

Summary of the Budapest Water Summit 2019: “Preventing Water Crises”

Held under the theme, “Preventing Water Crises,” the third Budapest Water Summit (BWS 2019) provided a platform for high-level discussion on global water issues. The Summit recognized the increasing frequency of crises triggered by water-related factors, in the context that sustainable development goal (SDG) 6 (water and sanitation) is viewed as intrinsically linked to all other SDGs and therefore achievement of the 2030 Agenda for Sustainable Development (2030 Agenda). Discussions framed how to prevent emerging water crises, how to manage crises where they cannot be prevented, and identifying relevant gaps in knowledge, governance, technology, finance, regulations and institutions.

In his opening remarks, János Áder, President of Hungary, emphasized the three water “dramas” of “too little, too much and too polluted.” Underlining that humanity can no longer take water availability for granted, he stated the BWS 2019 would explore scientific and technological innovations to manage water challenges and adapt to emerging water crises, as well as the financial resources required to scale up these solutions. Samdech Hun Sen, Prime Minister of Cambodia, recognized the need for action and for countries to work together, and drew attention to water as a human right.

The Summit featured ten high-level sessions on themes of: preventing water crises; valuing water versus the costs of a water crisis; economically rational behavior during a water crisis; mass migration; investment in water infrastructure; technology; science; implementation; transboundary water affairs; and institutional architecture. Side events and the Digital and Nature-based Sustainable Solutions Expo took place in parallel to the Summit.

The key outcome of the meeting was a document titled the “Budapest Appeal,” which identifies priority areas on water security and outlines concrete recommendations and solutions for governments, to consider at relevant international fora, including the UN Framework Convention on Climate Change (UNFCCC), the 2021 World Water Forum, and the UN High-Level Political Forum on Sustainable Development (HLPF).

BWS 2019 took place from 15-17 October 2019 in Budapest, hosted by the Government of Hungary, under the patronage of the President of Hungary and former Member of the High-Level Panel on Water (HLPW), János Áder. Approximately 2,500 participants from 118 countries, including two heads of state and 28 ministers, and representatives from government,

specialized water institutions, UN agencies, international research organizations, multilateral development banks, the private sector, and civil society, interacted during the three-day event.

This report provides an overview of plenary discussions at the BWS 2019.

A Brief History

The Budapest Water Summits are hosted by the Hungarian government with an aim to push the thematic global agenda on water via high-level plenary discussions and outcome recommendations. The Summits have convened every three years since 2013.

1st Budapest Water Summit: This event took place in October 2013 with the participation of UN leaders and heads of international water organizations, including UN Secretary-

In This Issue

A Brief History	1
Budapest Water Summit 2019 Report.	1
Inauguration Session	1
Session 1: Can Water Crises be Prevented?	3
Session 2: Value of Water vs. Costs of a Water Crisis	4
Session 3: Water Crises - What is the Economically	
Rational Behavior?	5
Session 4: Water Stress and Mass Migration - Is There a	
Way to Prevent Crisis?	5
Session 5: What is Needed for Doubling Investments?	6
Session 6: Technology to Avoid Water Crises - What is	
Missing?	7
Session 7: Science Against Water Crises: Do We Know	
Enough?	8
Session 8: Implementation - Do We Have the Right	
Systems in Place?	9
Session 9: Transboundary Water Affairs - How to Move	
From Risks to Opportunities?	10
Session 10: Is Our Institutional Architecture Capable of	
Supporting Transformation?	11
Closing	12
Upcoming Meetings	13
Glossary	13

General Ban Ki-moon. More than 1,400 participants from 105 countries, and 30 ministerial-level delegates, attended the conference. The meeting convened within the context of international negotiations around the 2030 Agenda, and addressed: universal access to water and sanitation; water, sanitation, and hygiene (WASH) issues; implementing integrated water resource management (IWRM); serving a growing population with water in a changing climate; water governance; specific, measurable, attainable, relevant, and time-bound (SMART) sustainable development goals; enabling a green economy for blue water; investing and financing to address the global water and sanitation crisis; and leveraging finance. The Summit produced the Budapest Statement, calling for water to be a stand-alone goal in what became the 2030 Agenda, and presented proposals covering the full spectrum of water management.

UN Sustainable Development Summit: The adoption of the 2030 Agenda at the UN Sustainable Development Summit in September 2015 in New York, US, affirmed the strong international support for a holistic approach to water management. Among the 2030 Agenda's 17 SDGs, members adopted SDG 6 on ensuring availability and sustainable management of water and sanitation for all.

2nd Budapest Water Summit: This event took place in November 2016 and involved approximately 2,600 participants from 117 countries, including several heads of state and many ministerial representatives. The Summit featured high-level plenary discussions on: drinking water; sanitation and hygiene; water-use efficiency; IWRM; water quality; and ecosystems. Speakers made keynote presentations on climate and disasters, urban systems, transboundary water management, and progress toward a global indicator framework for monitoring the SDGs. A High-Level Special Session on Climate Change and Water took place. The Summit produced a "Messages and Policy Recommendations" document containing recommendations for governments in their efforts to implement water-related aspects of the 2030 Agenda.

High-Level Panel on Water: This Panel was convened by the UN Secretary-General and the President of the World Bank in April 2016 and consisted of 11 sitting Heads of State and one Special Adviser. Its aim was to champion collaboration in the development and management of water resources, and improve water and sanitation related services, with a view to achieve the 2030 Agenda. The HLPW produced an outcome document in collaboration with UN Department of Economic and Social Affairs and the World Bank, "Making Every Drop Count: An Agenda for Water Action," in March 2018. In its recommendations, the Agenda supported periodic UN High-Level Meetings on water issues, including one in 2021 and one in 2023 as part of the midterm review of the UN Water Action Decade 2018–2028.

