



Addressing Groundwater Resilience under Climate Change

THEME V

Groundwater education and capacity building

KEY POLICY MESSAGES

- Education in groundwater is urgently required across the world.
- An interdisciplinary approach leads to better management.
- Deliver innovative education at the grassroots level in developing countries.

The buffering capacity, quality and invisibility of groundwater make this resource unique.
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Deciphering the dynamics of groundwater depends on technology and science, while sociological and economic knowledge play an important role in determining the use and distribution of the resource.

Together, these disciplines will enhance our capacity to make the best use of groundwater to benefit society.

Climate change, salinization and recharge are major emerging challenges in groundwater management. Rising to the challenge requires building the capacity of people and institutions from the grassroots up to measure, monitor and understand this unique resource.

The buffering capacity, quality and invisibility of groundwater make this resource unique. Experience since 2015 has highlighted the need to improve data analysis and interpretation, along with data collection. The 2020 Delft Agenda for Action – Knowledge and Capacity for Water Management identifies three major elements to improve capacity:

- Breaking the 'counting heads' mentality in measuring capacity development impact.
- Focusing on inclusiveness and blended approaches.
- Funding for capacity development.

The Erasmus Mundus GroundwatCh program is an example with its focus on knowledge and skills in the field of hydrogeology, global change, impacts and adaptation.

TIME IS OF THE ESSENCE IN AFRICA

Groundwater availability on the African continent is estimated to be 20 times greater than surface water. Climate change amplifies the need to develop and manage groundwater to meet the demands of agriculture, industry and an increasing population. Improved capacity across scientific fields is urgent.

However, many African countries lack the necessary capital, policy framework and human resources. Groundwater literacy must



Rising to the challenge requires building the capacity of people and institutions from the grassroots up to measure, monitor and understand this unique resource.

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be improved to promote efficient use without compromising the source at the local level. It was suggested that water education be included at different levels, including schools. The African Ministers' Council on Water has developed the Pan-African Groundwater Program (APAGroP), to strengthen policy and institutional systems, invest in developing tools and technical solutions, and build human capacity to sustainably manage and use groundwater.

Knowledge management means facilitating the exchange of experience and best practice in groundwater, advocacy and gender inclusion. A meeting of the 15 Southern African Development Community (SADC) member States defined the challenges. These include data collection; human and resource capacity and availability; and access to information and science.

The common priority was to enhance data collection and sharing through various platforms, pilot projects, literature archives and portals. Cooperative research, education will mitigate the challenge of groundwater overexploitation.

The crucial role women play is plain.

WOMEN HOLD THE KEYS

The UNESCO Intergovernmental Hydrological Programme (IHP) program focused on gender and water under the World Water Assessment Programme (WWAP) initiative. From the desktop literature and policy review to ground-truthing research, the crucial role women play was plain.

A case study of the Stampriet transboundary aquifer system revealed that in Botswana, some water laws are outdated, while institutional gender bias and overlapping legal systems are leading to unequal water access. Namibia has more advanced regulations, but field surveys revealed the legal foundation to support women's participation in decision-making was weak in both nations. The study highlighted that incorporating gender mainstreaming into national legislation is the way forward to build up capacity.

KNOWLEDGE SHARED IS KNOWLEDGE EMPOWERED

Isotope techniques to better understand complex aquifer systems are an emerging science. Proficiency in isotope-based techniques and the capacity to apply them differs significantly among countries. Educational programs aim to increase awareness, transfer knowledge and build capacity on how to use isotope hydrology, address sub-regional and transboundary questions, and enhance monitoring networks.

Drilled boreholes are vital, particularly in sub-Saharan Africa, but poor design and quality leads to premature failure. Training was undertaken in 13 countries through face-to-face courses, guidelines, blogs, webinars, and more. The initiative generated free material and literature and boosted collaboration among drilling professionals through the Rural Water Supply Network.

In South Africa, the FETWATER program was established in 2002 to increase human capacity in the water sector in partnership. The first two phases included the development of seven professional networks. The current third phase is taking an occupationally directed approach, including professionals in



Education in groundwater is urgently required across the world.
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water resource management, authorisation of use, regulation, liaison and infrastructure management.

In Latin America, groundwater is not a well-known field of study and investment in groundwater education is disproportionately low. Enterprises, water companies and government agencies lack appropriately trained personnel. Skilled personnel could help promote groundwater education by demanding training programmes and contributing resources along with the government.

Building up community capacity to use tools can drive sustainability.



LOCAL 'OWNERSHIP' BOOSTS RETURNS ON INVESTMENT

Despite high external investment in water management, many communities still fail to sustain the gains over time. Building up community capacity to use tools such as socio-economic-ecological mapping can help drive sustainability. Other tools include analysis and synthesis of data, and groundwater modelling.

The development of an android app CLART, for example, is an easy color-coded platform to guide people on groundwater storage, recharge areas and more. The development

of crop water budgeting games is another very innovative approach to enhance local awareness and enhance capacity.

Managed Aquifer Recharge (MAR) is an option to mitigate water scarcity and prevent salt-water intrusion, but it comes with risks. The SMART-Control project reduces the risks by developing and implementing an innovative web-based, real-time monitoring and control system in combination with risk assessment and management tools. Capacity building in SMART-Control tools will address public risk and efficiently address water quality, technical risk, automatic risk and advanced system management.

It is necessary to integrate a wide range of topics From the highly technical SMART and isotopic methods to more sociological awareness into education to enhance woefully inadequate groundwater knowledge and capacity.

ADDRESSING GROUNDWATER RESILIENCE UNDER CLIMATE CHANGE

IWRA/UNESCO-IHP Online conference, 28-30 October 2020

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ACKNOWLEDGEMENTS

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