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HIGHLIGHTS IN 2023

Assessing and operationalizing water and energy security at regional and global scales

Global water security challenges are expected to continue and intensify in arid and semi-arid regions with high population growth rates and severe environmental problems. To draw attention to this alarming issue, UNU-INWEH undertook a global water security assessment revealing that **out of 7.78 billion people living in 186 countries, over 0.61 billion people (8%) are critically water-insecure and 5.52 billion (72%) are water-insecure**. That is, three out of four people worldwide are water insecure, with women, children, and other marginalized groups being disproportionately affected. Water professionals and policymakers worldwide recognize the importance of evidence-based decision-making in building a future water world where all water resources should be identified and treated as precious and highly valued cornerstones of the circular economy. This assessment is a step in this direction that can be strengthened in future iterations.

There is a sharp disparity in water security across global regions and sub-regions. The least water-secure regions are Africa, including the Sahel, the Horn of Africa, and parts of West Africa, and South Asia and Small Island Developing States (SIDS) worldwide. Europe and the Americas are significantly more water-secure than other global regions. At the sub-region level, Eastern Europe is markedly less secure than Northern Europe, and South and Central America is less secure than North America. Least Developed Countries and SIDS face critical levels of water security. The 23 countries assessed as critically insecure include 16 Least Developed Countries (LDCs) and 7 SIDS: the Solomon Islands, Eritrea, Sudan, Ethiopia, Vanuatu, Afghanistan, Djibouti, Haiti, Papua New Guinea, Somalia, Liberia, St Kitts and Nevis, Libya, Madagascar, Pakistan, South Sudan, Micronesia, Niger, Sierra Leone, Yemen, Chad, Comoros and Sri Lanka. These countries are severely impeded from achieving water security in seven of the ten components: low levels of access to safely managed drinking water and sanitation services (Components 1 and 2), health, measured by high WASH-attributed mortality (Component 3), water quality (Component 4), water value (Component 6), water governance (Component 7) and water resource stability with high interannual variability and low storage capacity (Component 10). Globally, all regions face a trajectory of low levels of water security due to a range of compounding factors. However, these levels vary in each global region. In Africa, water security scores range from 29 (critically insecure) to 58 (insecure), followed by Asia ranging from 32 (critically insecure) to 81 (secure), the Americas from 52 (insecure) to 80 (secure), Europe from 51 (insecure) to 90 (secure), and SIDS from 23 (critically insecure) to 67 (moderately secure).

The study suggests that more than 10% of people (close to 800 million) do not have access to even basic drinking water, and more than 70% (close to 5.5 billion) do not have access to a safely managed drinking water service (the SDG 6.1 target). More than 22% (1.71 billion) do not have access to basic sanitation, and more than 53% (over 4.12 billion) need access to safely managed sanitation.

Regionally, Africa has the lowest levels of WASH access. Almost 31% (over 411 million) of people in 54 African countries, including 33 LDCs and 6 SIDS, do not have basic drinking water services. Only 201 million people (15%) can access safely managed drinking water, the SDG 6.1 target. In the case of sanitation services, more than 58% of people (780 million) do not have access to even basic

sanitation services, and 82% (1.1 billion) still live without access to a safely managed sanitation service. Twenty-five countries in Africa are severely impacted by WASH-attributed mortality, with estimated rates of over 40 deaths per 100,000 people annually.

In comparison, 20 Asian Pacific countries have mortality rates between 10-40 deaths per 100,000. This situation is not improving – in 2019, 164 countries assessed have increased rates of WASH-attributed mortality compared to 2016 WHO estimates. To achieve reasonable health goals globally, efforts to improve WASH services and wastewater treatment and reduce associated deaths must be significantly accelerated.

Comprehensive and accurate water quality assessment at the national level remains a challenge despite a dedicated SDG 6 target. Due to insufficient data, the level of industrial and domestic wastewater treatment could only be assessed in some countries as defined in SDG 6. This is a significant failure halfway into the SDG era, as only 14 countries have data on industrial wastewater treatment (2015 values). The level of domestic wastewater treatment, assessed by WHO using household sanitation statistics, remains very poor (below 30%) in Africa and large parts of the Asia-Pacific and poor (below 50%) in most South American countries, though there are exceptions in all regions.

