



United Nations
Educational, Scientific and
Cultural Organization



International
Hydrological
Programme

IHP-VIII Thematic Area 2

Groundwater in a Changing Environment

Activities and Outcomes 2014-2015

**International Hydrological Programme
Division of Water Sciences**

THE CONTEXT

Groundwater represents 98 percent of the world's unfrozen freshwater. It drives many geological and geochemical processes and sustains various ecological functions and services. The use of groundwater has increased significantly over the past 50 years owing to its high reliability during drought seasons, good quality and generally modest development costs. We know much about groundwater and aquifers from work completed during previous International Hydrological Programme (IHP) phases, but we need to learn more about the complexity of aquifer systems, the increasing global risk to groundwater depletion, quality deterioration and pollution, climate change impacts and the resilience of communities and populations dependent on groundwater sources.

Objectives of the Eighth Phase of IHP (IHP-VIII, 2014-2021) for this theme include: promoting measures addressing the principles of sustainable management of groundwater resources; addressing methods for the sound development, exploitation and protection of groundwater resources; developing new groundwater resources maps; fostering transboundary aquifers management; and strengthening groundwater governance policy and water management in emergency situations. These challenges call for comprehensive research, implementation of new science-based methodologies, the endorsement of principles of integrated management and environmentally-sound protection of groundwater resources.

“Groundwater in a Changing Environment” is the second of the six themes that structure IHP-VIII, which focuses on “Water Security: Responses to Local, Regional and Global Challenges”.





Theme 2 covers five different focal areas:

- Focal Area 2.1 – Enhancing sustainable groundwater resources management
- Focal Area 2.2 – Addressing strategies for management of aquifer recharge
- Focal Area 2.3 – Adapting to the impacts of climate change on aquifer systems
- Focal Area 2.4 – Promoting groundwater quality protection
- Focal Area 2.5 – Promoting management of transboundary aquifers.

During its first two years (2014-15) IHP-VIII supported the sustainable management of groundwater resources in a changing environment in all regions of the world as well as at the global level.

HIGHLIGHTS FROM KEY IHP ACTIVITIES (2014-2015)

► North America and Europe

Facilitation of cooperative management in South Eastern Europe

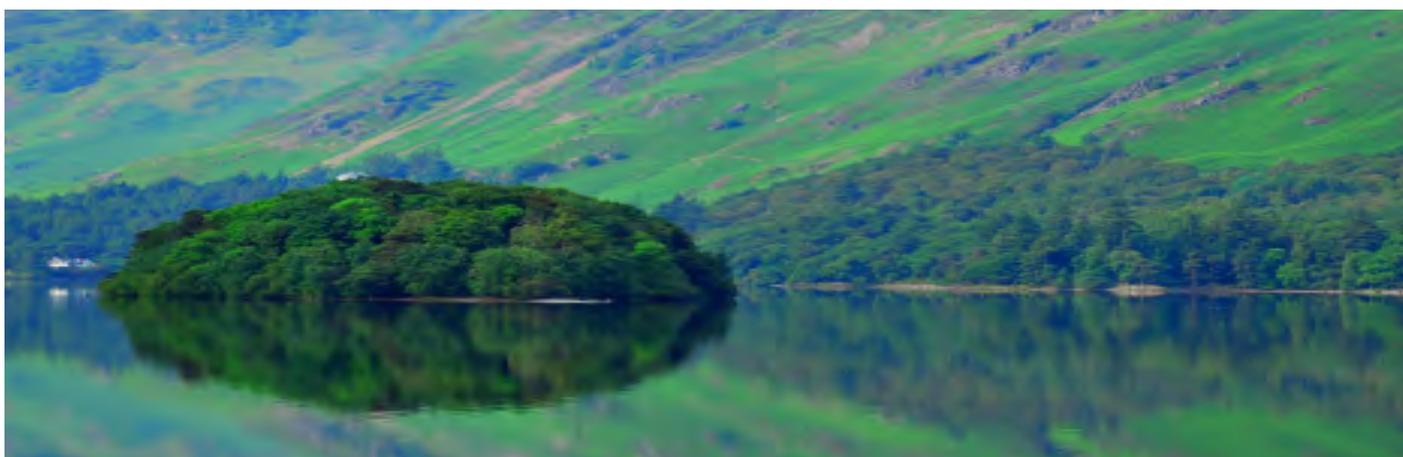
The Protection and Sustainable Use of the Dinaric Karst Transboundary Aquifer System (DiKTAS) project is an example of water cooperation in a post-conflict context and was the first ever attempt to introduce sustainable integrated management principles in one of the world's largest karst aquifer systems, located in South Eastern Europe. Jointly with the national authorities of Albania, Bosnia and Herzegovina, Croatia and Montenegro, IHP identified complex transboundary interactions that impact water use and water sharing for power generation, agricultural, domestic and other purposes between countries

