploitation through Isotope Techniques"

"*The simple fact is that there is a limited amount of water on the planet, and we dannot afford to be negligent in its use. Science and technology have a crucial role to play in improving water resource management policies and practices.*"

Dr. Mohamed ElBaradei
Director General, International Atomic Energy Agency

Transboundary Aquifers

As we in water-rich countries take our daily showers, water the lawn or laze about in the pool, it's easy to forget that fresh water is a life-or-death issue in many parts of the world.
Of a population of roughly 6.1 billion, more than 1 billion lack access to potable water. The World Health Organization says that at any time, up to half of humanity has one of the six main diseases -- diarrhea, schistosomiasis, or trachoma, or infestation with ascaris, guinea worm, or hookworm -- associated with poor drinking water and inadequate sanitation. About 5 million people die each year from poor drinking water, poor sanitation, or a dirty home environment -- often resulting from water shortage.

Water Shortage and the IAEA

Aspirations for development in many parts of the world are intricately linked to water. Whether concerning issues of health, food and agriculture, sanitation, the environment, industry, or energy production, a paramount issue in the 21st century is water - its availability, quality and management.
The IAEA, through its Water Resources Programme, is one of the UN agencies responding to its Member States by providing science-based information and technical skills to improve understanding and management of their water resources.

Two-thirds of the Earth is covered by water yet less than one per cent of the world's freshwater is accessible for use. Groundwater is the largest component (about 70%) of the accessible freshwater. The amount of water stored in groundwater systems or aquifers is greater than that of all rivers, lakes and the largest man-made reservoirs combined. More than half of the global freshwater supply for drinking, industrial uses and irrigation comes from groundwater. Without detailed knowledge of the characteristics of a groundwater system – the amounts of water available, replenishment rate and threats to water quality – it is impossible to use groundwater resources in a sustainable way.

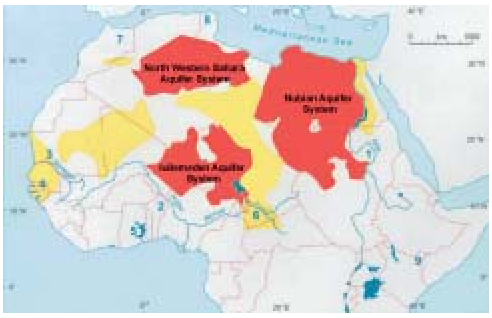
Isotopes: Unique Tools

Isotope techniques are an effective and often unique means to assess the long-term viability of groundwater resource exploitation. The costs are relatively small and techniques are complementary to classical hydrological investigations. In addition, isotopes provide insights that would not otherwise be possible or practical. By using isotope techniques water resource managers can quickly obtain information that may normally require decades of measuring rainfall and groundwater levels. The picture that emerges from isotopic investigations allows hydrogeologists to map the extent and age of groundwater, and to determine the sources as well as the rate of recharge.
Sustainable exploitation also involves knowing the balance between the natural replenishment rate and abstraction. Groundwater movement is often very slow and the water balance is delicately poised.

Isotopic analysis also allows one to understand and evaluate groundwater interactions with other aquifers, rivers, lakes, and wetlands. Importantly, isotopes help build a deeper understanding of how groundwater has behaved in the past and help predict what may happen in years to come, providing a sound scientific basis for water resources planning and protection. The IAEA's Water Resources Programme supports the application of isotope techniques to help its Member States to develop and implement their groundwater management strategies and policies. Currently it is supporting the implementation of over 60 technical cooperation projects related to groundwater management. It also undertakes coordinated research projects to develop new approaches on specific issues.

Managing Transboundary Aquifers

Freshwater resources shared by more than one country present special management challenges. Exploitation practices are often inconsistent and disagreements may arise over abstraction rights. Aquifers may receive the majority of their recharge on one side, while more of the discharge or abstraction might occur on the other side of an international border. Some transboundary aquifers contain huge quantities of freshwater, enough to provide safe drinking water amongst countries for centuries. Equitable and effective management of transboundary aquifers requires a coherent and defensible hydrological model supported by sound scientific information.



Managing transboundary aquifers: Guarani Aquifer, South America

The Guarani is the largest aquifer in South America, shared by Argentina, Brazil, Paraguay, and Uruguay. The principal threat to this aquifer system comes from uncontrolled pollution in extraction and recharge areas. Isotope techniques are helping these four countries to improve their understanding by defining the key hydrodynamic features of the aquifer, assessing water quality and contamination patterns, determining the origin and age of groundwater, and assembling a comprehensive database to be shared among the four countries.