Water Future International Conference: This event, organized by the Indian Institute of Science, convened 24-27 September 2019 in Bengaluru, India, to address the current and future challenges of global water resources, and technological

and institutional solutions to accelerate implementation of water-related SDGs. It produced the Bengaluru-Budapest Science Action Plan Towards Sustainable Water Futures, a call for action with a view to BWS 2019 proceedings. In its recommendations, the Action Plan urges a paradigm shift towards a multi-perspective, evidence-informed, and integrative digital operating framework. The plan supports enhancing existing science models with big data analytics, cloud computing, augmented intelligence, deep-learning techniques, and distributed ledger systems like blockchain technologies.

HLPF 2018 Review of Implementation of SDG 6:

According to the Review (sustainabledevelopment.un.org/hlpf/2018), SDG 6 is not on track to be achieved by 2030. The Review states that 2.3 billion people lacked access to improved sanitation facilities in 2018, and water pollution, including by pathogens, has worsened since the 1990's across Latin America, Africa and Asia. It also identifies that worldwide, more than two billion people live in water-stressed regions. In terms of climate change, the report states that of the 5.5 billion people affected by natural hazards between 1990 and 2015, 96% were affected by water-related hazards with total costs amounting to USD2.5 trillion. As priorities for action on the implementation of SDG 6, it recommends an improved enabling environment for investment, addressing inequalities, a new financing paradigm, smart technologies, enhanced capacity building, and multi-stakeholder partnerships.

Budapest Water Summit 2019 Report

Inauguration Session

The Summit opened on Tuesday, 15 October, in Budapest, Hungary to a live water-themed dance performance by Recirquel, a Budapest-based, world-renowned modern circus company.

Zsófia Tomaj, Master of Ceremonies, welcomed participants.

In his keynote address, János Áder, President of Hungary, stressed that technologies are needed to mitigate and adapt to emerging water crises. Among the country's successes, he noted



János Áder, President of Hungary

Hungary has built over 4,200 kilometers of dykes, as well as water reservoirs to manage floods, and its investments in water quality mean that “rivers leaving our country are cleaner than when they arrive.”

Samdech Hun Sen, Prime Minister of Cambodia, called for joint approaches and an implementation mechanism to promote regional and global cooperation, and improved water security. For governance and financing, he prioritized, *inter alia*: building a global, transparent, and harmonized political architecture to mobilize all stakeholders; enhancing coordination under the 2030 Agenda and the Paris Agreement; and increasing public investments and incentives for innovative business models.

In a video message, UN Secretary-General António Guterres, stressed that scaling up solutions for water challenges is critical to achieve the SDGs, citing that 40% of the world is already affected by water scarcity and more than 90% of disasters are water related. He expressed support for the Summit, noting the UN’s commitment to pursue the human right to water.

Gilbert Hounbo, UN-Water Chair and International Fund for Agricultural Development (IFAD), reflected on the quote “if climate change is a shark, then water is its teeth,” emphasizing that climate and water emergencies pose serious risks to the most vulnerable populations. He called for a transformational shift in how we value water, suggesting that water be promoted as an instrument for peace. He emphasized the need for data to inform decision making and integrated governance approaches.

Jin Liqun, President, Asian Infrastructure Investment Bank (AIIB), called water crucial to economic growth and food security. In Asia, he said, millions suffer from floods, costing the

Asian economy USD360 billion per year. He noted that poverty is linked to water shortage, contributing a “tremendous” loss to labor productivity. He reported that AIIB contributes USD1.4 billion to address water security challenges but a financing gap of hundreds of billions exists. He said AIIB is developing a water strategy to guide the investment sector.

Gajendra Singh Shekhawat, Ministry of Water Resources, River Development and Drinking Water and Sanitation, India, drew attention to the 17 countries facing high risks of water stress, saying this is creating shock waves across the globe. Pointing to increased conflict, migration, threatened food supplies, and vulnerability of water-dependent industries, he described water crises as an unstable and dangerous situation. He reported that water security is at the center of India’s development agenda, underlining efforts to decentralize water governance and a campaign to “make water everyone’s business.”

Session 1: Can Water Crises be Prevented?

Opening the session on Tuesday morning, moderator Bai-Mass Taal, Former Executive Secretary, African Ministers’ Council on Water, stressed that the water crisis “is already here,” steering discussions on how to decrease its impact. Conversations focused on: technology; promotion of water as a tool for peace; education of youth; investment for resilience; tiered pricing systems; and transboundary water governance.

Cecilia Abema Dapaah, Minister of Sanitation and Water Resources, Ghana, stressed that the fundamental action needed is to start with local solutions to “fix the basics.” She outlined Ghana’s efforts to, *inter alia*: introduce tiered water



L-R: Moderator **Bai-Mass Taal**, Former Executive Secretary, African Ministers’ Council on Water; **Raed Abu Al-Saud**, Minister of Water and Irrigation, Jordan; **Norbert Kurilla**, Ministry of Environment, Slovak; **Youssef Filali-Meknassi**, UNESCO; **Li Yong**, UNIDO Director General; **Rodolfo Lacy**, OECD; and **Cecilia Abena Dapaah**, Minister of Sanitation and Water Resources, Ghana

pricing mechanisms and smart meters in water supply systems to reduce losses and enhance water use efficiency, and “build bridges” with highly polluting sectors such as small-scale mining.

Raed Abu Al-Saud, Minister of Water and Irrigation, Jordan, shared the experience of living in a country without surface water, rivers, or lakes, requiring dependence on aquifers for water supply. Despite water supply challenges, he shared successful initiatives to treat wastewater for agriculture. Warning that “a thirsty nation is an aggressive nation,” he reiterated the need to promote water for peace to prevent water crises. He noted the value of educating young populations to influence water behavior towards preservation.

High-level Panel Discussion: Rodolfo Lacy, Organisation for Economic Co-operation and Development (OECD), discussed recommendations to manage risks, control disasters, and recover economies after extreme weather events. He underscored building resilience via, among others: eliminating activities that cause damage to water assets; increasing investment for resilient infrastructures; mainstreaming water challenges throughout all productive sectors; building on existing commitments such as the SDGs and the Paris Agreement; and improving early warning systems.

On financing for water management, Li Yong, Director General, UN Industrial Development Organization (UNIDO), said economic signals are vital in driving reforms by the sector, highlighting how China introduced tiered pricing systems, with safeguards for the poorest users, in its reform process. Dapaah noted that water is a priority area in Ghana’s budget, which, she stated, allocated USD1 billion for water management in 2019.