Assessing the impacts and trends of the global bottled water industry

The bottled water industry has developed into a significant and standalone economic sector in just around the last five decades. The current global bottled water sales are estimated at \$270 billion. A study led by UNU-INWEH reveals that bottled water market drivers differ significantly between the Global North and the Global South. In the former, bottled water is often perceived as a healthier and tastier product than tap water and is more a luxury good than a necessity. In the Global South, bottled water sales are stimulated primarily by the lack or absence of a reliable public water supply. The study reports [numerous cases of inorganic, organic, and microbiological contamination of hundreds of bottled water brands, with contamination often exceeding local or global standards](#). Thus, the study presents strong evidence against the misleading perception that bottled water is an unquestionably safe drinking water source and argues that the provision of a safe and reliable drinking water supply in any country may not be achieved at the expense of one water source over another. The world currently generates around [600 billion plastic bottles, amounting to approximately 25 million tons of plastic waste, which is not recycled but is disposed of in landfills](#). There is a need to address the tradeoffs of the bottled water industry as the world is embarking on achieving water-related sustainable development.

The lack of data available on water volumes extracted by the bottled water industry is mainly due to the need for more transparency and a legal foundation that would have forced bottling companies to publicly disclose the extracted water volumes and assess the environmental consequences of their activities. Developing countries of the Global South, where safe drinking tap water is not always available, represent potential future markets for bottled water. In this context, the lack of national policies for water management may promote uncontrolled groundwater withdrawal for bottled water procurement and increase the overall pressure on local water resources, with little or no contribution to the sustainable and reliable long-term drinking water supply. Overall, the bottled

water industry has a range of impacts that result in resource depletion. There is an increasing amount of scientific evidence that supports this concern.

Estimating storage losses in large reservoirs due to sedimentation

Water storage infrastructure is critical for development. Large dams and reservoirs provide hydroelectricity, flood control, irrigation, and drinking water, often performing multiple functions simultaneously. The construction of large dams peaked in the 1960s and 1970s, and today, nearly 60,000 such dams exist worldwide. Thousands have aged considerably since then, facing a higher risk of failure or becoming less effective. One significant contributor to this decline in performance is reservoir sedimentation, resulting from dams impeding rivers' natural sediment transport process. Reservoir sedimentation reduces functional storage capacity due to sediment accumulation and deposition.

Researchers at UNU-INWEH estimated sedimentation rates for 47,403 large dams in 150 countries and revealed that 6316 km³ of [global storage in these dams will decline to 4665 km³, causing a 26% storage loss by 2050. This storage loss roughly equals the annual water use in India, China, Indonesia, France, and Canada.](#) The decreased storage will challenge many aspects of national economies, including irrigation, power generation, and water supply.

By now, significant regions of the world have already lost 13–19% of their initially available water storage. Asia-Pacific and African regions will likely experience smaller storage losses in the next 25+ years compared to the Americas or Europe. On a country level, Seychelles, Japan, Ireland, Panama, and the United Kingdom will experience the highest water storage losses by 2050, ranging between 35% and 50%. In contrast, Bhutan, Cambodia, Ethiopia, Guinea, and Niger will be the five least affected countries losing less than 15% of storage by 2050. The decrease in the available storage by 2050 in all countries and regions will challenge many aspects of national economies, including irrigation, power generation, and water supply. The newly built dams will not be able to offset storage losses to sedimentation. This UNU-INWEH study is an alert to this creeping global water challenge with potentially significant development implications.

Fulfilling justice and equity will only be achievable if risk mitigation and climate change adaptation strategies are designed with a comprehensive assessment of diversity in the levels of vulnerability of different population groups and communities. This UNU-INWEH report investigated the population characteristics of the communities living behind levees in the United States of America to highlight how the [social, economic, and demographic disparities of population groups behind levees can make some of these communities highly vulnerable to floods and levee failures.](#) As the world prepares to take serious mitigation and adaptation action on climate change, such inequity and injustice implications call for significant reform in current flood management practices.

Understanding and reporting inequity behind levees

Fulfilling justice and equity will only be achievable if risk mitigation and climate change adaptation strategies are designed with a comprehensive assessment of diversity in the levels of vulnerability of different population groups and communities.

Infrastructure equity is an immediate concern with levees, constituting the backbone of the US protection against flooding. Flooding patterns are exacerbated by anthropogenic climate change in several regions, posing a significant risk to the nation's economy, safety, and well-being. The evolving risk of flooding is shown to disproportionately affect historically underserved and socially vulnerable communities (HUSVCs).

