



A not-for-profit Canadian organization

Mission: Promoting groundwater learning.

Vision: Providing knowledge tools for developing groundwater sustainably for humanity and ecosystems.

Groundwater Education is an Essential Element of the Water Action Agenda

Groundwater makes up 99% of the Earth's liquid freshwater and about 50% of river flow. Nearly 50% of the global population depends on groundwater for all or part of its drinking water. Approximately 70% of global food production relies on groundwater. Groundwater depletion and pollution are at the core of the global water crisis. More than two billion people worldwide live in water poverty and another two billion live with water scarcity. In these regions, groundwater is key for maintaining food security and providing safe drinking water in the face of global population increase and climate change.

And yet...only a few water management organizations place groundwater at the center of climate change adaptation, environmental protection, agricultural management, water security, and land management. Decision makers have little appreciation that hydrogeology and groundwater science are specialized fields, with specialized knowledge and solutions. In addition, decision makers and the public have been given insufficient exposure to the basic conceptual groundwater knowledge needed to inform policy and public opinion. Enhanced public awareness of groundwater will empower citizens and water stakeholders to take informed, local action on water issues.

Why then are groundwater science, policy and economics largely missing from the educational curriculum?

Groundwater education and research are inadequate through primary, secondary, and higher education. Almost without exception, groundwater education is simplified and does not capture the multidisciplinary complexity and unique intellectual challenges posed by groundwater systems. The learning outcomes are limited, leaving students ill-equipped to understand groundwater with its beautifully juxtaposed geological, hydrodynamic, chemical, microbiological and temporally varying components. Limited instruction results from the lack of critical mass of groundwater faculty for teaching and mentoring, as well as a lack of well-defined learning objectives and space for groundwater courses in the curriculum.

For those who argue that a novel approach to groundwater education is too big of an undertaking, there already exists a successful academic model for teaching and research of an immense, complex water system: oceanography. In the 1960s and '70s, universities around the world created major new oceanography programs, offering more than 20 undergraduate programs and more than 30 graduate programs. Importantly, these oceanography programs all had a critical mass of faculty, generally more than a dozen, linked to faculty spread across four core sub-disciplines (geology, physics, chemistry, biology). In comparison, only a few groundwater programs in the world can claim similar critical mass.

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We desperately need educated groundwater professionals to manage and protect freshwater resources. The job market for groundwater professionals is buoyant. Over the past decade a great many young people have become motivated to work towards a sustainable planet, and groundwater science will resonate with them. Offering groundwater education in a multidisciplinary framework that interfaces hydrogeology with ecology, economics, law, forestry and sociology will not only appeal to students, but is the only way to address groundwater in a rigorous manner.

Given the sheer size and risk of the expanding global water crisis, and the key role of groundwater, it is now an opportune time for universities to create undergraduate and graduate programs similar to the size and number of oceanography programs. A key challenge is the lack of synthesized groundwater knowledge in the highly specialized and fragmented literature on groundwater.

This challenge is being addressed by the [Groundwater Project](#) which aims to provide synthesized knowledge about 'all things groundwater' with free-of-charge original books written in many languages and available on the Groundwater Project website. Synthesized knowledge has been assessed by experts and written in a manner understandable to the intended readers. The Groundwater Project alone will not solve the missing groundwater curriculum in education, but the creation of abundant synthesized knowledge, available free online, will enhance education and learning while exposing students to the magnificent nature of groundwater science.

I believe that groundwater education is our best strategy to tackle the global water crisis, and I call on universities throughout the world to show leadership and commit to development of integrated and effective groundwater programs. *Which institutions will step up to meet this challenge?*

Sincerely,

Dr. John Cherry

The Groundwater Project Leader

Recipient of the 2020 Stockholm Water Prize