Youssef Filali-Meknassi, UN Educational, Scientific and Cultural Organization (UNESCO), highlighted the importance of transboundary collaboration on water management, noting nearly half of the world’s population live in communities adjacent to one of the 310 transboundary rivers or lakes, or 592 aquifers. He highlighted UNESCO’s efforts to establish an intergovernmental observatory on transboundary water systems and water

diplomacy to, *inter alia*, contribute to a common understanding of shared water, facilitate information sharing and monitoring and help prevent water-based conflicts.

Norbert Kurilla, Ministry of Environment, Slovakia, underscored putting water at the core of sustainable development for security and prosperity. Reflecting on existing multilateral commitments, he opined that the “governance crisis” is making water crises more complex and challenging to address. He emphasized the need to work together to manage water policies in a different way, sharing national efforts to mobilize actions.

Session 2: Value of Water vs. Costs of a Water Crisis

One Tuesday afternoon, Aaron Salzberg, University of North Carolina, moderated discussions on operationalizing solutions for water. Panelists raised a number of topics, including: reducing water consumption; valuing water at the individual level; accessing water as a human right; improving local water governance; unlocking funding for water investment; building synergies; and multistakeholder initiatives.

Lindiwe Sisulu, Minister of Human Settlements, Water and Sanitation, South Africa, discussed how the country averted a recent drought crisis through such actions as: effective management, communication campaigns, and alignment with the private sector. She underscored the need to arrive at a shared understanding of the inherent cultural, spiritual, economic, and environmental value of water, noting challenges to reconcile these values with budgets to cover the costs of drought.

Ahmat Awad Sakine, Permanent Representative of the African Union to the EU, asked all participants whether each individual has personally valued water. He proposed potential positive impacts of reducing individual water consumption, stressing the responsibility of governments to provide access to clean water as a basic human right.

High-level Panel Discussion: Olcay Ünver, Vice Chair, UN-Water, discussed the four dimensions of water, as: an environmental resource; a service for WASH; a cultural and



L-R: **Lindiwe Sisulu**, Minister of Human Settlements, Water and Sanitation, South Africa; **Ahmat Awad Sakine**, Permanent Representative of the AU to the EU; **Pio Wennubst**, Permanent Representative of Switzerland to the UN Food and Agriculture Organization (FAO), IFAD and the World Food Programme (WFP); **Frank Rijsberman**, Director General, Global Green Growth Institute (GGGI); Moderator **Aaron Salzberg**, Director, Water Institute, University of North Carolina; **Olcay Ünver**, Vice Chair, UN-Water; **Elisabeth van Duin**, Director, Ministry of Infrastructure and Water Management, the Netherlands; and **Rochi Khemka**, 2030 Water Resources Group

spiritual element; and an input to economic sectors. He drew attention to the role that global and regional legal instruments, such as the UN Convention on the Protection and Use of Transboundary Watercourses and International Lakes (the Water Convention) can play in “leveling the playing field.”

Frank Rijsberman, Global Green Growth Institute, discussed the challenge of economically valuing water resources, which is also considered a human right, citing how incentives designed to support poor farmers can result in inefficient water usage. While noting the Dutch saying “never waste a good crisis,” he emphasized that good policy can make countries better prepared to respond to crises.

Elisabeth van Duin, Ministry of Infrastructure and Water Management, the Netherlands, shared how effective water authorities have organized around the concept of collectivity and accountability.

Pio Wennubst, Permanent Representative of Switzerland to the Food and Agriculture Organization of the UN (FAO), IFAD and World Food Programme (UN Rome-based Agencies), suggested looking at needs across different sectors, from energy to tourism, and negotiating plans so that “each stakeholder is also a shareholder.”

Rochi Khemka, 2030 Water Resources Group, noted that valuing water is not only about cost-benefit analysis, emphasizing the importance of arriving at a common understanding of the need to value water in building strong institutions to bring relevant stakeholders to the table.

Panelists highlighted promising multi-stakeholder initiatives, such as the introduction of polluter pays models to address water pollution in Mongolia, and the development of tradeable permits for wastewater reuse in India.

Session 3: Water Crises - What is the Economically Rational Behavior?

Maria Concepcion Donoso, Florida International University, moderated this session on Tuesday afternoon. Discussions focused on how to deal with complexities in policy processes and the financial sector, including: voluntary agreements; economic incentives and models for IWRM; flood forecasting and early warning systems; and risk assessments.

In his keynote address, Martin Frick, UNFCCC Secretariat, discussed the evolution of multilateral decision making, noting the current challenge to create the necessary governance tools that can handle complexity and “radical cooperation.” He shared how the “failure” of the 2009 Copenhagen Climate Change Conference opened the way for the bottom-up, voluntary approach that led to the Paris Agreement, reflecting an overall growing recognition of the critical role of non-state actors, as embodied in the UN Secretary-General’s Climate Action Summit in September 2019.

Jennifer Sara, World Bank, discussed how decisions are made along the “economic water cycle,” from the watershed to final end-use. She stressed that adopting a circular economy approach for water, with supportive policies such as tariffs to signal water scarcity, can help manage demand and ensure fair and equitable allocation among competing uses.



Martin Frick, Senior Director, Policy and Programme Coordination, UNFCCC Secretariat

High-level Panel Discussion: Karine Méasson, European Investment Bank, described the Bank’s commitment to mobilize new funding for sustainability and climate action. She stressed the importance of innovative financial products, such as research and development loans for the private sector.

Ciarán Ó Cuinn, Director, Middle East Desalination Research Centre, highlighted using gap analysis research to inform decision making and create a portfolio of intervention options ranging from desalination to cheaper alternatives. He stressed that tools and pathways for sustainable water management exist, but achieving scale requires increased capacity of states to understand pricing mechanisms.

Joseph Siaw Agyepong, The Josphong Group, shared the view that financing wastewater is considered risky because it requires long-term commitments. He called for innovation and integrated approaches.