Protection of coastal aquifers in the Mediterranean area

The groundwater resources of the Mediterranean region are either the main sources of freshwater or are vital to supplementing surface-water sources. IHP coordinated a series of regional assessments and case studies on Mediterranean coastal aquifers which identified the causes of degradation and over-extraction of groundwater resources. They were part of the Strategic Partnership for the Mediterranean Sea Large Marine Ecosystem (MedPartnership), the largest joint environmental initiative in the history of the Mediterranean. Complemented by a series of regional consultations, the assessments provided a sound, scientific basis for the development of a regional action plan for coastal aquifers. The participating countries adopted the plan in 2015. This was the first time – within the context of a major marine protection project – that coastal aquifers were considered an important element of the “river basin/coastal zone/coastal zone/continental shelf” environmental continuum.

Renewed cooperation with UNECE for the promotion of international legal instruments on water

A fruitful cooperation between IHP and the United Nations Economic Commission for Europe (UNECE) started in 2012 when the Parties to the UNECE Water Convention recognized UNESCO's expertise in the domain of transboundary aquifers. Joint activities included sharing experiences, preparing training course material and publications, and organizing regional consultations and capacity-building activities. In November 2015, the Parties to the UNECE Water Convention expressed their appreciation of the results and asked UNESCO to continue with the cooperation.



Related UNESCO Chairs and Category 2 Centres in the region

- International Groundwater Resources Assessment Centre, Delft, The Netherlands
- The Centre for Water Law, Policy and Science, Dundee, UK
- International Centre for Water Cooperation, Stockholm, Sweden
- Regional Centre on Groundwater Resources Education, Training and Research in East Africa, Nairobi, Kenya
- UNESCO Chair in Geohydrology, South Africa
- UNESCO Chair in Water Economics and Transboundary Water Governance, Canberra, Australia
- UNESCO Chair in Hydropolitics, Geneva, Switzerland

► Latin America and the Caribbean

Fostering cooperation to improve the governance of groundwater resources in Central America

IHP has developed methodological guidelines to conduct an in-depth multidisciplinary assessment of groundwater resources. In the framework of the Groundwater Resources Governance in Transboundary Aquifers (GGRETA) project, a multidisciplinary assessment was developed in the Trifinio area (Guatemala, El Salvador, Honduras). The main result is increased awareness among local stakeholders of the importance of groundwater resources and the identification of two aquifers (Esquipulas in Guatemala and Ocotepeque-Citalá in El Salvador and Honduras).

Release of a Regional Strategy for the Management of Transboundary Aquifers in Latin America and the Caribbean

The fourth book of the “ISARM-Americas” Series entitled “Regional Strategy for the evaluation and management of Transboundary Aquifer Systems in the Americas” was published in 2015. It presents a strategy to address regional challenges through contributions from experts, institutions and governments of the 24 participating countries.

Community of Practice in the Caribbean

IHP, in consultation with its network of experts on groundwater and climate change (GRAPHIC), established a partnership with the International Research Institute for Climate and Society (Columbia University) and University of West Indies in the Caribbean, founding a Community of Practice. The community exchanges information on existing needs and opportunities generated by water and climate impacts in the Caribbean and identifies opportunities for collaboration. Alongside the UNESCO Institute for Water Education (UNESCO-IHE), IHP organized a training course in Saint Kitts on groundwater management in Small Island Developing States (SIDS) for the Caribbean Member States.