A study undertaken by UNU-INWEH and partners investigated the population characteristics of the communities living behind levees in the United States of America to highlight how the [social, economic, and demographic disparities of population groups behind levees can make some of these communities highly vulnerable to floods and levee failures](#). The study compared the sociodemographic and socioeconomic composition of leveed and non-leveed US communities. It showed a substantial overrepresentation of HUSVCs in leveed areas at the state, regional, and national levels. Further, the study analyzed the proportion of communities designated as "disadvantaged" in leveed versus non-leveed areas, revealing a substantially larger population of disadvantaged communities residing behind levees. The results showed that nationally, Hispanics are the most overrepresented population in leveed areas, yielding a disparity percentage of 39.9%, followed by Native American (18.7%), Asian (17.7%), and Black (16.1%) communities. Communities characterized by low education, poverty, and disability exhibit a disproportionately higher presentation of 27.8%, 20.4%, and 5.4% in leveed areas across the US. In 43 states, disadvantaged communities are overrepresented behind levees, with a national disparity percentage of 40.6%. At the regional level, the highest disparity was observed in the Northeast (57.3%), followed by the West (51.3%), Southeast (38%), Midwest (29.2%), and Southwest (25%). These findings can enable policymakers to identify hotspots within HUSVCs that must be prioritized to enhance their levee systems' integrity and climate adaptation. As the world prepares to take serious mitigation and adaptation action on climate change, such inequity and injustice implications call for significant reform in current flood management practices.

Supporting global UN processes

UNU-INWEH continued to engage with the UN processes through several mechanisms. The institute coordinates (together with the United Nations Department of Economic and Social Affairs, UN-DESA) the UN-Water Task Force on implementing the Water Action Decade (2018-2028). The Task Force includes over 15 UN-Water members and partners. In 2023, the significant contribution of UNU-INWEH consisted of supporting and contributing to [the UN 2023 Water Conference](#) (22-24 March 2023), New York, where the institute, on behalf of United Nations University, submitted a commitment (#SDGAction51713) "[Addressing global water crisis through research-policy bridging, capacity development and advocacy](#)" to the Water Action Agenda. In addition, UNU-INWEH co-organized three side events: (1) Global to local water security assessment: how do we measure up and how close are our targets mid-way to SDG6?" organized in collaboration with WHO, ADB, WaterAid Canada, Northwestern University, USA; (2) Identifying and bridging the capacity gaps to achieve water-related SDGs, organized in collaboration with the United Nations Office for Sustainable Development, National Water and Sanitation Agency of Brazil, Korea Water Resources Corporation, and UNESCO International Centre for Water Security and Sustainable Management; and (3) Addressing water scarcity to achieve climate resilience and human health, co-organized with

Colorado State University, Global Institute for Water Security at the University of Saskatchewan, Pacific Water Research Centre at the Simon Fraser University, University of Alabama at Birmingham School of Public Health, and Global Water Security Center at the University of Alabama, USA.

In addition to a major contribution to the [UN 2023 Water Conference](#), UNU-INWEH participated in the [2023 SDG Summit](#) (18-19 September 2023), where the institute co-organized a side event, "Addressing Global Water Insecurity: Harnessing the power of big data, novel technologies, and international collaboration" in collaboration with York University, Canada, and UNITAR. While considering the importance of reliable data and accurate, up-to-date information for evidence-based decision-making, this event helped build momentum for harnessing the potential of new technologies, large open-access databases, and inclusive international collaborations to tackle global water insecurity, especially in regions of the world where data and resources are most limited.

CAPACITY DEVELOPMENT

Supporting the achievement of water-related Sustainable Development Goals (SDGs)