Monika Weber-Fahr, Global Water Partnership, discussed work in collaboration with the World Bank and World Health Organization to build economic arguments for drought management. Sara proposed that in order to help attract financing, there could be a shift from discussing risks to discussing benefits.

Simon Zajc, Minister of the Environment and Spatial Planning, Slovenia, shared a flood forecasting system used by four countries, formerly at war with one another, that he said has decreased flood damage by 30%.

Weber-Fahr explored how engagement with affected groups, such as farmers, could stimulate behavior change. Sara concluded that climate resilience requires awareness-raising, noting that there is a need to understand behavior, in order to inform the private and public sectors of successful examples of adaptation and nature-based solutions.

Session 4: Water Stress and Mass Migration - Is There a Way to Prevent Crisis?

This Wednesday morning session was moderated by Ahmet Saatçi, Turkish Water Institute. Panelists discussed water infrastructure for refugees, water risk modeling, the water cycle, and new models for economic development.



L-R: Moderator **Ahmet Mete Saatçi**, President, Turkish Water Institute; **Nizar Zaied**, IsDB; **Wambui Gichuri**, African Development Bank (AfDB); **Charles Iceland**, World Resources Institute (WRI); **Isidro González**, UfM; **Ciarán Ó Cuinn**, Director, Middle East Desalination Research Centre (MEDRC); **Bekir Pakdemirli**, Minister of Agriculture and Forestry, Turkey

Bekir Pakdemirli, Minister of Agriculture and Forestry, Turkey, discussed consequences of hosting an estimated 3.6 million refugees, primarily from Syria, noting Turkey has spent USD40 billion to date, with 5% dedicated to water-related services for refugees. Reflecting on his family's experience with the trauma of migration, Pakdemirli stressed the importance of a humane approach, stating this has enabled Turkey to resettle more than 98% of refugees within local populations, with significant investments dedicated to upgrade water and sanitation infrastructure in host cities and provinces.

Nizar Zaied, Islamic Development Bank, drew attention to global research from 2017 showing an estimated 18.8 million people had migrated for environmentally-induced reasons, noting the clear convergence between migration movements and water scarcity hotspots. He emphasized three key messages for policy: migrants move for a multitude of reasons; the bulk of refugees move to urban areas within their own countries; and mobilized resources can reduce vulnerabilities of populations at risk for environmentally-induced migration.

High-level Panel Discussion: Wambui Gichuri, African Development Bank, highlighted the “livelihood approach” used in allocating grants, reporting USD35 million provided to Sudan to build resilience through financing infrastructure. Underscoring the link between water services and development, she named water as both a contributing and compounding factor for crises. Zaied proposed “integrating actions” to address water challenges with health and education to stimulate increased resource mobilization.

Ciarán Ó Cuinn, Middle East Desalination Research Center, asserted that while banks have an important role to play, the best solution is a “return to a rights and justice based international order.” On the water cycle, Cuinn explained that while

desalination is critical for human life, wastewater reuse is more affordable and efficient. Zaied shared a vision for the future where renewable energy could be deployed for desalination.

Charles Iceland, World Resources Institute, introduced the Aqueduct Water Risk Atlas which uses indicators to understand risks and opportunities such as: chronic water risks; episodic risks; lack of water services; infrastructure problems; and poor utility performance. He described a new model soon to be released, aimed to predict risk, prevent conflict, and stabilize migration, highlighting demographic indicators as most closely intertwined with conflict.

On migrants entering the work force, Isidro González, Union for the Mediterranean, raised the challenge of providing job opportunities for migrant populations. Iceland added that politicians can help shape a positive narrative regarding incoming migrants, welcoming them to the work force for “win-win solutions.”

Session 5: What is Needed for Doubling Investments?

This session took place Wednesday morning, moderated by Xavier Leflaive, OECD, who requested panelists consider how to mobilize more resources, as well as how to use available financing more effectively.

Miguel da Moura, National Agency for Water Sanitation, Cape Verde, discussed institutional and market reforms that have placed the country on track to meet its water-related targets, including securing a minimum per household daily water supply of 40 liters, and ensuring that households do not spend more than 5% of their income on water. He highlighted initiatives to, *inter alia*: create a revolving fund to “spread the gains at very low cost;” incentivize the tracking of non-revenue water to reduce water losses; and explore technical innovations such as desalination.



Pierre Victoria, Véolia

Pierre Victoria, Véolia, discussed business models that address water-related risks for investors. He highlighted: a project in Durban, South Africa, that recycles municipal waste water for use by both private companies and lower-income communities; a Rockefeller Foundation-led partnership supporting US cities to cope with flooding; and new investments for successful rehabilitation of public infrastructure. Victoria concluded that good governance, rather than the lack of finance, is the key challenge in achieving scale, stressing the role of policy to provide a clear vision and clarify roles and responsibilities.

High-level Panel Discussion: Andreas Proksch, Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH, expressed that subsidies are necessary to achieve universal goals on access to water and sanitation, specifying they must reach target populations, be financially sustainable, and focus on sanitation. Miguel da Moura added that subsidies should aim to improve the quality of water services and address the external costs of water. Prithvi Raj Singh, Jal Bhagirathi Foundation, worried that doubling investments in water could lead to increased water resource exploitation.

Singh discussed how to build capacities at the community level to reduce consumption and costs, and build resilience. He stated that India's experience with water subsidies seemed to help wealthy and urban people use more water, rather than minimizing the number of poor people facing inadequate water access. He said the water problem is not about money but rather about cooperation, and stressed the importance of collaboration, decentralized water governance and community driven water management.

Nikolay Kosov, International Investment Bank, identified water finance challenges as a lack of “coordination, collaboration and courage.” Describing a need for specific guidelines to preserve and finance water, he shared a vision for a “new player” apart from banks, and involved in science, to mobilize resources for water safety without the limitations of geopolitical influences.

David Tyler, European Bank for Reconstruction and Development, shared experiences working with other multilateral banks to use blended finance instruments for water projects. He described the Green Cities programme as a successful collaborative approach, engaging various sectors with sustainable infrastructure investments and policy measures.

