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**UNU-INWEH**

Institute for Water,  
Environment and Health



# ANNUAL REPORT 2020



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Environment and Health

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# ABOUT UNU-INWEH

UNU-INWEH is one of the United Nations University (UNU) institutes, an academic arm of the UN. The University's 14 research and training institutes are located in 12 countries and address a range of global development challenges. UNU-INWEH's primary focus is global water development challenges. Water is the entry point to all UNU-INWEH's activities, including environment and health. The Institute works to bridge the gap between the wealth of knowledge that exists on water resources, and the practical needs that political leaders and decision makers, particularly in low- and middle-income countries of the Global South, have.

UNU-INWEH's research has a diverse range of stakeholders, including politicians and policymakers in developing countries, concerned with water, health and environment issues; donors and implementing agencies; scientific community in water-related research institutions and academia; UN agencies and other international and regional organisations and networks; host country and national partners in Canada, media; and civil society.

UNU-INWEH was established in 1996, as a public service agency and a subsidiary body of the UNU. Its operations are secured through long-term host-country and core-funding agreements with the Government of Canada. The Institute is located in Hamilton, Canada; its facilities are supported by McMaster University.

UNU-INWEH is the only Institute in UNU that focuses entirely and solely on water issues. It is also the only entirely water-focused UN entity in Canada.



## DIRECTOR'S SUMMARY

The year 2020 was a difficult one, for all nations, for all people. The Pandemic hit everybody hard and, at times the year just did not make sense. And yet, in peculiar ways, it was a year of great success for UNU-INWEH. The main event of the year for UNU-INWEH has been the announcement, by the Government of Canada, of its renewed financial support for the Institute of C\$2 million per year for five years, from 2020 to 2025. The funding announcement coincided with the United Nations' 75th anniversary. With that the Institute started to implement its **new Strategic Plan** that focuses on four interconnected areas: accelerating the implementation of water-related SDGs, activating a technology revolution for water security in the global South, advancing gender equality for effective water management; and managing water and climate-related risks and operationalising water security. All of these have strong roots in the past work of UNU-INWEH and address some of the key groups of water challenges that the world is facing.



Another big achievement has been the commitment by the Canadian Government to establishing a new Canadian Federal Water Agency that will coordinate national efforts to improve management of the country's water resources. This will also inevitably strengthen the Canadian stance on the global water stage. UNU-INWEH has been a leading partner, together with the major Canadian research programme – Global Water Futures - and other partners, in cooperating with the Government of Canada and in the evolution of the Water Agency.

While the “Great Pause” caused by the COVID-19 pandemic surely brought new challenges, it also opened new opportunities. UNU-INWEH started a new “externship” programme, open for young researchers from anywhere in the world, and quadrupled the number of students in the collaborative McMaster- UNU-INWEH graduate programme - Water Without Borders.

UNU-INWEH has also essentially set a knowledge path and an agenda for the water-migration nexus at global, regional and national levels by releasing several outputs on the topic. The foci on water and global South in migration discourse are not very visible in migration discourse, and these contributions filled this large gap.

Through the extended use of its flagship tool – SDG 6 Policy Support System - UNU-INWEH extended its normative support services to 34 countries, primarily from the global South, and is now aiming to increase this number to 50 in the next 2 years.

UNU-INWEH inspired around 400 media stories in over 40 countries, published some 30 journal articles, books and reports, providing, amongst others, the major contribution to UN-Water annual World Water Development Report on “Water and Climate Change”.

In the week when the WHO declared the pandemic, we published an op-ed pointing out that lack of progress on water and sanitation globally will definitely make things worse. The institute also embarked on the development of a tool to assess the vulnerability to water-related infectious diseases, which we hope to release soon.

So, it was, after all a good year, but this is because we made it such despite all odds. It is due to the hard work and commitment of UNU-INWEH staff, donors, partners and friends. However, let's leave 2020 in the past and move on...

Vladimir Smakhtin  
Director: UNU-INWEH  
Hamilton, Ontario, Canada

# MESSAGE FROM THE CHAIR OF THE INTERNATIONAL ADVISORY COMMITTEE

Like every other organization, the COVID-19 pandemic disrupted the work of UNU-INWEH's International Advisory Committee this year. We were not able to gather in person for our annual meeting, but we met in digital space instead to review the Director's steps for the first year of implementation of the Institute's new Strategic Plan. We have also begun virtual briefings of the Committee on major projects of the Institute - a small innovation which also allowed the Committee to be in touch with researchers from UNU-INWEH's wider network of academic partners across Canada, as well as representatives of Global Affairs Canada. We hope to continue these briefings in 2021 and look forward to the opportunity to meet again in person.