UNU-INWEH co-leads a consortium of partners (United Nations Office for Sustainable Development, the Ministry of Environment of the Republic of Korea, Korea Environment Corporation, UNESCO International Centre for Water Security and Sustainable Management, Korea Water Resources Corporation, and the United Nations Environment Programme) to implement a project 'Water in the World We Want' to investigate how countries can address critical evidence gaps and deliver better policies to achieve Sustainable Development Goal (SDG) 6. The [SDG 6 Policy Support System \(SDG-PSS\)](#), the key output of this project, helps create evidence on the enabling environment of SDG 6 at the national level in countries with limited or missing data. By the end of 2023, 68 countries have been engaged through project-led workshops on using SDG-PSS within their national contexts. SDG-PSS consists of the following components: *Capacity Assessment, Finance, Policy and Institutional Assessment, Gender Mainstreaming, Disaster Risk Reduction (DRR)/Resilience Mainstreaming, and Integrity*. These components were chosen as they allow a better understanding of the enabling environment where water and sanitation policies are developed and implemented for achieving SDG 6. SDG-PSS permits answering the challenge of bringing data and information from multiple international and national tools and translating them into a 'fit-for-policy' evidence framework. SDG-PSS is available in six languages (English, Spanish, French, Portuguese, Arabic, and Korean). There is an e-course on SDG-PSS to address capacity building for systematic and practical use of the tool. [The course](#) provides training and teaching on using this system to produce evidence and data on the enabling environment for achieving SDG 6. The effort required by the SDG-PSS to get all the evidence together is an essential step for countries to evaluate better which data is missing and where gaps in policymaking exist.

Achieving Sustainable Development Goal 6 (Ensuring availability and sustainable management of water and sanitation for all) by 2030 is a grand challenge for the world. Its timely achievement is expected to allow countries to reach an important milestone in their journey towards sustainability, as successful water and sanitation management will be a foundation for achieving many other water-related SDGs directly or indirectly.

Effective planning and policy implementation through strengthening and realigning enabling environments are critical to driving success in achieving water-related SDGs at the national level. However, evidence and appropriate data for policymakers and development actors to make this happen is missing, overlapping, or even fragmented in most countries in the African region. If the countries are to achieve SDG 6, they need to assess their current national progress effectively. This means defining gaps and weaknesses and addressing them with workable policies and action plans to promote strong enabling environments for achieving SDG 6. These countries also need to set their national baselines, targets, and priorities in the general SDG process and focus on the ones that can be realistically achieved by 2030.

In the "Water in the World We Want" project, UNU-INWEH and its partners continue to maintain and roll out its flagship tool, the SDG 6 Policy Support System (SDG-PSS), in more countries. The tool helps create evidence on the enabling environment of SDG 6 at the national level in countries with limited or missing data. The extended use of SDG-PSS requires the engagement of more water professionals, managers, policymakers, and more countries. The experience of organizing project-led workshops in the second and third phases of the project showed that strengthening regional partnerships and cooperation has been critical for the project's success. Thus, engaging more countries in using SDG-PSS is crucial to promote multinational collaboration and ensure knowledge exchange for effective use of the tool while informing policy and decision-makers on the enabling environments of SDG 6. Parallel to introducing SDG-PSS to more countries, it is taking stock of the work undertaken by the project and lessons learned to ensure a more significant impact on the project as it enters its fourth phase.

At the end of the project's third phase in 2023, 68 countries are using or considering using SDG-PSS to support their journey to water-related sustainable development. Implementing SDG-PSS has benefited Brazil in three critical dimensions: (1) defining gaps and national targets, (2) strengthening institutional collaboration, and (3) fostering SDG 6 international collaboration by facilitating SDG-PSS in other countries, particularly those belonging to the Community of Portuguese Language Countries (CPLP). Using SDG-PSS in Brazil contributed to a better understanding of SDG 6 specificities, especially among policy professionals, and helped define numerical aspirations and identify institutional weaknesses at the national level. For example, Brazil is on track to achieving targets 6.1 and 6.2 by 2030 and has defined numerical objectives such as ensuring sewage collection for 90% of the population and ensuring drinking water supply for 99%. By exploring different components of SDG-PSS as a tool for analyzing SDG 6 indicators simultaneously, new avenues of exploration define future metrics for other targets. Inter-institutional collaboration for data collection for SDG 6 indicators in Brazil has evolved through policies and information exchange mechanisms such as open data, spatial data infrastructure, and information access laws. Organizations from different sectors have allowed for a broader institutional analysis of SDG-PSS outputs, strengthening collaboration and having excellent potential to contribute to future policies and actions for Brazil to achieve SDG 6 in 2030.

