IAEA Technical Cooperation Programme

Ensuring the availability of drinking water for the population of Tegucigalpa, Honduras

The challenge

The city of Tegucigalpa in Central Honduras has a population of 1 300 000 and its drinking water is supplied mainly from two reservoirs (Laureles and Concepción) and from springs located in the forest of La Tigra. The municipal government of Tegucigalpa faces a significant challenge: accelerated population growth and anthropogenic factors including pollution have reduced water availability from these sources during the summer season. 30% of the population does not have access to drinking water, and must be supplied with potable water via water tankers. The construction of new reservoirs has been proposed as a solution, but the high cost and long building period have led water service providers to examine groundwater as a possible short term alternative.

The project

Honduras sought IAEA assistance to determine the suitability of aquifers as a quick and economical solution to improve the availability of drinking water in Tegucigalpa. With the support of the technical cooperation programme, fourteen local professionals were trained in three different institutions on the use of isotopes in underground hydrology and aquifers in volcanic zones.

Through the technical cooperation project, a census of wells was conducted to determine their locations and characteristics. Fifty-three wells with different depth ranges (from 0-40, 40-80 and 80-3000 metres) were selected for a monitoring network. Water samples were taken from this network of wells to determine the chemical and isotopic composition of the groundwater. Chemical

Staff from SANAA learning more about aquifers in volcanic zones. (Photo: Isabel Acosta/SANAA)

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and isotopic characterization of groundwater and rainwater, together with other conventional hydrogeological studies, was used to establish a preliminary conceptual hydrogeological model of the aquifer systems to enable the use of groundwater resources.

A local meteoric line was established after two years of study to analyse the stable isotopes present in the rainwater (oxygen-18 and deuterium), and a working group was created to interpret the data produced from these activities, with personnel from the Energy Company, the Secretariat of the Environment, the National Autonomous University of Honduras and the National Water Company. These personnel worked together with IAEA experts to interpret the data with the aim of generating conclusions and recommendations to guide their future work.

The impact

This project generated vital information for the identification of favourable zones for the exploitation of aquifers. This data will allow Honduran authorities to develop sustainable drilling plans for Tegucigalpa to improve the drinking water distribution service in the city. Key project achievements included the delimitation of aquifer rechargeable zones, an improved knowledge of the hydrogeological functioning of aquifers in the city, and the identification of areas vulnerable to anthropogenic pollution, using geochemical and isotopic techniques.

The project results will support the efforts of the municipal water service to better manage local water resources and to ensure sustainability, thanks to the identification and delimitation of sustainable exploitation zones. The results will also contribute to the protection of aquifer rechargeable zones and to areas that are sensitive to contamination. The delimitation of protection zones will allow Honduras to design appropriate strategies to utilize aquifers while preventing contamination risks, and are expected to have a significant impact on the quality of life of the local population.

PROJECT INFORMATION

Project No: HON7001

Project title: Using Isotopic Techniques to Improve the Management of Groundwater Resources in the Central District

Duration: 2016-2017 (2 years)

Budget: €182 400

Contributing to:

Partnerships and counterparts

An inter-institutional support agreement was created between three state companies:

- National Autonomous Service for Aqueducts and Drains (SANAA);
- National Electricity Company (ENEE);
- Secretariat for Natural Resources and the Environment (My Environment);

Support was also provided by the National Autonomous University of Honduras (UNAH).

Facts and figures

- Fourteen professionals were trained in three different institutions on the use of isotopes in underground hydrology and aquifers in volcanic zones;
- Three rain collection sites were identified for isotopic analysis: La Vega Station, Quiebramontes Station and San Matías Station;
- Thirty samples were analysed over a two year period;
- 450 wells were registered, of which 53 wells were selected for a sampling and monitoring network. Two sampling campaigns were carried out to create maps to enable the development of the Conceptual Hydrogeological Model.

The science

Isotope hydrology is a branch of hydrology that uses environmental isotopes and other geochemical tracers of natural origin to assess the origin and movement of water within the hydrological cycle. Environmental tracers such as stable water isotopes provide unique information to characterize and define sources, flows and interactions between different bodies of water, including mixing processes. In addition, naturally occurring radionuclides such as tritium and carbon-14 are commonly used to estimate the age of groundwater. This information is essential to assess the current rates of groundwater replenishment, as well as transport processes in aquifers and their vulnerability to pollution.