As the Chair of INWEH's International Advisory Committee, my main focus this year was to support the Institute and its Director in securing a renewal of the Institute's multi-year funding from its host government, Canada. With the foundation of a new five-year Strategic Plan, with a stronger focus on gender equality and climate change, I knew that UNU-INWEH had a strong case. I was delighted when I learned in late June that Global Affairs Canada confirmed a new arrangement to provide funding for the Institute over the next five years. My sincere thanks go to the Minister of International Development and the staff of Department for their ongoing support of the Institute and its work.

After considerable turn-over in 2019, the International Advisory Committee had a year of stability in 2020. We were delighted that David Passarelli, formerly of the UNU Rector's Office in Tokyo, will be able to continue to serve as the Rector's representative on the Committee from his new role as the Director of the UNU Center for Policy Research (CPR) based in New York. I would also like to congratulate one of our IAC members, Akiça Bahri, for her appointment this year as the Minister of Agriculture, Water Resources and Fisheries of Tunisia. We are delighted that despite these important new responsibilities at home, she is able to continue serving as a member of the Committee.

My best wishes to all staff, friends and supporters of the Institute for 2021.

Michael Small  
Fellow, Morris J. Wosk Centre for Dialogue  
Simon Fraser University  
Vancouver, British Columbia, Canada

# YEAR HIGHLIGHTS

## Canadian Government support to UNU-INWEH extended

In summer 2020, Canadian Government announced its continued support to UNU-INWEH for the next 5 years. The funding announcement coincided with the World Water Week and the United Nations' 75th anniversary. Subsequently, the Institute started to implement its new **strategic plan** that focuses on four interconnected areas: i) helping countries implement water-related Sustainable Development Goals ii) bringing unconventional water resources and technology revolution to the global South, iii) advancing gender equality for effective water management and iv) managing water- and climate-related risks and operationalising water security. The UNU-INWEH provides a range of **knowledge products and policy support services** along the lines of these four key directions.

The Institute's link to the United Nations and explicit mandate to inform policy gives UNU-INWEH privileged access to influence global policy debates on water. The Institute taps into global networks that span academia, industry and government worldwide to develop practical solutions to water-related challenges. UNU-INWEH's location in Canada provides a platform to join forces with leading Canadian research institutions to showcase Canada's contribution to this field and advance a shared vision for a water secure world.

Canada's strong support for UNU-INWEH and its generous and continued commitment are gratefully acknowledged. In 2021, UNU-INWEH will celebrate its 25-th anniversary.

The screenshot shows a news release on the UNU-INWEH website. At the top is a red header with the 'EurekaAlert!' logo and the AAAS logo. Below the header is a dark navigation bar with links for HOME, COVID-19, NEWS RELEASES, MULTIMEDIA, MEETINGS, PORTALS, and ABO. The main content area features a news release dated 28-AUG-2020 with the headline 'Canada renews support for UN University Institute in Hamilton addressing world water issues: \$10M'. A sub-headline reads 'Research organization is at forefront of pressing global water challenges; New funding coincides with World Water Week and UN's 75th anniversary'. Below the headline are social media sharing icons for Facebook, Twitter, YouTube, and LinkedIn, along with a 'SHARE' button. To the right are 'PRINT' and 'E-MAIL' options. The main text states: 'HAMILTON - Canada today announced a CDN\$10 million extension of core funding through 2025 for the UN University Institute for Water, Environment and Health, a research organization at the forefront of pressing global water challenges.' It also notes that the institute is hosted by McMaster University. On the right side of the page is a thumbnail image of the 'Strategic Plan 2020-2024' cover, which features the UNU-INWEH logo and the text 'UNITED NATIONS UNIVERSITY INSTITUTE FOR WATER, ENVIRONMENT AND HEALTH (UNU-INWEH) Strategic Plan 2020-2024'.