In Tunisia, the Tunisian Expert Working Group is championing SDG-PSS by compiling data, reporting on SDG 6 progress, and raising funds for activities leading to sustainable water development in the country. The project has brought together at least 13 experts and professionals from four leading ministries and 12 national institutions and departments. SDG-PSS has strong political support from

the Ministry of Agriculture. Implementing SDG-PSS has benefited Tunisia in five dimensions: (1) developing capacity, (2) improving SDG 6 data reliability, (3) supporting national policies, (4) defining national targets, and (5) stimulating reflections on gender mainstreaming. SDG-PSS has facilitated the assessment of specific SDG 6 Targets and helped identify gaps and establish international benchmarking. The gaps stimulated data research, collection, assembly, and cross-checking between sources and institutions to ensure quality and reliability. This resulted in identifying indicators with the most limited data available (Indicators 6.2.1, 6.3.1, and 6.6). Identifying these gaps helped foster discussions on how to tackle the problem. For example, the Tunisian team is working on engaging more resourceful and motivated experts by establishing an additional national committee dedicated to collecting data for each indicator and target.

Behavior change and inclusive decision making in Africa

UNU-INWEH is part of the [Behavioral Adaptation for Water Security and Inclusion \(BASIN\) consortium](#), which aims to synthesize, assess, and test the application of potential multi-level behavioral and psychological science perspectives for adaptation in targeted areas of Africa to enhance water security for populations vulnerable to climate change. While Sub-Saharan Africa is expected to become the next hotspot of water scarcity, adaptation is fundamentally about behavior change. The project targets weather and climate information to enable adaptation by addressing critical climate–water challenges in Burkina Faso, Malawi, and Tanzania while providing the basis for upscaling in the Sahel, Ethiopia, and Zambia. Through intensive engagement with stakeholders and policymakers and tailored and targeted policy-oriented actions, BASIN aims to achieve (1) improved decision-making to enable more effective and equitable adaptation in policy and practice and (2) more inclusive water security in the face of climate change in project countries and globally.

Online Learning Centre

In addition to its projects, UNU-INWEH advocates and implements gender mainstreaming in its capacity-building, training, and advocacy initiatives. For example, the institute's online learning platform, Water Learning Centre (WLC), offers courses with gender aspects embedded in them. For example, "[Water and Migration](#)," where water scarcity and water quality deterioration are recognized as critical challenges to sustainable development and as potential causes of social unrest and conflict within and between countries. Water scarcity and water quality deterioration also impact traditional seasonal human migration routes and, together with other water insecurity factors, could reshape migration patterns. Women and girls are among the vulnerable segments of the migrant population. In the case of another course, "[WASH in Healthcare Facilities](#)", limited water, sanitation, hygiene, waste management, and cleaning (WASH) in healthcare facilities are critical vulnerabilities in health systems that can significantly affect the quality of care, particularly for women. Globally, one in four healthcare facilities lacks essential water services, one in ten HCFs needs sanitation services, one-third need handwashing facilities at the point of care, and one-third need systems to segregate waste. Due to significant data gaps, baseline data on environmental cleaning in healthcare facilities must be collected. Under-prioritization of WASH in healthcare facilities has contributed to a higher risk of infection, increased use of antibiotics, and acceleration of antimicrobial resistance, especially among vulnerable populations and population groups like women and girls. This course provides an overview of technical evidence and guidance for supporting better WASH in healthcare facilities to enhance patient health outcomes. The course has been developed for healthcare

professionals, peer supporters, and community workers interested in improving WASH and environmental sanitation in healthcare facilities.

The UNU Hub in Calgary

In December 2023, UNU-INWEH launched the UNU Hub on Empowering Communities to Adapt to Environmental Change through a formalized agreement with the University of Calgary. With a primary focus on water, the UNU Hub at the University of Calgary will develop the scientific understanding, solutions, and skilled workforce required to mitigate and adapt to climate threats that affect ecosystems, economies, personal safety, and ways of life around the world.

The NEW UNU Hub's research program has four interdisciplinary clusters, led by world-class scholars, collaborating to bring their expertise to bear on four essential areas of water studies:

- Understanding changes in aquatic ecosystems
- Evaluating risks of infectious diseases in a changing climate
- Environmental predictions for water sustainability, and
- Building resilience in Indigenous communities.

The Hub will also offer training opportunity for students of all levels, including joint graduate degree programs at the MSs and PhD levels, international internships, and summer training. The Hub's research and training activities will address the challenges of environmental change, paired with outreach to advance policy-relevant university research. It will develop collaborative programs for researchers and students seeking opportunities that are impactful and relevant to global practice and policy. The Hub's reach is global, with outcomes that are accessible and applicable beyond Canada, extending to the Global South.