Ákos Szalai, National Bank of Hungary, discussed efforts to meet priorities of the government to strengthen economic competitiveness, leading to the Bank's analysis of, and recommendations on, Hungary's energy and water infrastructure. He said green bond portfolios can be an effective tool for financing water investments, particularly for central banks.

Pio Wennubst, Permanent Representative of Switzerland to the UN Rome-based Agencies, discussed how to influence the perception of risk and return of investment (ROI). He underlined the significant financial value in investing in collaboration, often overlooked. He outlined innovative efforts of the Blue Peace Financing Initiative on investments, considering water as an entry point for financing. He concluded that motivating different sectors to collaborate on investment plans can yield high ROI as well as establish governance mechanisms that reduce risks of conflict.

In ensuing discussion, speakers opined on, among others, subsidies, specifically: how they can be used to ensure more equitable access and lower the cost of water investments; the role of citizens in pushing governments to deliver on their responsibilities; and the need to support national authorities to create enabling environments for the consistent application of subsidies across different jurisdictions and sectors.

Session 6: Technology to Avoid Water Crises - What is Missing?

On Wednesday afternoon session, moderator Carlo Giupponi, Dean, Venice International University, stimulated discussion on technology, on how to make “what is available implementable,” and how to connect technology with the SDGs. Discussions focused on: tools for water efficiency; translating data to action and technology into practice; integrated systems; and the need for increased interdisciplinary work.

Underlining the paradox between the abundance of global fresh water and the three billion people facing water scarcity annually, Sam Cheptoris, Minister of Water and Environment, Uganda, stressed the need for water efficiency. He highlighted a number of technologies, including: leak detection; pre-paid meters; waterless toilets; rainwater harvest; and purification and recycling. Reiterating that technologies already exist, he called for: increasing promotion of and investment in innovative



L-R: Moderator **Carlo Giupponi**, Dean, Venice International University; Johannes Cullman, WMO; **Sam Cheptoris**, Minister of Water and Environment, Uganda; **Joe Manous**, US Army Corps of Engineers; **István Kenyeres**, Biopolus; **Giovanni De Santi**, Joint Research Centre, European Commission (EC); and **Pierre Victoria**, Véolia

solutions; improving management of water resources; and supporting awareness among water users to improve efficiencies and recycling opportunities.

Johannes Cullman, World Meteorological Organization (WMO), questioned why people are not prepared for the occurrence of droughts, floods, and other water crises. He identified communication gaps as a main source of failure, sharing that 40% of WMO members lack established flood forecasting and warning services. He highlighted the World Water Data Initiative, which provides members' access to early warning and water management information, as one solution for the lack of access to quality hydrological data. On how to enhance resilience to water-related crises, Cullman called for a stop to financing "partial solutions" that do not benefit people. He recognized the need to make the human right to water access more prominent.

High-level Panel Discussion: Joe Manous, United States Army Corps of Engineers, highlighted the broad range of technical solutions that can be harnessed to address water crises, noting, *inter alia*, how to balance fluctuations in hydropower systems through solar technologies, digital monitoring of leaks in water infrastructure, and the use of regulations to promote nature-based solutions, such as aquifer recharge. Framing the challenge as how to translate "the state of the art to state of the practice," he underscored the role of education and awareness raising for different groups of stakeholders.

István Kenyeres, Biopolus, discussed emerging ideas on applying the notion of circularity to build integrated systems that mimic "how the human body delivers air, food, energy and circulates waste" within urban settings. He described the sustainability challenges as finding the equivalent of an "algorithm" to drive a dynamic and intelligent operating system, allowing users to "download" available solutions to manage their water-related problems.

Giovanni De Santi, Joint Research Centre, European Commission, underscored the need for interdisciplinary scientific programmes to develop a range of contextualized technical solutions.

Discussing how to make better use of existing technologies, Pierre Victoria, Véolia, remarked that "SDG 6 (on water) needs SDG 17 (on implementation and partnerships)," and suggested that the challenge for the water community is to be more open minded and learn from other sectors.

Responding to the question of "what next?," panelists highlighted the need to: incorporate circular economy principles into water initiatives; promote a new understanding of territorial approaches to stimulate targeted investments; integrate nature-based solutions with artificial intelligence; and address social and political factors that influence technology uptake.

Session 7: Science Against Water Crises: Do We Know Enough?

János Bogárdi, University of Bonn, moderated Wednesday's afternoon session, for which Hungarian President János Áder was in attendance as a member of the audience. Regarding science in water crises, intense discussion involved the role of science in: developing and communicating relevant knowledge to solve water challenges; assisting decision makers to manage competing interests; and enhancing monitoring of the SDGs.

Charles Vörösmarty, City University of New York, set the stage for understanding scientific gaps in SDG 6 and then outlined "next generation" products that could address those gaps. He compared available science on water and sanitation targets, which has long been a component and goal of civil engineering and public health, to that on the other SDG 6 targets, which is not well developed, and, in addition, requires broader interdisciplinary perspectives to be effective. He described the untapped potential of: real-time Comprehensive Water Assessments (COMPASS); machine learning, such as Google Earth categorization of grey and green infrastructure; geospatial analysis that compare tradeoffs in the water-energy nexus;



Charles Vörösmarty, City University of New York

and interdisciplinary studies with historians, architects, and hydrologists to learn from ancient technologies and rehabilitate infrastructure. On cueing private sector involvement, he stressed: developing clear traceable metrics showing investments will have positive net sustainability benefits; and verification via a block-chain type of tracking of water resources.

Claudia Sadoff, International Water Management Institute, reflected that “science, like art, is never finished,” explaining that while there is enough science to address water crises, there is also a need for more. Stating over 70% of global water is used for agriculture, she listed food and climate as research priorities. She noted the need to improve communication to translate “data to information and science into policy.”

Zhang Zhongyi, Ministry of Water Resources, China, explained that large populations in China stress existing water supplies, compounded by disasters and pollution. He described a number of efforts aimed to improve water governance, such as: prioritizing water conservation by promoting a water-saving society and improving efficiencies across all sectors; improving and balancing the distribution of water resources; and fostering synergies between governments and markets to decrease water use.