## Unpacking the global potential of wastewater

Together with several international and Canadian partners, UNU-INWEH completed and published a ground-breaking study on global and **regional potential of wastewater as a water, nutrient and energy source**. The analysis suggests that, currently, 380 billion m<sup>3</sup> (m<sup>3</sup> = 1,000L) of wastewater are produced annually across the world which is a five-fold the volume of water passing through Niagara Falls annually. Wastewater production globally is expected to increase by 24% by 2030 and 51% by 2050 over the current level.

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### Wastewater is a Source of Valuable Water, Energy and Nutrients: How Do We Recover It?

Words by Kate Zerrenner



FEB 25, 2020



The full nutrient recovery from wastewater would offset 13% of the global demand for nutrients (nitrogen, phosphorus, potassium) in agriculture. Supporting resource recovery from wastewater will need a step-wise approach to address a range of constraints to deliver a high rate of return in direct support of Sustainable Development Goals (SDGs) 6 (water), 7 (energy) and 12 (sustainable consumption and production), but also other Goals, including adaptation to climate change and efforts in advancing “net-zero” energy processes towards a green economy. The findings of this study have been highlighted in print and electronic media such as Science Magazine, German National Radio, Spanish Newswires EFE and Europa Press, Triple Pundit (USA), and Climate News Network (UK), among others with coverage in 7 languages and 29 countries along with media 227 stories.

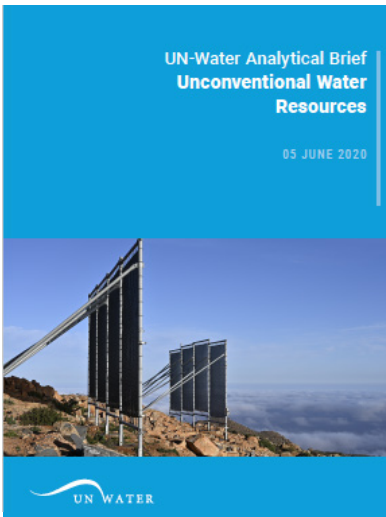
*“Wastewater is not a waste but rather a valuable source of water, nutrients, and energy. UNU-INWEH’s study is strategic in untapping wastewater potential and bringing it up to the attention of policy makers world-wide”*

-Blanca Jimenez Cisneros, co-author of the study and CEO of National Water Commission, Mexico





## Launch of the UN-Water Analytical Brief on Unconventional Water Resources at Dresden Nexus Conference



UNU-INWEH's work on unconventional water resources has been and remains a coordinated initiative to build and share a global vision on such resources – desalination, various forms of atmospheric water harvesting and transport across oceans, etc. – and to trigger international and regional cooperation across the UN Member States. For three years, UNU-INWEH led a UN-Water Task Force on unconventional water resources that engaged over 10 other UN agencies and several international technical partners, and highlighted the role of such resources in global sustainability processes and in alleviating global water scarcity. In June 2020, UNU-INWEH and UNU-FLORES co-organised a special session at the high-profile **Dresden Nexus Conference**, where the final product of this task Force – the **Analytical Brief on unconventional water resources** – was launched. The analytical briefs' Series is the flagship collaborative product of UN-Water

network that present collective position of the UN-Water members and partners on critical global water issues. Since its launch, the UN-Water Analytical Brief on Unconventional Water Resources has been downloaded 1,350 times.

*"We are proud to have been able to work with our many UN partners on the Analytical Brief that brings the issue of unconventional and underutilized water resources to the forefront of discussion on how to help alleviate water scarcity".*

- Manzoor Qadir, Coordinator of the UN-Water Task Force on Unconventional Water Resources



## Setting an agenda for research on water and human displacement

UNU-INWEH invested significant effort in setting a research agenda and a knowledge path to better understanding of the water-related causes and effects of human migration. The Institute published a comprehensive global analysis of issues related to **water and migration** developing a framework that may be useful to aggregate water-related causes and consequences of migration and interpret them in various socioecological, socioeconomic, and sociopolitical settings. Analysis also examined global agreements, institutions, and policies on migration and showed such agreements and policies either reflected or missed the impacts of water and climate crises as direct or indirect triggers of human displacement.

In a related **book chapter** UNU-INWEH stressed that environmental migration, and more specifically, water-driven migration is one of the critical challenges facing the global community today as more people's identity, habitat assets and livelihoods are impacted due to forced migration – all this particularly true for populations living into the Global South.