GENDER MAINSTREAMING AND GENDER-RELATED RESEARCH

In 2023, women constituted 60% of the full-time staff members at UNU-INWEH and 50% of its [International Advisory Committee \(IAC\)](#). The Institute has strong commitment to the UNU-wide Action Plan on gender and gender mainstreaming and it continues to address gender as a critical element of its projects and activities.

In the "Water in the World We Want" project, UNU-INWEH and its partners continue to maintain and roll out its flagship tool, the SDG 6 Policy Support System (SDG-PSS), in more countries. [One of the significant components of the tool addresses gender mainstreaming](#). This component evaluates the status of and supports gender mainstreaming into water- and sanitation-related SDG targets at the national level. It helps users understand gender-specific objectives and commitments within national water policies, the frequency of including gender specialists in decision-making, the status of funding for gender mainstreaming activities in the water sector, evidence of institutional commitment to practice gender parity and promote gender equality in water-related ministries and institutions; and status and implementation of training to raise awareness on gender equality within water-related institutions working on achieving SDG 6.

Most countries participating in the project “Water in the World We Want” have reported "Gender Mainstreaming" as a priority component of SDG-PSS in addressing water-related sustainable development at the national level. There is a need for mainstream gender interventions that address disaster risk reduction and resilience and implement integrity measures in the water sector. For example, one of the project's participating countries, Morocco, reported that gender mainstreaming is crucial for promoting equity and inclusivity in water-related policies and programs. Applying a gender lens to water and sanitation issues in Morocco has helped identify and address the specific priorities, uses, and needs of women and men, ultimately contributing to more effective and sustainable water management. Each component is crucial in assessing, planning, and implementing water-related policies and programs in Morocco. By focusing on these areas, Morocco can address its specific challenges, align its efforts with the water-related SDGs, and work towards achieving sustainable water management and improved water access for its population.

A UNU-INWEH-led study investigated the [intersections between water quality and gender by examining how water quality impacts may differ between genders](#) in terms of health, living, and social effects and exploring the linkages between SDG 3 (addressing health priorities), SDG 5 (Gender equality), and SDG 6 (Access to safe water and sanitation). This study expanded on scientific monitoring of sex-disaggregated data in the water domain to uncover the often-ignored or strategically dismissed linkages between water and gender for effective and fit-for-purpose management of water resources based on their quality. The study was piloted in Abeokuta City, Nigeria, to gain insight into context-specific intersections of unsafe water, sanitation, and hygiene on gender and to collect a real-time data set relevant to low- and middle-income countries.

The study results underscore unsettling, largely unseen gender disparities in exposure to health-related risks associated with water sources not supported by government infrastructure (i.e., non-utility water sources) and highlight pronounced differences in water source preferences and utilization, the burden of water sourcing and collection, and health- and hygiene-related practices. Specifically, the study results warn about the water safety of non-utility water sources. Without point-of-use treatment and water safety protocols, those water sources are unsuitable for potable uses, potentially posing compounded health risks associated with microbial contaminations and high calcium content, particularly affecting boys. Also, the results show that girls are likely the most affected by the repercussions of water collection, including time constraints, health implications, and safety concerns. Men and boys face a higher risk related to poor hygiene, while women may be more susceptible to health effects stemming from toilet cleaning responsibilities and shared sanitation facilities. Despite the preference for disposable sanitary pads among most women and girls, women maintain better menstrual hygiene practices than girls. This age-specific disparity highlights potential substantial health risks for girls in the near and distant future. Enhancing women's economic status could improve access to superior healthcare services and significantly elevate household well-being. The study highlighted that water-related impacts are not gender-neutral and calls for targeted actions, including urgent planning and implementation of robust water safety protocols for non-utility self-supply systems and mainstreaming gender concerns. The methodology developed and piloted serves as an introductory guide for relevant practitioners to examine and track site-specific differential health and socioeconomic effects of inadequate water quality, especially in locales like the study area.

