Water Resources

Objective

To enable Member States to sustainably use and manage their water resources through the use of isotope technology.

Water and the Millennium Development Goals

In 2010, the United Nations reviewed progress made in achieving the Millennium Development Goal (MDG) adopted in 2000 related to reducing by half the number of people without access to safe drinking water. The conclusion was that progress has been uneven, with some regions having less than 60% access to safe water. Critical areas were identified that can help accelerate progress in implementing this goal. The Agency's contributions within the MDG framework involved the promotion of isotope hydrology techniques including: (1) coordinated efforts to improve integrated water resources management; (2) improved hydrological data collection, assessment and information dissemination; and (3) strengthening of hydrological and meteorological monitoring networks, which are critical for addressing water management and climate change issues. Key Agency activities and achievements in 2010 related to these three areas are described below.

Water Resources Assessments

The Agency began implementation of the IAEA Water Availability Enhancement (IWAVE) project, which supports the MDGs by enabling Member States to conduct science based, comprehensive assessments of national water resources. These assessments will support policy decisions for allocating water to competing priorities and allow a more sustainable management of surface and groundwater resources. Three pilot studies are anticipated in order to develop a methodology to be utilized by other Member States. The first pilot study was initiated in the Philippines by holding a workshop that brought together multiple stakeholders and government entities dealing with water. Deliberations led to the identification of a number of 'gaps' in knowledge and capacity required for the desired level of water resources assessment. In addition, two meetings were held in Vienna to discuss the Agency's approach in this project and to identify interested international partners.

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In the area of global isotope monitoring networks for precipitation and rivers, new isotope data sets were compiled for different continents and made available to hydrologists and isotope experts on the Agency's web site (*www.iaea.org/water*). There is

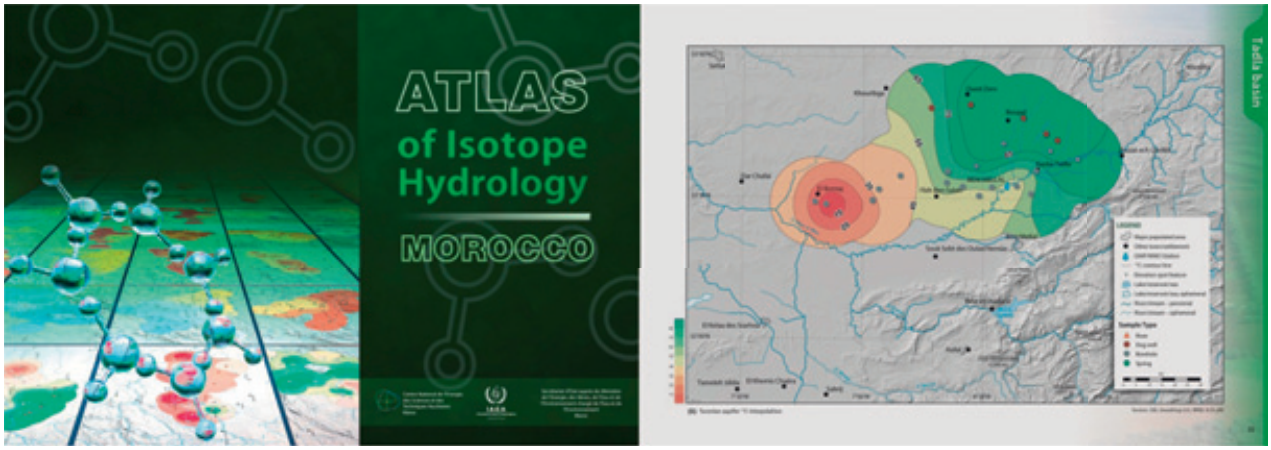

FIG. 1. An isotope hydrology atlas focusing on Morocco was published in 2010.

Addressing the Challenges of Capacity Building

Increasing the use of isotope hydrology to support water resources management and policy decision making is a challenge because trained personnel are needed for field sampling, analyses, and interpretation and communication of results. In 2010 the Agency adopted a multi-pronged approach to address this capacity building challenge. With regard to field work, a new Agency isotope field sampling guide was published, and most of the isotope hydrology training courses taught in 2010 contained a field demonstration component. To address analytical needs, the Agency produced a 45-minute video providing an Overview of Laboratory Isotope Analysis Methods for Water Resources Studies (IAEA-IWSA) to increase Member State capacity to perform their own isotope analyses. The video describes many of the key analytical methods used for isotope hydrology studies. In addition, two training courses were conducted at Agency Headquarters on the use of laser absorption based stable isotope analysers. In addition, fellowships were supported through various technical cooperation projects. Isotope data interpretation and presentation issues were addressed primarily through regional and national training courses and technical cooperation fellowships. Highlights included: an advanced regional training course on 'Isotope Techniques for Assessment of Shallow Groundwater and their Interactions with Surface Waters', organized in collaboration with the Argonne National Laboratory in the USA; regional training courses on isotope hydrology in India, Mexico and Morocco; and national training courses in the Democratic Republic of the Congo, Ethiopia, Ghana, Thailand and Uganda.

Water testing and sampling for isotope analysis in a rural environment (left), and a training course held in Morocco on the use of a laser absorption analyser to determine stable isotope contents in water samples (right).

increasing demand for globally distributed isotope data to support hydrological studies and to help understand the effects of land use and climate change.

A CRP on geostatistical analysis of spatial isotope variability to map the sources of water for hydrological studies was completed. The participants developed improved isotope maps and statistical analyses, contributing to more reliable interpretations of isotope results.

The *Atlas of Isotope Hydrology — Morocco* was published in 2010 (Fig. 1). Developed in collaboration with the Agency's Moroccan counterparts, the atlas describes results from ten different isotope hydrology projects across Morocco. It is both a national and regional resource and serves as an example of how isotope hydrology can be integrated into national water resources assessments. One important new aspect of the atlas is the inclusion of isotope interpolation maps for various hydrological basins. These maps allow an easy, visual characterization of groundwater systems, including recharge areas and locations of modern and fossil groundwater. The interpolation approach was developed by the Agency, and the resultant maps are helping to demonstrate to water managers and policy makers the value added by isotope data in hydrological investigations.

Strengthening Member State Capabilities

In 2010, analyses of groundwater resources in Brazil and the United Republic of Tanzania were conducted to demonstrate how the technique of tritium/helium-3 dating, and other noble gases, can be used as a 'reconnaissance characterization' method. Results from the United Republic of Tanzania revealed important characteristics about a recently discovered groundwater system that had not previously been detected and are now being used by that Member State to determine the potential for water supply development.

The assessment of groundwater resources in Madagascar was completed through a national technical cooperation project as part of the National Programme for Borehole Drilling in the Provinces of Fianarantsoa and Tuliar. The objective was to ensure a sustainable source of potable water in southern Madagascar. Data from isotope and hydrochemical analyses indicated that there are two main aquifer types: one is relatively isolated and possibly protected from pollution; the other is characterized by a higher rate of recharge, and is thus more vulnerable to pollution. The results of this work are expected to contribute to the development of safer drinking water supplies in Madagascar.

In Latin America, a regional technical cooperation project on coastal aquifers was completed in 2010. The goal was to improve the capability of six Latin American Member States (Argentina, Costa Rica, Cuba, Ecuador, Peru and Uruguay) to assess the dynamics of coastal groundwater systems and water quality deterioration by means of isotope and geochemical techniques. Isotope data were used to identify recharge areas, to assess groundwater dynamics and to prove the relevance of hydraulic connections between river water and groundwater.

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