High-level Panel Discussion: Moderator Bogárdi invited panelists to ponder whether science is ready to deliver its mandate to develop, package, and communicate relevant knowledge for informed decision making and action.

Taikan Oki, Senior Vice-Rector, United Nations University, and UN Assistant Secretary-General, highlighted how “asking the right questions to ourselves and the UN system,” enabled research that helped explain how progress in China and India contributed to attaining the Millennium Development Goals (MDGs) target for drinking water five years ahead of schedule. He said subsequent analysis has highlighted weaknesses of the MDG approach, informing a more ambitious and aspirational SDG focus on “leaving no one behind.”



Moderator **János Bogárdi**, University of Bonn



Moderator **Ravi Narayanan**, Asia-Pacific Water Forum

Discussing how science can help decision makers manage competing demands, Klement Tockner, Austrian Science Fund, described freshwater ecosystems as a blind spot in the Paris Agreement, stating, for example, this contributed to a view of hydroelectric generation as a “climate neutral” energy solution. He emphasized the importance of enhancing collaboration between ecologists, social scientists and engineers to address such gaps.

Discussing the role of science in a “post-fact world,” Robert Varady, University of Arizona, stated science faces two major existential threats: increased questioning of what constitutes objective truth; as well as the unintended consequences of technological advancements, such as the rise of internet platforms that share misinformation.

Discussing consequences of declining public funding for research, panelists noted the danger of not sufficiently examining the social impacts of new technologies, and raised strengthening partnerships with the private sector and open source alternatives, such as the Open Data Cube for Africa, as potential solutions.

Exploring the role of science in enhancing monitoring of the SDGs, Vörösmarty underscored the importance of developing new interdisciplinary tools to enhance understanding of complex processes and encourage scientific collaboration to develop the fundamental data needed.

Session 8: Implementation - Do We Have the Right Systems in Place?

On Thursday morning Ravi Narayanan, Asia-Pacific Water Forum, moderated this session. Panelists sought to answer the questions “the right implementation systems for what, for whom, and for where?” Discussions involved: joint management with farmers; coordination between downstream and upstream users; balancing service delivery and resource management; ethical arguments for water management; and the need for “soft skills” of communication in governance.

Tebaldo Vinciguerra, Holy See, presented a message from Pope Francis expressing hope that deliberations would be guided by recognition of the human right to water consistent with the inalienable dignity of all people, and that the most marginalized should be the first to benefit from improved water supply systems.

Claudia Pahl-Wostl, University of Osnabrück, highlighted findings from comparative analyses of diverse river basin governance systems, stating the overwhelming evidence shows that the right systems are not yet in place. Drawing on preliminary conclusions from in-depth case studies on IWRM in Germany, Spain, Mongolia, Iran and South Africa, Pahl-Wostl highlighted: avoiding one-size-fits-all solutions and focusing on key guiding principles for good governance; identifying leverage points and change agents; conducting more “transdisciplinary” research; and establishing a global community of practice linked to the SDG implementation process.

High-level Panel Discussion: Mohamed Abdel Aty, Minister of Water Resources and Irrigation, Egypt, shared experience in managing multiple demands for water, noting the construction of the Aswan Dam led to a shift from managing floods to managing water scarcity, requiring a new set of skills and capacities. He said Egypt has one of the highest recycling rates for water resources, and that policy requiring all new development projects to be based on desalination, has triggered a ten-fold increase in desalinated water output in just a few years. On the governance architecture required to manage this transition, he highlighted: joint management with associations of farmers and other users; enhanced coordination with upstream countries; and transparent and independent monitoring mechanisms to build public trust in recycled water quality.

Discussing France’s experience, Jean Launay, National Water Committee and French Water Partnership, explained that the water management system revolves around decentralized, basin-level masterplans that form the basis for allocating funding to water service providers. He further noted the system has evolved from a focus on delivering quality drinking water to a wider focus on ecosystem and biodiversity conservation. On lessons learned, Launay highlighted the need to: ensure tiered systems for revenue collection that can generate resources to address challenges such as pollution and access; develop common databases for information and monitoring; and incorporate environmental safeguards.

Stefano Burchi, International Association for Water Law, stressed that the goal of legal frameworks should be to facilitate, not impede, IWRM. He said one of the key challenges is how to account for, and address the needs of marginalized groups, both in regard to their human right to drinking water and livelihoods. On water withdrawals by agriculture, he emphasized the need to build legislative frameworks to ensure a balance between service delivery and resource management.

Vinciguerra posited that moral purpose may be needed to drive good governance for the two billion people who do not have access to drinking water. He reflected that the presence of water in ancient spiritual and religious texts and culture inspire value in water, which could be useful to help transform, strengthen, and drive management for future action. Pahl-Wostl added that an ethical argument could inspire a new approach to understanding the human-nature relationship.

On the need for “soft skills” of communication in governance systems, Pahl-Wostl framed participation as a craft, considering these skills as crucial in building trust, along with political will, in order to empower and include stakeholders. Eddy Moors, IHE Delft Institute for Water Education, underlined that the complexity of water issues demands both an interdisciplinary and transdisciplinary approach to connect sectors and policy makers to water users. Specifically, he outlined that water scarcity requires clear communication and negotiation among food, health and energy sectors.

Session 9: Transboundary Water Affairs - How to Move From Risks to Opportunities?

Aaron Wolf, Oregon State University, moderated this session on Thursday morning, with a focus on the opportunity for cooperation agreements to stabilize populations, countries and regions.

Drawing attention to the fact that 40% of the global population live in transboundary basins, Kire Ilioski, UN Economic Commission for Europe (UNECE), said the majority



L-R: Moderator **Aaron Wolf**, Oregon State University, US; **Kire Ilioski**, UNECE; **Jamal Al-Adly**, Minister of Water Resources, Iraq; **Zaheed Farooque**, State Minister, Ministry of Water Resources, Bangladesh

of international water courses lack cooperative arrangements, are not in force, or are not implemented properly. He underlined that transboundary cooperation can generate economic, social and political benefits that can stabilize society and prevent conflict and resolve post-conflict situations, emphasizing that it is essential for addressing water crises caused by climate change. He reported that UNECE has contributed to the development of bilateral and multilateral agreements in almost all transboundary waters in pan-Europe.

