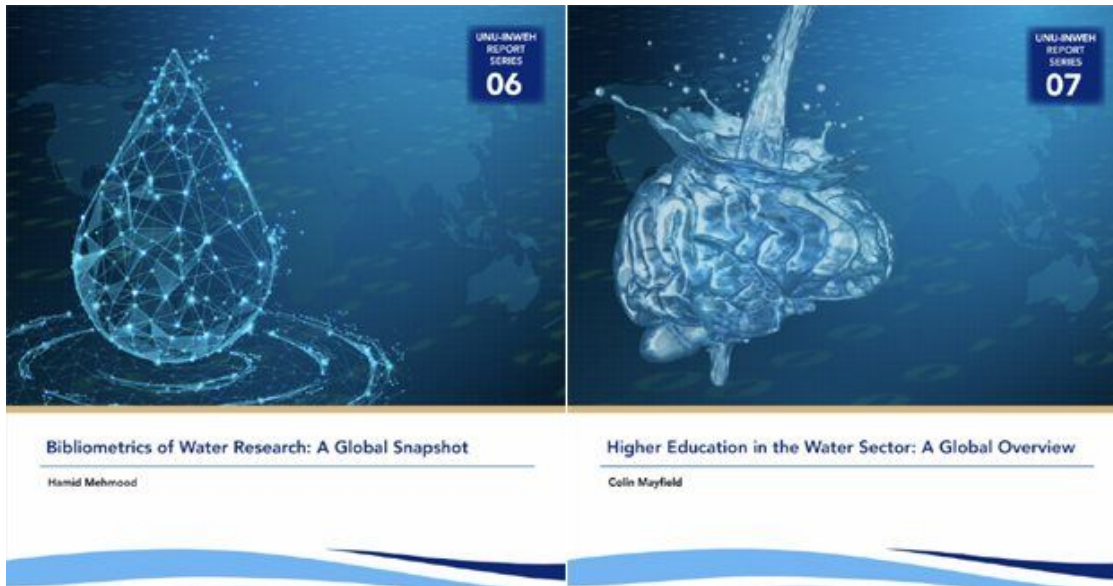


# Researchers call for flow of water research, education towards developing world

According to newly released research from the United Nations University, post-secondary education and research aimed at tackling the global water crisis is concentrated in wealthy countries rather than the poorer, developing places where it is most needed. Two new papers from the UNU's Canadian-based Institute for Water, Environment and Health call for reducing this "alarming" imbalance between resources and need, which impedes the search for solutions to crucial water challenges.



They also suggest refocusing how water research is assessed; with more emphasis on whether the work leads to successful, practical solutions and less on counting the number of papers published and cited by other researchers.

Leading international agencies rank inadequate water supply and sanitation among the top-10 global risks, and the UN's Sustainable Development Goals set ambitious targets for improvement.

## Weaknesses in water-related research and education systems

Despite the research and other efforts that have gone into trying to resolve the water challenges, "not many of them have been removed from the global development agenda", says Hamid Mehmood, a UNU-INWEH senior researcher, based in Hamilton, Ontario, in his paper, "Bibliometrics of Water Research: A Global Snapshot".

"Higher education related to water is a critical component of capacity development," according to Colin Mayfield, professor emeritus at the University of Waterloo, Ontario, in "Higher Education in the Water Sector: A Global Overview."

In their separate papers, Drs. Mayfield and Mehmood examine the weaknesses in water-related research and education systems and suggest reforms.

In both cases, with no global data source offering detailed information on educational activities in the water sector, or even listing water-resources programmes as a discrete category, the authors devised indirect strategies to extract information from several databases.

Mehmood entered a string of 1,057 search terms into the Scopus database, which indexes 22,800 journals, magazines and reports from more than 5,000 international publishers, to find trends in water-related publications and citations, between 2012 and 2017.

Mayfield also used Scopus as well as the Shanghai Academic Ranking System, the Times Higher Education (THE) website, the Ranking Web of Universities, Our World in Data and the UNESCO Institute for Statistics to get data on the location of the world's more than 28,000 universities that offer degrees in water-related programmes, particularly those with high academic rankings, as well as the obstacles and opportunities for researchers and students to access them.

Most troubling for both is the evidence that too little training and research takes place where water problems are most acute.

"Countries with protracted water problems in infrastructure, environment, agriculture, energy solutions do not seem to be at the forefront of water research production or knowledge transfer. Instead, global water research is reliant on the Western - particularly US - scientific outputs," Mehmood states. "Considering the regional and cross-boundary nature of water-related problems, the lack of regional knowledge flows is alarming."

