Argentina applies isotopic techniques to water

By Laura Gil

In Argentina, like in many parts of the world, water is at risk of overexploitation and contamination. To protect it, scientists are studying its invisible details with the help of nuclear technology and the support of the IAEA.

"Argentina is lucky to have a very good amount of water per inhabitant, but this water is distributed very unevenly across the country," said Daniel Cicerone, Environmental Manager at Argentina's National Atomic Energy Commission (CNEA). "In some regions, finding out if the water we are using on a daily basis is regularly recharged, running out or at risk of contamination can make the difference between poverty and prosperity."

The science behind this is called isotope hydrology — a discipline that, according to Douglas Kip Solomon, Professor of Geology and Geophysics at the University of Utah in the United States, "is one of the most powerful and trustworthy tools available to thoroughly assess groundwater."

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"Most of the fresh, usable water in the world is in the ground, but most of the water that's available to us is surface water," said Solomon, who is helping Argentinian experts map their water with the help of the IAEA. "It is extremely important that we understand the interactions between surface water and groundwater, so we know how to properly manage these resources and protect them."

Hidden reserves

Since early 2016, Argentinian isotope hydrologists have been gathering and interpreting data from two strategic regions with the help of the IAEA. The idea is for policymakers to use this information and to design improved water management models — hydrological models — for these regions.

The two regions were selected for different reasons. The first is the arid valley of Mendoza, western Argentina, where people rely on the fresh underground water of the Uspallata and Yaguaráz aquifers, along with other, smaller ones. Authorities are keen to find out whether this water is being sustainably extracted, and if the aquifers have enough capacity to support increased water use.

"We need water for everything. Water is our daily bread," said Sergio Cirauqui, who works in a kayaking and rafting adventure shop at the top of a mountain in Uspallata. "But we are very conscious of the fact that water is a finite resource and that we have to take care of it. And as a finite resource, we should make almost sacred use of it."

Mendoza, a region in Argentina where scientists use isotope hydrology to study the groundwater.
(Photo: L. Gil/IAEA)

Isotope hydrologists take water samples from Mendoza, western Argentina.
(Photo: L. Gil/IAEA)

Argentinian isotope hydrologists have been hiking the mountains and plains of Mendoza for more than a year, collecting water from wells, lakes and rivers, accompanied by international and IAEA experts. Back in their labs, they are interpreting the results to paint a clearer picture of what is available.

"We look to find out exactly how water moves inside aquifers, how it interacts with rivers and how much of it is left," said Sandra Ibáñez, Isotope Hydrologist at the University of Cuyo in Mendoza, who is participating in an IAEA technical cooperation project in the country.

Based on such data, policymakers are in a better position to establish rules for the use of water for drinking, agriculture and industry. Knowing that surface water is infiltrating groundwater, for example, can lead to stricter regulations on acceptable pollution levels.

"Once we have the results, we can decide what business activities to develop in Mendoza," said Juan Andrés Pina, Deputy Director of the Groundwater Division at Mendoza's General Department of Irrigation.

The second region under study is a streambed in Los Gigantes, Córdoba, an old uranium mining complex about 700 kilometres west of Buenos Aires. The site is under environmental remediation, and isotope hydrologists are working to find out more about the quality of the groundwater and its potential vulnerability to contamination.

Through the IAEA project, scientists have monitored the safety and quality of the water that was recharging the San Roque lake reservoir, a source for human consumption in the city of Córdoba.

"This interdisciplinary and interinstitutional study will help authorities improve the conceptual model and hydrological understanding of the area and strengthen the remediation of the site," said Daniel Martínez, geologist and researcher at the National Council for Scientific and Technological Research (CONICET).

IAEA technical cooperation projects have been essential in transferring knowledge and technology to national and local institutions, said Raúl Ramírez García, Section Head at the IAEA's Department of Technical Cooperation.

"The new information provided by isotopic techniques will help monitor the water resources and support the kind of decision making that will lead to social and economic benefits for the population of these regions," Ramírez García said.