Other published research explored the **application of geospatial data and tools** to assess the water-migration interlinkages using case studies in Lake Chad, Aral Sea and



### Water and Migration: A Global Overview

Nidhi Nagabhatla, Parthea Pouramin, Rupal Brahmhatt, Cameron Floret, Talia Glidman, K. Bruce Newbold, Vladimir Smakhtin



*“Water-related triggers and consequences of human displacement, as well as the scale of migration in the developing world, are aspects that are less visible in global migration discourse. We are trying to fill these gaps”.*

- Nidhi Nagabhatla, Principal Researcher: Water Security



## Helping countries accelerate the achievements of national water targets

The UNU-INWEH's flagship tool – SDG 6 Policy Support System (SDG-PSS), has contributed to improved processes and collaboration to achieve national SDG 6 targets, particularly in developing countries where data to design policies and make decisions are not always or easily available. After work undertaken in late 2019 and early 2020, the tool is now used or considered for use by water professionals and policy makers from around 50 institutions in 34 countries of which 29 joined the group recently (Egypt, Jordan, Saudi Arabia, Morocco, Kenya, Tanzania, Madagascar, Mozambique, Kuwait, Bahrain, Armenia, Bangladesh, Cambodia, Iran, Mongolia, Sri Lanka, Tajikistan, Turkey, Viet Nam, Brazil, Colombia, Chile, El Salvador, Guatemala, Mexico, Panama, Paraguay, Saint Kitts and Nevis, and Trinidad and Tobago). The third regional workshop (March 2020) of the second phase of the SDG Project (2019-2020) allowed a number of countries from LAC region to get familiar with the tool and start customising it for their national contexts. And the online workshop in November that focused on the lessons learned from the use of SDG-PSS to accelerate progress towards SDG 6 engaged some 70 delegates from most participating countries.



Participants of the regional workshop in the Latin America and Caribbean, Costa Rica, March 2020

The tool is available in three languages – English, French and Spanish – while versions in Portuguese, Arabic and Korean are either in the plans or in the works. If the SDG-PSS is formally adopted only in all currently participating countries, it has the potential to positively influence around 100 million people with inadequate drinking water supplies and 270 million without improved sanitation facilities in these countries – by facilitating the national inter-agency collaboration to achieve just the first two targets of SDG 6 – 6.1 (universal water supply) and 6.2 (sanitation for all). Impact on the ground from achieving other SDG 6 targets are more difficult to quantify at present, but those positive impacts will certainly be more extensive.

*"It has been a pleasure working with UNU-INWEH over the last 5 years, on developing and rolling out the SDG-PSS in tens of countries; this tool catalyzes cooperation across water professionals, researchers, and policymakers to accelerate the achievement of SDG 6"*

- Eun Hae Jeong, Long-term Project Collaborator and Director of Green Transformation Policy Division, Ministry of Environment, Republic of Korea



## Advancing the understanding of water and health interlinkages in the COVID-affected world



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### OPINION

## Coronavirus & Water Pandemics: Doing the Math

By Vladimir Smakhtin

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This article is to commemorate World Water Day on March 22

Vladimir Smakhtin is Director of the UN University Institute for Water, Environment and Health, funded Government of Canada and hosted by McMaster University, Hamilton, Ontario.



Open sewage in Uganda slum. Credit: I. Jurga, SuSana

HAMILTON, Canada, Mar 19 2020 (IPS) - As the COVID-19 coronavirus pandemic spreads, guidance on your hands and other measures intensifies.

The COVID-19 pandemic did not reshape UNU-INWEH's agenda, but only confirmed that we are on the right path. The Institute continues with its strong focus on water and health interlinkages. One of UNU-INWEH's thematic directions – on water-related risks – covers health risks as well and allows to react quickly to emerging global health risks and threats. The Institute responded to pandemic with two opinion articles that stressed the need for accelerated water and sanitation progress for the vulnerable in the face of the pandemic and its consequences. The **first** of these was published during the week when WHO declared the Pandemic; it was one of the first to show, with facts and numbers, how lack of critical water services may promote the spread of the disease globally. The **second** emphasised the impacts of the disease on the most vulnerable groups and stressed that pandemic presents an opportunity to reform our approaches to provision of the universal access to WASH and healthcare.

UNU-INWEH, together with UNECE, UNESCWA, UNECA, UNEP, and WHO, is currently developing a joint initiative that aims to strengthen natural resource management for COVID-19 response, recovery and resilience.