### **Among Mehmood's findings:**

- Globally, more research papers are being published and the number of academic journals focused on water issues is rising. Even so, water-related research doesn't figure prominently in most countries - usually falling below 10% of all published papers. And the proportion is even lower among those that lead in publications in all subject areas.
- Water-related research is published in 88 countries. Between them, the United States and China accounted for 33% of the 1.2 million papers published between 2012 and 2017, although their publication rate is growing more slowly than many other countries.
- About 70% of the academic journals that carry research on water issues are published in just four countries - the United States, Britain, Germany and the Netherlands - and only 2% are in China.

All 15 countries leading in publications per million population are among the world's wealthiest, suggesting water research does not necessarily emerge as a reaction to water scarcity but, instead, to some economic value in a supply and sanitation industry expected to be worth \$1tn in 2020.

China now leads the US in terms of the average number of times each published paper is cited in another study. But most Chinese research is cited in other Chinese papers. A far higher percentage of American papers are cited externally, a knowledge flow that gives US research more global influence and impact. "In water research, the USA remains more authoritative," Mehmood notes.

- The average number of citations for each paper dropped precipitously, from 22 in 2012 to just three in 2017. Mehmood suggests this decline results, at least in part, from the lower quality of papers written to conform with government sponsored policies on publication or increasing pressure in academia to produce research papers.
- The pressure to publish, he says, might be "critical for researchers to survive under the existing 'publish or perish' paradigm, but is hardly conducive from a development angle".

Mayfield's paper states that "overall, the state of education and training in the water sector varies between regions of the world", and the developed world has many concentrated places of excellence in water studies. That is less common in parts of Africa and Asia.



## Data-driven decision-making for water security

Dr Shafick Adams 29 May 2019



### Among many findings:

- Most of the universities that offer courses in water-related issues, and that publish research papers, are in North America, Europe and parts of Asia. In Sub-Saharan Africa, which faces severe water shortages, very few postgraduate institutions offer recognised programmes on water.
- Wealthy nations are home to the highest-quality schools, with 38 of the universities in the Shanghai Ranking's Top 50 for Excellence in Water Resources in North America and Europe, and the other 12 in Australia, China and Taiwan.
- Four universities ranked in the top 50 both for excellence in teaching (Times Higher Education website) and in excellence in water resources (engineering, Shanghai Ranking) are in the United States; the others are in China.
- The cost of education is a barrier in many countries, especially for foreign students. Many students from water-stressed countries who attend university in North America or Europe don't return home after graduation, depriving their countries of badly needed expertise. "Any incentive, process or practice that encourages the return of these highly-qualified students to jobs in the water sector could benefit the home country," Mayfield notes.
- The lack of detailed and centralised information means "searching for information on water-related programmes and courses is an onerous task for students", Mayfield says. "Also, a better 'roadmap' is needed to chart the programmes. Given the highly autonomous nature of universities and their faculty members, it would be unreasonable to expect widespread cooperation in curriculum design and delivery, but some sharing of materials would be very beneficial." Perhaps, he adds, "a consortium of universities could offer large-scale water studies, courses or programmes using the specific expertise of their combined faculty members".
- There is a need to encourage more women to enter the water-resources field.
- The most important skills, knowledge and abilities for work in the water sector identified in many studies were "interpersonal" - the ability to interact, coordinate, teach and learn. These skills are not typically taught or emphasised in water-sector education and training and should be considered and incorporated in educational activities.

Both authors agree that assessing research impact by tabulating publication and citation numbers simply show how information circulates in academic circles without determining its practical impacts.

"To help accelerate solutions to global and national water challenges that many of these research papers are highlighting, the water research community needs to look beyond the research 'box' and identify ways to measure (the) development impact of water research programmes, rather (than) 'impact' based solely on academic impact measured in citations," Mehmood says.

"The research findings, learning and knowledge in these research publications needs to be conveyed in a practical way to the real users of this knowledge - stakeholders who are beyond research circles."

Similarly, Mayfield suggests teaching ratings be based on outcomes, including assessments by previous students after different intervals since graduation about the quality, content and relevance of their programs to their employment experience.

Concluded Dr. Vladimir Smakhtin, director of UNU-INWEH: "When it comes to water research, the publish or perish philosophy that drives many researchers must take second place to the goal of on-the-ground results, especially in the developing world where there must be also a more structured focus on water education in the future. We need to find ways

to make these reforms, and soon; otherwise we will not achieve water-related SDGs. We hope these two papers stimulate the dialog on how to implement the changes required."

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