Jamal Al-Adly, Minister of Water Resources, Iraq, described the importance of transboundary cooperation to water and energy security, migration trends, a secure economy, and international peace. Using the Tigris and Euphrates rivers as examples, he underscored the challenges in water management between up and downstream users, particularly in regions where there is pre-existing weakness in cooperation, and where not all countries are parties to the Water Convention. “Rivers were created before borders,” he said, “so people downstream have the same rights as those upstream.”

High-level Panel Discussion: Zaheed Farooque, State Minister, Ministry of Water Resources, Bangladesh, elaborated on the perspective of a small riparian country surrounded by larger upstream countries. Noting 57 of 400 rivers that cross the country are transboundary, he outlined how the 1996 Ganges Treaty to share surface waters with India is helping the country to cope with the alternating challenges of massive inflows of water and sediment during the monsoon season, and water deficits during the dry season.

Susanne Schmeier, IHE Delft Institute for Water Education, discussed the role of river basin organizations (RBOs) in addressing transboundary challenges. She noted that RBOs can only be effective if they are given the mandate and means to facilitate joint projects that translate into real benefits for members. She highlighted the Mekong River Commission, the Water Convention, and the Senegal River Basin Development Organization as best practices of how to, respectively: address disputes linked to upstream development projects; translate global water norms for specific transboundary contexts; and consolidate collaboration through the joint ownership of infrastructure. Schmeier acknowledged that a common weakness is that many RBOs do not sufficiently involve non-state actors in decision-making processes, citing the Mekong and Danube RBOs as examples of good practice in this regard.

Péter Kovács, International Commission for the Protection of the Danube River, presented the 14-member Danube River Protection Convention as “one of the best cases in the world” for transboundary water cooperation. Discussing the evolution of the 25 year-old treaty, he said it started as bilateral technical cooperation to address joint challenges, such as pollution and flooding, and later expanded into a multilateral agreement guided by an EU-supported strategic action plan. Among emerging challenges, he highlighted extreme droughts and floods due to climate change and water scarcity.

Franz Rojas Ortuste, Development Bank of Latin America, shared how asymmetrical distribution of water resources in Latin America can lead to conflict. Framing that transboundary water issues can present opportunities, he referenced the Bank’s strategic objective to work beyond treaties for successful IWRM. He highlighted the need to enhance hydro-meteorological data.

Saara Bäck, Ministry of the Environment, Finland, challenged experts to consider how to change “data into information, and information into action.” She spoke of developing trust among stakeholders and the needs for data, to inspire successful transboundary cooperation.

On inspiring the next generation of water champions, panelists concurred on the value of early education. Kovács underscored enhanced public participation to engage stakeholders, while Bäck encouraged peer learning. Ilioski noted that training should balance technical water expertise with skills in diplomacy.

Session 10: Is Our Institutional Architecture Capable of Supporting Transformation?

During this Thursday afternoon session, facilitator Maggie White, Stockholm International Water Institute, invited panelists to reflect on what is needed to move from “a paradigm shift to an institutional shift” in IWRM.

In a keynote address, Danilo Türk, Former President of Slovenia, and Chair, Global High-Level Panel on Water and Peace, emphasized the need for urgency. Noting the IWRM model has been in use for more than four decades, he identified political challenges in multilateral governance as a key barrier to achieving transformation. Türk highlighted the upcoming HLPF SDGs review in 2021 and the 2023 midterm review of the UN Water Action Decade 2018-2028 as key moments “to critically think about our global system and how to improve it.”

High-level Panel Discussion: Lesha Witmer, Women for Water Partnership, recalled that SDG 6 was one of four goals identified by the UN General Assembly as lacking a dedicated “institutional home,” meaning there is no, among others, dedicated intergovernmental negotiating mechanism or science-policy interface for water. Witmer urged for a new cooperation mechanism to address the entire cycle of water management, and to deal with critical issues such as how to value water, including virtual water.

Christine Dawson, US State Department, discussed common denominators in building a transformative global water agenda, including: sharing experiences and expertise to drive action on the ground; reaching across sectors and stakeholders; and engaging with young people. Describing 2020 as a “huge year” for terrestrial biodiversity, she stressed that, while challenging, the water sector must be part of the conversation at the World Conservation Congress, and on the Post-2020 Biodiversity Framework and the Strategic Approach to International Chemicals Management, among other processes.

Nchedi Maphokga-Moripe, Department of Water and Sanitation, South Africa, discussed lessons from her country’s recent drought crisis, noting its severity triggered unprecedented



András Szöllösi-Nagy, Chair, BWS 2019 International Programme and Drafting Committee, and **Abdoulaye Sene**, Executive Secretary, 2021 World Water Forum, at the conclusion of the BWS 2019.

institutional collaboration and resource mobilization across the government. She explained that one of the lessons learned is a need for agile intergovernmental institutions to help countries respond to crises, while also guiding preventive measures such as early warning systems, knowledge sharing, and financial support.

Anthony Slatyer, Water Policy Group, lauded the work of the HLPW for mobilizing political leadership in understanding, valuing and managing water. He noted the political difficulty in implementing certain measures, such as: re-allocating water to serve changing values in a context of scarcity; factoring environmental costs in water pricing; derisking water investments; and sharing data in contexts of transboundary conflict. He stressed the role of multilateral processes to provide the “political scaffolding” to support governments to take needed actions.

On working towards an institutional shift, Joshua Newton, Independent Consultant, proposed moving forward incrementally, informed by stakeholders, to ensure what is delivered is what is needed by countries. He suggested *inter alia*: integrating water issues into other existing UN processes on sustainable development; and galvanizing government actions through the UN Water Action Decade and its midterm review in 2023. Dawson said no single approach would work and advised thinking globally and acting locally, saying real transformation is going to occur on the ground.

