



Water
Resources
Programme

Isotope Hydrology Section
Division of Physical
and Chemical Sciences
Department of Nuclear Sciences
and Applications
International Atomic Energy Agency
Wagramer Strasse 5, P.O. Box 100
A1400, Vienna, Austria
Phone: +431 2600 21736,
Fax: +431 26007
ihs@iaea.org
www.iaea.org/water

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Water — its availability, quality and management — is paramount to development. Concerning issues of health, food and agriculture, sanitation, the environment, industry, and energy production, the International Atomic Energy Agency (IAEA), through its Water Resources Programme, responds to the needs of Member States by providing science based information and technical skills to improve understanding and management of water resources.

Through the sustainable use of water, we can begin to meet basic needs, reduce vulnerabilities, and empower people to develop and control the resources upon which they depend. By tracking the isotopes of water, scientists can quickly obtain valuable information which may otherwise require decades of hydrological data collection to gather. Isotope techniques can help determine the origin, age and renewal rate of groundwater, and whether it is at risk of salt water intrusion or contamination. It also permits the rapid and reliable mapping of non-renewable groundwater resources, the majority transboundary aquifers, so that they can be abstracted rationally for equitable use.

Isotope techniques are important tools to understand surface water movement and interaction with groundwater, dam leakages, and the impact of climate change on water resources development and management. To address global water challenges, such as water shortage and quality, over-exploitation and the impact of climate change on water resources, Member States need precise information to enable them to make decisions about sustainable water resource management. Working with partners in government and the United Nations system, the IAEA has been a pioneer in developing isotope hydrology as a powerful and effective scientific approach for managing water resources.

Support is provided to Member States in using isotope hydrology through technical advice and analysis, capacity building, and expert services. The United Nations proclaimed the period 2005–2015 as the International Decade for Action, 'Water for Life', to place a greater focus on water. It commits countries to achieve the water-related targets of the Johannesburg Plan of Implementation from the 2002 World Summit on Sustainable Development (WSSD), as well as the 2015 deadline of the Millennium Development Goals set in 2000

The IAEA has spearheaded efforts for the use and application of isotope techniques by national institutions in the Member States to address priority water issues. By supporting training, technical expertise and infrastructure development, the IAEA has been working to meet the needs and requests of Member States for capacity building to address their practical problems. There are currently over 80 technical cooperation projects in the African, Asian, European and Latin American regions addressing a variety of issues related to groundwater and surface water resources.

Building human capacity is a central goal of the Water Resources Programme. To that end, the programme offers training courses, and supplies updated teaching and training materials. As part of the programme's public outreach efforts, newsletters are regularly published, and pamphlets and audiovisual material are disseminated. The Water Resources Programme organizes technical meetings to bring together Member State institutions and other UN agencies to explore water issues of international concern and also provides financial support for conferences held in developing countries.

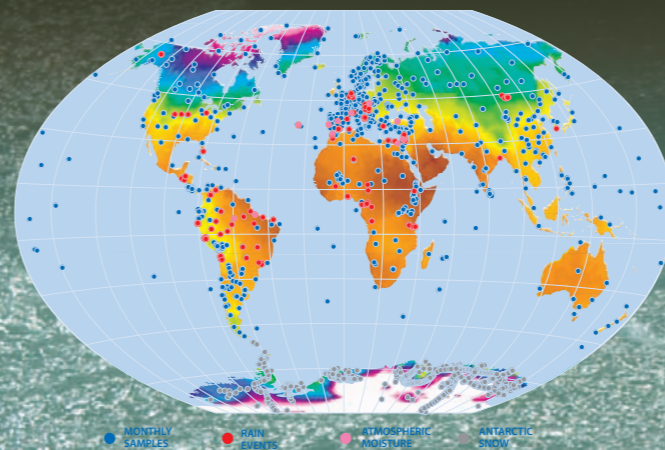
The IAEA's Coordinated Research Projects (CRPs) support international research efforts to develop new scientific approaches on relevant themes. Scientists are brought together from developed and developing nations to exchange knowledge and to enhance research capabilities while working on themes of common interest. The IAEA also grants research contracts to universities, research centres and other Member State institutions when innovative research is proposed that will advance the field of isotope hydrology.



A comprehensive understanding of the water cycle as well as of hydrological systems such as river basins, lakes and aquifers is essential to make resource development possible without having an adverse impact on the environment. Over the last 50 years, data from the Global Network of Isotopes in Precipitation (GNIP) have become an increasingly important tool to meet these information needs, providing unique insights into hydrological and climatic processes at the local, regional and global scales.

Precipitation in each location has its own isotopic 'fingerprint', which is then carried into groundwater and can be used to determine the age, recharge rates and flow velocities of groundwater. The GNIP, managed in cooperation with the World Meteorological Organization, provides the isotopic signatures of oxygen and hydrogen in precipitation worldwide, and consists of about 900 monitoring stations in over 100 countries and territories. The IAEA provides logistical support to the stations and maintains the quality and consistency of the data. The GNIP database of the IAEA now includes over 120 000 monthly data records, and can be accessed through the new GIS-based, user-friendly computer-assisted mapping environment known as WISER.

The Global Network of Isotopes in Rivers (GNIR) was launched in 2007 to complement the GNIP programme and Moisture Isotopes in the Biosphere and Atmosphere (MIBA) begun in 2003 and focuses on regular sampling of water isotopes in plant stems and leaves, as well as in soil and atmospheric vapour.



The Water Resources Programme's laboratory offers analytical support and services for ensuring the quality of isotope measurements worldwide. The laboratory has played a significant role in developing, refining and communicating analytical techniques for isotope measurement and maintains an extensive analytical capability for isotope analysis used in water resource management. The IAEA assists Member States in establishing and maintaining a laboratory network that can provide reliable analytical data and fulfil analytical needs of national and regional TC projects, and facilitates the establishment and upgrading of laboratories.

An important role of the IAEA is in the preparation, certification and distribution of isotope reference materials used to calibrate measurements in other laboratories. The IAEA Isotope Hydrology Laboratory distributes standards for over 40 isotope ratio measurements worldwide. In some cases, the IAEA is the only source of such standards such as, for example, the Vienna Standard Mean Ocean Water 2 (VSMOW2) for stable isotopes of oxygen and hydrogen in water. Conducting inter-laboratory comparisons on a regular basis provides participating laboratories with the opportunity to evaluate the accuracy of their own measurements.

The Water Resources Programme continuously seeks new ways to improve the measurements of isotope data, such as the recent development of helium isotope applications. Tritium-helium dating has been shown to be an effective and powerful tool for obtaining groundwater ages for young groundwater. Distribution of a new laser spectrometer and the ongoing training of Member State representatives in its use allows countries the opportunity to independently examine more samples much faster than before, and has lower initial and maintenance costs than previous methods.