UNU-INWEH carried out a **global review of the health impacts of water-related disasters**, showing that there is lack of understanding of multifactorial disease and mental health risk factors, as well as water-borne disease indicators in disaster-related discourse.

In addition, in 2020, the Institute initiated the development of a new online tool that aims to measure, monitor and map vulnerability of countries to WASH-related disease outbreak, its likelihood, and severity. The tool will be released in 2021.

*"There are many known water-related health risks and diseases that keep claiming millions of human lives annually. We aim to equip water and health policy makers in countries with knowledge and tools that help better anticipate and prevent these diseases"*

- Lina Taing, Researcher: Water and Health



## Examining the potential of data and technology in water management and disaster risk reduction



### Strategic Foresight to Applications of Artificial Intelligence to Achieve Water-related Sustainable Development Goals

Hamid Mahmood, S. Karthik Mukkavilli, Ingmar Weber, Atsushi Koshio, Chinaporn Meechaiya, Thanapon Piman, Kenneth Mubea, Cecilia Tortajada, Kimberly Mahadeo, Danielle Liao

Together with eight partners from Canada, Japan, Qatar, Thailand, Sweden, Kenya and Singapore, UNU-INWEH developed a comprehensive **Strategic Foresight to Applications of Artificial Intelligence to Achieve Water-related Sustainable Development Goals**. The foresight made several recommendations, including the need to conduct holistic assessments of social, economic, and cultural factors before AI adoption in the water sector, as prospective applications of AI are case-specific; and establishing a national council with representation from all stakeholders to allow for the successful adoption of AI by water agencies. The work was presented at several virtual international events including the ITU International Conference on Artificial Intelligence for Good. UNU-INWEH will engage with UN High level committee in programs (HLCP) and UN Innovation network

to explore how these policy recommendations can be used to guide the development of national strategies that use AI to help achieve water-related SDGs.

UNU-INWEH also developed and preliminary tested a prototype tool for mapping historical and anticipated future flooding extent using AI approaches, cloud computing and open datasets. The tool can be customised to any region, and hence has a great potential for rolling out in developing, flood affected countries of the Global South, in the context of flood mitigation and emergency response, insurance schemes, and overall public awareness of flood risks.

*"Artificial Intelligence, big data and cloud computing - all have huge potential to improve water management globally; but innovative thinking is required to make this potential really work"*

- Hamid Mahmood, Senior Researcher: Hydro-informatics and Information Technology

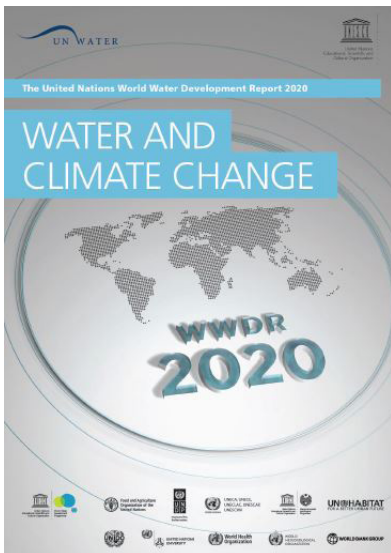


## Influencing Canadian water policies



The **Governor General of Canada – in her Throne Speech** in September 2020 – made the historic announcement that the Federal Government “...will create a new **Canada Water Agency** to keep our water safe, clean, and well-managed. The Government will also identify opportunities to build more resilient water and irrigation infrastructure”. UNU-INWEH has been a leading partner in cooperating with the Government of Canada and others in the **evolution of the Canadian Water Agency** and was signatory to the letter sent to the Prime Minister and cabinet that resulted in the Throne Speech announcement, a new **Canadian Federal Water Agency** that will coordinate national efforts to improve management of the country’s water resources. The creation of the Agency will also inevitably strengthen the Canadian stance on the global water stage. **Public consultations** about current and future freshwater management challenges in Canada and the role a new Canada Water Agency are now ongoing.

## UNU-INWEH in the World Water Development Report



As in previous years, UNU-INWEH, together with other UNU sister centers has made its contribution to the UN-Water annual **World Water Development Report (WWDR)** coordinated by UNESCO-World Water Assessment Programme (WWAP). The theme of the 2020 WWDR was “Water and Climate Change”. This time, UNU-INWEH contribution was massive, with UNU-INWEH being the lead agency in two chapters (“Water availability, Infrastructure and Ecosystems”, and “Water-related extremes and Risk Management”) and contributing to four chapters, (“Technological innovation and citizen knowledge”, “Human settlements”, “Water governance for resilience to climate change”, “Human health impacts”). The Report has been downloaded nearly 70,000 times since its launch in March 2020.