Closing

Budapest Appeal: On Thursday afternoon, András Szöllösi-Nagy, Chair, BWS 2019 International Programme and Drafting Committee, presented an outcome document, the Budapest

Appeal, explaining it was drawn upon comments received in online consultation and was not a negotiated text. He added that a purpose in its drafting was to bring together the political and technical community to raise the profile of water, with a view to major international events and increasing political will to address water security.

Final Outcome: The BWS 2019 Budapest Appeal is organized in two sections: “What We Need to Do,” and “This is How We Can Do It.”

In the first section, the Budapest Appeal outlines four main areas for action, linked to:

- Recognizing the multi-faceted value of water in the fullest sense;
- Creating a water-secure future for all;
- Ensuring coordination across sectors and institutions; and
- Building on innovative technologies, remote sensing and digital methods.

On implementation, the Appeal lists six recommendations to:

- Develop cooperation at all levels, through such actions as ensuring timely, transparent and accessible data and invoking the approach of “Nothing About Us Without Us”;
- Strengthen the role and capacity of institutions through, *inter alia*, ensuring gender balance and multi-stakeholder involvement, and rethinking the role of UN institutions in relation to water;
- Facilitate knowledge sharing at all levels on the science, management, impacts, and institutional arrangements for agreements on water;

- Build capacities through education, vocational training, and reviving local and indigenous traditional knowledge;
- Encourage a radical reorientation of financing flows, through, among other actions: taking account of, and reducing water-related risks in all investments and programmes; developing economic valuation approaches to deal with trade-offs and the “hidden” water- stranded assets; and targeting subsidies towards those most in need; and
- Frame every development policy with the environment in mind, taking into consideration trade-offs multiple interests, spillover effects, with “life cycle” approaches.

Closing Remarks: Péter Szijjártó, Minister of Foreign Affairs and Trade, Hungary, stated “either all of us win or all of us lose,” in terms of water governance as “water connects us all.” He called for international organizations and governments to allocate financial resources to develop new technologies to address water crises, and highlighted the role of the private sector. Noting that water is extremely important to maintaining peace and security, he added that challenges start out as local, “but impacts become global immediately,” and “neither water nor pollution stops at borders.”

Expressing excitement to host the 9th World Water Forum in Senegal, Abdoulaye Sene, Executive Secretary, 2021 World Water Forum, recognized the strong link between the BWS and the Forum, saying that the Budapest Appeal will contribute greatly to discussions among heads of state in producing resolutions for water security, peace and development.

Szöllösi-Nagy closed the meeting at 4:04 pm.

Upcoming Meetings

6th United Cities and Local Governments (UCLG)

Congress: World Summit of Local and Regional Leaders: The 6th Congress will coincide with the implementation phase of numerous global agendas, including the New Urban Agenda, the 2030 Agenda for Sustainable Development and the Paris Agreement. **dates:** 11-15 November 2019 **location:** Durban, South Africa **www:** <https://www.uclg.org/en/media/events/uclg-world-congress-and-world-council>

International Mayors Forum: This Forum will include a session on ensuring the availability and sustainable management of water and sanitation in cities under current climate change scenarios. **dates:** 12-15 November 2019 **location:** Guayaquil, Ecuador **www:** <https://unosd.un.org/events/2019-3rd-international-mayors-forum>

World Toilet Day 2019: The 2019 theme for this global awareness raising campaign is “Leaving No One Behind.” **date:** 19 November 2019 **location:** worldwide **www:** <http://www.un.org/en/events/toiletday/>

Santiago Climate Change Conference (UNFCCC COP 25): This meeting will feature COP 25, the 15th meeting of the COP serving as the Meeting of the Parties to the Kyoto Protocol (CMP), and the second meeting of the COP serving as the Meeting of the Parties to the Paris Agreement (CMA), as well as meetings of the subsidiary bodies. **dates:** 2-13 December 2019 **location:** Santiago, Chile **www:** <https://unfccc.int/santiago>

32nd UN-Water Meeting: This meeting will gather UN-Water Members and Partners to coordinate the UN’s approach to water and sanitation issues. **dates:** 28-29 January 2020 **location:** Rome, Italy **www:** <http://www.unwater.org>

Second Meeting of the Open-ended Working Group on the Post-2020 Global Biodiversity Framework: This meeting will advance preparations for the development of the post-2020 global biodiversity framework. **dates:** 24-28 February 2020 **location:** Kunming, China **www:** <https://www.cbd.int/conferences/post2020>

World Water Day 2020: The 2020 celebration is coordinated by the UN-Water Expert Group on Water and Climate under the theme “Water and Climate Change.” **dates:** 22 March 2020 **location:** worldwide **www:** <https://www.worldwaterweek.org/event/8398-world-water-day-2020-water-and-climate-change>

Africa Water Security Congress: This Congress is organized by Africa Water Funds, and serves as a pre-meeting to the 2021 World Water Forum. It seeks to advance source water protection in Africa. **dates:** 27-30 April 2020 **location:** Nairobi, Kenya **www:** <http://www.worldwatercouncil.org/en/nairobi-2020-africa-water-security-congress>

Seventeenth World Water Congress: Organized by the International Water Resources Association, this meeting will convene under the theme “Foundations for Global Water Security and Resilience: Knowledge, Technology and Policy” **dates:** 11-15 May 2020 **location:** Daegu, Republic of Korea **www:** <https://www.worldwatercongress.com/index.php>

Ninth World Water Forum: Organized by the World Water Council, the Forums aim to enhance dialogue of the decision-making process on water at the global level, seeking to achieve the rational and sustainable use of this resource. **dates:** March 2021 **location:** Dakar, Senegal **www:** <http://www.worldwatercouncil.org/en/dakar-2021>

Glossary

2030 Agenda	The 2030 Agenda for Sustainable Development
BWS	Budapest Water Summit
HLPF	High-Level Political Forum
HLPW	High-Level Panel on Water
IWRM	Integrated water resource management
SDG	Sustainable Development Goal
UNECE	UN Economic Commission for Europe
UNFCCC	UN Framework Convention on Climate Change
The Water Convention	UN Convention on the Protection and Use of Transboundary Watercourses and International Lakes