Women are underrepresented in the water workforce, particularly in developing countries where, as some preliminary estimates suggest, women make up less than 17%. Yet, actual quantitative evidence of this under-representation is lacking. Also, data on their role across the water sector (globally and nationally) are limited. UNU-INWEH initiated a study, 'Women-in-Water,' on quantifying women's representation in the water sector. The study is based on collecting and utilizing gendered statistics by formulating quantitative gender-responsive indicators, designing methodologies for analyzing the role of women in the water sector globally/nationally, and illustrating current gender status to push for much-needed inclusivity and increase women's participation in decision-making and water governance. Six measurable indicators for three critical domains of the water sector were streamlined through a rigorous iterative process from initially identified five key domains with ten measurable gender-responsive indicators (and some 13 sub-indicators) from the UNESCO-WWAP toolkit for sex-disaggregated data. An online public survey was designed and disseminated to harvest sex-disaggregated data into the indices from various sources in the Global South. The survey was distributed in three languages (English, French, and Spanish) to 151 countries. Some UN agencies (UNDP, UNESCO/WWAP, UN Women, and ILO) were contacted to facilitate the survey dissemination to national and regional water actors through their in-country Resident Coordinators. The surveys were distributed directly to the in-country water actors through contact information from publicly available online directories. A total of 218 survey responses were received from 20% of the countries of the Global South, limiting further analysis due to poor data coverage. The project methodology is being revised, and the scope is trimmed to focus on regional analysis (Africa and Central America).

VISIBILITY AND RECOGNITION

UNU-INWEH's success in receiving international visibility and recognition was continued in 2023. This is evidenced in the healthy and organic success of the institute in engaging partners and stakeholders in the real world (e.g. actors in Ottawa and other parts of Canada, different UN agencies, and new collaborators) and over social media. Just in Instagram, the institute more than doubled its followers in 2023.

According to Google, UNU-INWEH outputs in 2023 resulted in over 1000 media stories/news, an increase from previous years. UNU-INWEH media and some social media statistics are among the top ones within the UNU system. UNU-INWEH's reports on bottled water, the environmental impacts of bitcoin, and the status of water security in the world were among its top reports in terms of the attention they received from the media and social media users in 2023.

The institute researchers were also very active in organizing and contributing to various events and conducting interviews with various media (TV, Radio and written news). The institute was very active in organizing or contributing to various events in the UN Headquarters in New York with success in engaging a diverse range of stakeholders, especially at the UN Water Conference. The institute also increased its level of engagement with the policy actors and the academic community in its host country, Canada, and put major effort in outreach efforts in Ottawa.

EVENTS IN 2023

Selected Sessions and Events at International Conferences

Side Event “Identifying and bridging the capacity gaps to achieve water-related SDGs” within the UN Headquarters during the UN 2023 Water Conference 22-24 March 2023, New York. The side event was jointly organized by United Nations Office for Sustainable Development (UNOSD), UNU-INWEH, National Water and Sanitation Agency of Brazil (ANA), Korea Water Resources Corporation (K-water), and UNESCO International Centre for Water Security and Sustainable Management (UNESCO i-WSSM). <https://sdgs.un.org/conferences/water2023>

Side Event “Global to local water security assessment: how do we measure up and how close are our targets mid-way to SDG6?” and a press conference within the UN Headquarters during the UN 2023 Water Conference 22-24 March 2023, New York. The side event was jointly organized by UNU-INWEH, WHO, ADB, WaterAid Canada, and Northwestern University. <https://sdgs.un.org/conferences/water2023>

Side Event “Addressing Water Scarcity to Achieve Climate Resilience and Human Health” outside the UN Headquarters during the UN 2023 Water Conference 22-24 March 2023, New York. The side event was jointly organized by UNU-INWEH, Colorado State University, University of Saskatchewan, Pacific Water Research Centre, Simon Fraser University, University of Alabama at Birmingham School of Public Health, and University of Alabama Global Water Security Center, USA. <https://sdgs.un.org/conferences/water2023>

Side event “Bridging the gap between science and policy for water security” jointly organized by the University of Johannesburg, Rand Water, the Water Research Commission and South Africa’s Department of Water and Sanitation outside the UN headquarters during the UN Water Conference 22-24 March 2023 at the South African Consulate, New York, March 23, 2023.

Side Event “Addressing Global Water Insecurity: Harnessing the Potential of Big Data, Novel Technologies, and International Collaboration” during the 2023 SDG Summit at the UN Headquarters, 18-19 September 2023, New York. The side event was jointly organized by UNITAR, York University, and UNU-INWEH. <https://www.un.org/en/conferences/SDGSummit2023>

Webinar on the impacts of Recent El Nino in Asia and Pacific, 27 September 2023. The webinar was jointly organized with UN ESCAP (Online Event).