# CAPACITY DEVELOPMENT

## Water Without Borders graduate programme

This collaborative (UNU-INWEH-McMaster University) graduate certificate programme initiated in 2010 is done in tandem with a graduate degree programme from any faculty at McMaster University. It aims to enhance professional and academic development and addresses water issues across geopolitical or disciplinary boundaries. The programme extends over two-semesters and has three courses: problem-based learning, writing a mini-paper on a water-related topic relevant to UNU-INWEH work and an international field trip to a developing country. In 2020, the **WWB programme** has been presented on-line, as many other programmes worldwide, and it has seen an unprecedented interest and enrolment with 35 new students joining. This exceeds the enrolment in previous years almost 4 times.



WWB field trip, Peru, February 2020. The cohort of 2019-2020. Photo credit: Shaikh Mohd Faizaan, WWB alumni

## Short-term training programmes

As in previous years, UNU-INWEH offers several such **programmes**, including Internships (open to recent graduates or final-stage graduate programme students), Embedded Learning Experience (ELE) programme (targeting mostly early-stage university scholars) and McMaster University Student Training (MUST) programme (specifically designed for McMaster University students from all faculties and departments). These programmes continue, but as COVID-19 pandemic affected face-to-face in-house training programmes, UNU-INWEH has launched a new program, provisionally called - “**Externships**”, where externs work remotely. This programme is open for recent graduates or final-stage graduate programme regardless of the trainee location in the world. Since its launch in September 2020, 9 trainees from 6 countries joined the team remotely. Overall, there were 17 in-house trainees from 7 countries in all short-term programs throughout 2020, of which 11 were female, 6- male, and 24% was from the Global South.



UNU-INWEH ELE scholars and MUST students, February 2020

## On-line learning and teaching

**Water Learning Centre**

The UNU-INWEH's Water Learning Centre (WLC) provides opportunities for water professionals to strengthen their capacity in several focused and multidisciplinary learning areas. WLC promotes topics such as unconventional water resources and technologies for water-scarce areas, WASH-related disease and water pollution, water-related risk and water security, data and technology for strategic water planning and management, sustainable water management, and climate change.

Available Courses

- SDG 6 Policy Support System (Starts: Available Now)
- Global Water Security (Starts: Available Now)
- Big Data Analysis for Water-relate... (Starts: Dec. 17, 2020)
- Water and Migration (Starts: Dec. 17, 2020)
- Water and Health Programme (Starts: Dec. 17, 2020)
- Mangroves Biodiversity &... (Starts: Dec. 17, 2020)
- Unconventional Water Resources (Starts: Jun 17, 2021)
- Integrated Water Resource... (Starts: June 14, 2021)

In line with increasing interest to on-line learning, UNU-INWEH revised its on-line **Water Learning Centre (WLC)** by updating the content of some of its existing courses, and adding several new ones. The courses now offered through WLC include Global Water Security, Big Data Analysis for Water-related Applications, Water and Migration, Water and Health, Mangroves Biodiversity & Ecosystem, Unconventional Water Resources, and a training course in three languages for SDG 6 Policy Support System. More courses will be added in 2021. The overall strategy for the WLC is to ensure primarily self-paced learning in specific focused areas. Some courses are designed for already practicing water professionals, others can form part of a larger programme offered by

Universities. Some larger courses on WLC follow a partnership-based approach, working with four regional training centers in South East Asia, Latin America and the Caribbean, Middle East and Sub-Saharan Africa. In 2020, 140 students enrolled in WLC courses.

UNU-INWEH contributed to the new Massive Open Online Course (MOOC) "Governance for Transboundary Freshwater Security", produced by the Global Water Partnership in collaboration with GEF International Waters and other partners. The MOOC presents multiple facets of governance for transboundary freshwater security – from financing mechanisms to negotiation skills – while emphasising the urgency of sustainable development and cooperation at many levels. This 6-weeks long MOOC is available on **SDG Academy website**. UNU-INWEH staff has been involved in various webinars, on-line presentations describing the Institute's capacity building effort and lectures to university students.

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