Related UNESCO Chairs and Category 2 Centres in the region

- Regional Centre for Groundwater Management for Latin America and the Caribbean, Montevideo, Uruguay

► Aisa and the Pacific

Water resources assessment

Within the framework of the Transboundary Waters Assessment Programme (TWAP), IHP undertook a multi-disciplinary assessment of groundwater resources in the Asia-Pacific region to develop the first ever online database on transboundary aquifers (68 total) and SIDS (21 countries).

The UNESCO Bangkok Office released the publication *Current Status and Issues of Groundwater in the Mekong River Basin* as a result of the cooperation between UNESCO, the 14 concerned Member States and regional partners.

IHP also organized a workshop on “Remote Sensing Techniques in Support of Water Resource Assessments” in Central Asian countries, in collaboration with the United States Geological Survey (USGS) in Kazakhstan.

Water governance and cooperation

As part of the Groundwater Resources Governance in Transboundary Aquifers (GGRETA) project in the region, capacity building activities on groundwater governance have been conducted in cooperation with national institutions in Kazakhstan and Uzbekistan.

Training courses and seminars addressed different topics such as hydro-diplomacy, domestic and international legal and institutional aspects of groundwater governance and groundwater monitoring, among others. These were carried out with the support of the UNESCO Almaty and Tashkent offices, IGRAC and UNESCO-IHE.

IHP was also an active participant in the follow-up to the International Decade for Action “Water for Life”, 2005-2015. Several sessions and events were organized by IHP during the International Conference held in Dushanbe in June 2015, in particular the High Level Roundtable on “Water Cooperation as a Catalyst to Achieve Water Related Goals”.

Related UNESCO Chairs and Category 2 Centres in the region

- UNESCO Chair in Sustainable Groundwater Management, established at the University of Tsukuba, Ibaraki, Japan and the Institute of Geo-ecology, Mongolian Academy of Sciences, Ulaanbaatar, Mongolia.



► Africa

Cooperative frameworks for transboundary aquifers

The Culture of Peace: Assessment and Agreed Management of Transboundary Aquifers in Central Africa project aims to obtain information on transboundary aquifers from Cameroon and Chad. During the first phase, preparations were made to collect information from 2016-2017 in a standardised manner.

The GGRETA case study on the Stampriet Transboundary Aquifer System evaluated one of the largest aquifer systems in Southern Africa shared by Botswana, Namibia and South Africa. The project led to firm steps being taken towards the first cooperative management mechanism of a transboundary aquifer in the region.

Capacity building activities

Since 2014, IHP has organized several important events throughout Africa, including: regional workshops on transboundary aquifer assessment and management in Southern and Eastern Africa (March 2014, Nairobi, Kenya) and West and Central Africa (July 2014, Dakar, Senegal) aimed at improving the inventory and characterization of transboundary aquifers; and a regional meeting on tools for the sustainable management of transboundary aquifers in Southern Africa (July 2015, Johannesburg, South Africa) in collaboration with the International Water Management Institute (IWMI).; and the OpenWater 2015 symposium and Workshops (September 2015, Addis Ababa, Ethiopia). The OpenWater symposium facilitated sharing experiences, tools, training materials and model codes applicable in the water domain.

A training workshop on international water law also took place in May 2015, in Gaborone, Botswana, focusing on the links between water law at international and domestic levels. The workshop also featured training on hydrodiplomacy and enhancement of negotiation skills.

In the framework of the MENARID Programme, aimed at improving the governance of natural and water resources (groundwater and trans-boundary water systems) in the Middle East and North Africa, a Learning Workshop took place in Lebanon, in June 2014, on the topic of groundwater resources management and monitoring and evaluation systems.

Related UNESCO Chairs and Category 2 Centres in the region

- Regional Centre for Groundwater Resources Education, Training and Research in East Africa, Nairobi, Kenya
- UNESCO Chair in Geohydrology, the University of the Western Cape, South Africa



► Arab States

Raising awareness activities on groundwater governance and tools for water cooperation

A Regional Workshop entitled “Towards Effective Groundwater Governance in the Arab Region” was organized in Egypt, and IHP organized a special session to present the results of the Groundwater Governance project within the Third Arab Water Forum, Egypt, in joint collaboration with the Food and Agriculture Organization (FAO) and IWMI.

