Projects Description *for* ARASIA TC Programme
TC Cycle 2014-2015

Project Number: RAS/7/027

Project Title: Using Environmental Isotopes and Natural Radioactivity in the Assessment of Ground Water Quality

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Overall objective: To assess water resources using environmental isotope techniques with special emphasis on groundwater dynamics, seawater intrusion and quality

Project duration: 2 years

PROJECT DESCRIPTION

Regional gap / Problem / Need analysis: Most of Arab countries suffer from a severe water shortage for several years. This is characterized by small quantities in rainfall and large evaporation rate from surface water bodies. This challenge is expected to be more serious in the future because of the environmental and climatic changes, which will create a long dry season, most probably for several years. Arab countries belong to arid and semi arid zones, and hence they are severely affected by water shortage. The dependence on the limited ground water resources in Iraq, Jordan and Syria for example is still a major task for many reasons; probably because of the little knowledge on the water origin and size of the fresh water aquifers and their interaction with surface water. In addition, there is still limited information about the hydrological and hydrogeological behaviours of the underground aquifers and their interaction with surface water resources. Water shortage creates several hydrological problems, especially in the southern Euphrates River valleys in both Syria and Iraq. The ground water in this area is affected by; ? High levels of salinity, mostly because of high irrigation rates under dry conditions and impact of the so-called "drainage return flow" effect.. ? The presence of wetland, marshland and the Gulf in south Iraq. The type of rocks and soils and alluvial characteristics. Saline waters from irrigation return flow or from the Gulf are poured into the surface water rivers, and expected to percolate later into the groundwater basins. This complicated the interaction situation among several groundwater aquifers and surface water in the area and there is no clear information to assess this situation. The interaction of the above parameters creates a unique situation that should be identified. In Jordan, the Water Authority of Jordan (WAJ) plans the exploitation of the non-renewable groundwater of the deep sandstone aquifers 61 (Disi aquifer) in southern Jordan, in order to reduce the gap between water demand and availability in Jordan. In 2010 Water Authority of Jordan start drilling 54 deep wells which penetrate the Disi aquifer with a capacity of 250 m3/h each. In the beginning of 2013, more than 100 million cubic meters per annum (MCM/a) of fresh water are expected to be abstracted from the Cambro-Ordovitian sandstone aquifer and transferred to the capital Amman for drinking purposes. The use of both environmental isotopes and natural radioactivity techniques for the assessment of such information and the interaction among water bodies will be very useful for managing ground water resources and for the assessment of groundwater quality in the participating Arab countries. The environmental isotopes (Tritium and Carbon-14) will be used for groundwater, and stable isotopes (O-18 and H-2) to identify the origin and interaction between surface and ground water resources. While Natural radioactivity analysis technique will be used to assess the ground water quality through measuring the harmful isotopes (Ra-226 and Ra-228).

This project is proposed as a regional activity for the following reason(s): 1- Because ground water aquifers in the region shares several parameters, namely; similar water quality, recharge, strata water table, and groundwater movement. 2- The interaction among experts from several countries in the region and the interaction among several laboratories will produce a clear and a broad picture for the actual situation in the area.

Stakeholder analysis and partnership: Groundwater is one of the top issue in the region. The main stakeholders are governments and water-related managemnt organizations.

Role of nuclear technology: Isotope hydrology has been applied widely and effectively in groundwater investigation and management.