Webinar on the impacts of Recent El Nino in Asia and Pacific, 3 November 2023. The webinar was jointly organized with UN ESCAP (Online Event).

Event: “Differential Impacts Assessment in WASH Research” at the WASH Research Seminar of the WATER-WISER Center for Doctoral Training at the University of Leeds, United Kingdom, 22 June 2023. The knowledge-sharing event was co-organized by Cranfield University, UK, Loughborough University, UK, and the University of Leeds, UK. The event showcased UNU-INWEH’s work on water-gender nexus analytics, advocating the role of Differential Impacts Assessment in water research.

Event: UNU-INWEH participated in “Technology, Water and Women” to mark the 2023 International Women’s Day organized by Women for Water Partnership and Soroptimist International, 14 March 2023. The event called for better access to technology-related education, clean water, and safe sanitation (Online Event).

Event: UNU-INWEH contributed to the Confluency Colloquium, a transdisciplinary and arts-based water justice workshop and interactive mobile art exhibit funded by Canada’s Social Sciences and

Humanities Research Council (SSHRC) and co-led with the Universities of Toronto and Cape Town. The workshop was held from June 5-7th, 2023 with 50 participants representing Pan-African interests and perspectives and closed with the launch of an international art exhibit traveling through South Africa and Canada that brings attention to global water injustice. The art exhibit includes a river of life sculpture, murals, photography, comics, poetry, and audio-visual installations that evocatively communicate the concerns of informal settlement residents and refugee youth in the face of servicing inequities and economic disparity.

Event: Launching workshop for the UNU Sustainability Nexus AID programme. Nov 27-28, Dresden, Germany. This was jointly organized with UNU-FLORES.

Selected Workshops

Africa regional workshop (5-7 July 2023, Nairobi, Kenya) of the SDG 6 project highlighting the use of SDG-PSS in 16 countries (Benin, Burundi, Cameroon, Central African Republic, Côte d'Ivoire, Liberia, Ethiopia, Mauritania, Morocco, Namibia, Nigeria, Rwanda, South Africa, Tunisia, Uganda, and Zimbabwe) while promoting need-specific capacity development as a key step in achieving SDG 6 in these countries.

Latin America and the Caribbean regional workshop (20-22 September 2023, Brasilia, Brazil) highlighting the use of SDG-PSS in 17 countries (Belize, Brazil, Chile, Cuba, Dominica, Dominican Republic, El Salvador, Guatemala, Guyana, Panama, Paraguay, Peru, Saint Kitts and Nevis, Saint Lucia, Suriname, and Trinidad and Tobago. In addition, Cape Verde from Africa but a Portuguese-speaking country) while sharing and discussing experiences, challenges, and possibilities in achieving SDG 6 at the national level.

BASIN (Behaviour Adaptation for Water Security and Inclusion) capacity development consultation held with WaterAid (Burkina Faso, Tanzania, UK, and Canada), Canada's IDRC, UK's FCDO and the London School of Economics prior to the Adaptation Futures conference in Montreal, Canada, October 2, 2023.

Workshop on Mapping the Unseen: Leveraging Innovative Tools for Flood Hotspot Mapping and Risk Assessment, December 5, 2023. The online workshop was jointly organized with UN ESCAP.

Workshop on Mapping the Unseen: Leveraging Innovative Tools for Flood Hotspot Mapping and Risk Assessment, December 19, 2023. The online workshop was jointly organized with UN ESCAP.

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Chamanara, S., Ghaffarizadeh, S. A., & Madani, K. (2023). The environmental footprint of bitcoin mining across the globe: Call for urgent action. *Earth's Future*, 11, e2023EF003871.

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Logie, C.H., Moses Okumu, Isha Berry, Alyssa McAlpine, Daniel Kibuuka Musoke, Robert Hakiza, Amaya Perez-Brumer, Stefan Baral & Peter Kyambadde (2023) Multi-method findings on COVID-19 vaccine acceptability among urban refugee adolescents and youth in Kampala, Uganda, *Global Public Health*, 18:1, <https://doi.org/10.1080/17441692.2023.2185800>

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