In cooperation with UNECE, IHP actively promoted all the available international legal instruments covering transboundary aquifers (i.e. UN International Law Commission 2008 Draft Articles on the Law of Transboundary Aquifers, UNECE 92 Water Convention, and the UN 97 Watercourses

Convention). Workshops to promote these were co-organized in Beirut, Lebanon, in February 2015 and in Amman, Jordan, in March 2015. IHP also supported the preparation, in November 2014, of the Arabic version of the UNECE Water Convention Model Provisions on Transboundary Groundwaters. The latter is being distributed and promoted in all IHP's and its partners' activities in the Arab region.

Assessment of coastal aquifers: case studies in Arab States

Five Arab States participated in the assessment of coastal aquifers within the framework of the MedPartnership project: Algeria, Egypt, Libya, Morocco and Tunisia. In addition to their contributions to the regional evaluations of coastal aquifers, Algeria and Tunisia were also selected as case studies in the context of this project. In Algeria, coastal aquifers were duly considered in the establishment of the country's national strategy for integrated coastal zone management and at the local level with regards to the integrated management plan for the Reghaia coastal area. In Tunisia, a case study was carried out in the Ghar El Melh area to evaluate and map the vulnerability of seawater intrusion and land-based pollution in the area's coastal aquifer.

Key publication

- Model Provisions for Transboundary Groundwaters of the Convention on the Protection and Use of Transboundary Watercourses and International Lakes (Water Convention) (in Arabic)

► Global Initiatives

Transboundary aquifers

The ongoing "International Shared Aquifer Resources Management (ISARM)" initiative implements various global and regional activities. For example, IHP carried out a global assessment of 199 transboundary aquifers and 42 SIDS aquifer systems to develop an Information Management System through online maps. The Programme cooperated closely with Member States to improve knowledge about transboundary aquifers in Central America, Central Asia and Southern Africa. ISARM also developed a novel methodology for the multi-disciplinary assessment of transboundary aquifers. Activities in the programme also included gender-sensitive data collection and the organization of training on conflict prevention and water cooperation.

Groundwater governance

In response to major concerns regarding the future of groundwater, the Groundwater Governance: A Framework for Action project identified and promoted best practices in groundwater governance. The project was implemented by IHP, the Food and Agriculture Organization (FAO), the World Bank and the International Association of Hydrogeologists (IAH), and funded by the Global Environment Facility (GEF). A Global Diagnostic of groundwater governance and a corresponding Framework for Action were presented at the Seventh World Water Forum in 2015.

Mapping activities

IHP and the International Groundwater Assessment Centre (IGRAC; under the auspices of UNESCO) released the "2015 Map of Transboundary Aquifers of the World" identifying 592 transboundary aquifers. A new "Global Map of Groundwater Vulnerability to Floods and Droughts" was also published as an example of successful cooperation with the German Federal Institute for Geosciences and Natural Resources (BGR).

Climate change

During COP21, IHP launched a set of publications on the role of groundwater in climate change mitigation and adaptation, one of them with a special focus on Small Island Developing States (SIDS).



IHP is the only intergovernmental programme of the United Nations system devoted to water research and water resources management, as well as education and capacity building. Since its inception in 1975, the programme has evolved from an internationally coordinated hydrological research programme into an all-encompassing, holistic programme to: mobilize international cooperation in order to improve knowledge and innovation to address the challenges related to water security; strengthen the science-policy interface to achieve water security at the local, national, regional and global levels; and facilitate education and capacity development to improve the management and governance of water resources. Today, IHP facilitates an interdisciplinary and integrated approach to sustainable watershed and aquifer management, including the social and economic dimensions of water. As part of the current Eighth Phase of IHP (IHP-VIII) centred on “Water Security: Responses to Local, Regional and Global Challenges”, IHP defined Water Security as: “The capacity of a population to safeguard access to adequate quantities of water of acceptable quality for sustaining human and ecosystem health on a watershed basis, and to ensure efficient protection of life and property against water-related hazards – floods, landslides, land subsidence and droughts.”

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