



GLOBAL WATER ALLIANCE

Global Water Alliance 16th Annual Conference
Report for Conference Proceedings

Advancing WaSH Goals in a Changing World Through Innovation and Resilience

The challenges of climate change and resource shortages require innovative approaches to advance resiliency and mitigation in WaSH (water, sanitation, and hygiene).

October 19th, 2023

Hosted by Science History Institute

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CONFERENCE OVERVIEW

The Global Water Alliance, in association with the Science History Institute, hosted its 16th Annual Conference, "Advancing WaSH Goals in a Changing World Through Innovation and Resilience" on October 19th, 2023. Over 132 professionals, students, and other stakeholders came together to discuss, brainstorm, learn, and share innovations and solutions that can help address the global water crisis.

SCOPE OF THE ISSUE

The climate crisis is a water crisis- it brings with it more frequent and intense hurricanes, floods, glacial melting and droughts, which in turn are making our water more unpredictable, more scarce, and more polluted. This crisis has changed our water cycle, limited freshwater availability and exacerbated waterborne illnesses throughout the world. At the same time, our water infrastructure is aging and failing, exposing people to chemicals and pathogens, flooding during extreme weather events and water disruptions. The brunt of many of these water-related climate impacts will be felt the hardest by our most vulnerable communities, including minority and lower income communities, women and girls, older people, indigenous communities, and people with disabilities.

[Only 0.5% of water on Earth is usable and available freshwater](#) and climate change is dangerously affecting that supply. Almost 40% of the world's population lack access to safely managed sanitation services and [about two billion people worldwide don't have access to safe drinking water](#). Globally, [80% of wastewater is not treated or reused before it is released into the environment](#), contributing to around 1.8 billion people who are using a source of drinking water that is contaminated. United Nations Sustainable Development Goal (SDG) 6 seeks to ensure access to water and sanitation for all by 2030, but we are currently not on track to reach that goal.

[90% of all climate impacts are felt through water](#), and we are in desperate need of new innovations, technologies and data analytics in water management to address these challenges and build a more resilient future. This includes but is not limited to advances in data aggregation, analysis and forecasting, desalination, wastewater treatment and community-based water sampling and monitoring. The water crisis requires innovative thinking from diverse stakeholders, including our next generations of water leaders.

The UN General Assembly proclaimed the period from 2018 to 2028 as the International Decade for Action, "Water for Sustainable Development" aiming to further improve cooperation, partnership, capacity development and catalyze actions in response to the ambitious UN 2030 Agenda for Sustainable Development. To successfully implement the goals of the Water Action Decade, including SDG 6 and other internationally agreed water-related goals and targets, Global Water Alliance hopes to support the preparatory process. Our 16th Annual Conference also served as a look toward the World Water Forum in Bali in May of 2024, which will have the theme of "Water for Shared Prosperity".

For the full conference agenda, images and more information, please visit us [HERE](#). The following proceedings capture key points made during the full-day event.

CONFERENCE PROCEEDINGS

Session 1: Welcoming Remarks

Speaker: Melissa Stevens, Conference Manager, Global Water Alliance

- Melissa started the conference with a call to order and a land acknowledgement that we were gathered in Lenapehokink, traditional homeland of the Lenape people for tens of thousands of years.

Speaker: Christy Schneider, Senior Manager of Exhibitions, Projects and Programming, Science History Institute

- Science History Institute is an organization that collects, preserves and interprets the history of science.
 - They are interested in the stories behind science that people bring and share with each other.
 - They have an oral history program, a collection of objects and a library and archival collection.
- SHI had two exhibits on display during the conference that an environmental historian brought attendees on tours of during breaks:
 - An exhibit of environmental board games that deal with water and reflect some cultural values on how to solve water problems.
 - BOLD: an exhibit on the history of color, which had an element on the history of water pollution through dyes.
- Christy challenged the audience to think about who is at a gathering, who is not at the table and who we would like to invoke as we gather.
 - She reflected on her time meeting a water activist in Bolivia who was working with biosand filters in her town and was working on issues related to climate change and water.
 - Hearing this activist speak about striking against the privatization of water and her drive to get international support and communicate with other Bolivians is all part of the story behind the science, politics and cultural exchange that really help to get access to human rights like water and sanitation for all.
 - As we gather today, we should think of all those connections and innovations that help propel us toward human health and thriving.

Speaker: Christiaan Morssink, President, Global Water Alliance

- The Science History Institute illustrates science as a series of innovations.
 - Some of these innovations are evolutionary while others are revolutionary.
- Science has also shaped the work of the United Nations and the World Health Organization among many other political and medical institutions.

- Philadelphia is a centerpoint of scientific innovations- we are the first to do water piping and fire hydrants were invented in Philadelphia.
 - These hydrants come with many issues such as not being able to reach high rise buildings, being expensive to repair and difficult to maintain.
 - This requires evaluating new innovations to better fit the situation of the present.
 - These kinds of problems are resulting in new science.
- When you look at water, it has been taken for granted for millennia; we have only started to do work on water management at the global scale since the United Nations started talking in these terms in the 1970s,
 - We have switched from just exploring the transportation element of water to looking at drinking water and the pollution and diseases related to water and understanding it on a global scale.
- This is where organizations such as the Global Water Alliance come in.
 - GWA has developed their work on the basis of the United Nations.
 - United Nations Water was only developed as a group in 2003 and World Water Day was formed in 1993.
- The history of thinking in these terms is pretty short, but we have done a lot since then.
 - It relates also to issues around development aid and development projects and the globalization of trade, etc.
 - In that context, we see activities happening that are related to water but are also in the realm of food.
- The definition of sustainability and the SDGs that we used was created because the Millennium Development Goals were missing a certain element of sustainability.
 - Too many water boreholes go dry after a few years- how do we make them more sustainable?
- Now we face the notion of translating sustainability and adding an extra element to this in terms of resilience.
 - Science takes place in a political environment and science denial is something that many do.
 - The whole idea of science manipulation is also a part of the equation.
- But, resiliency is becoming part of the equation more and more, partly because we did not pay attention to it earlier and partly because we now realize that climate change is going to hit hardest in the field of water management.
 - This will be the focus of Global Water Alliance's 16th Annual Conference.
- Christiaan points out that this is just a conference- we are among thousands of organizations worldwide working on water issues and water management.
 - We are part of a large market that people are operating- this particular gathering fits with a lot of others.

- This conference is a precursor to the World Water Forum in Bali, Indonesia in May of 2024 and is based on the context of deliberations of the World Water Forum.
- This conference will have diverse speakers from different genders, disciplines and countries, including young people ages 15-25, who are the largest group of literate people as an echelon in the world and will face the future of the climate crisis.

Session 2: Shaping community science for wetland restoration and resilience: Lessons from East Kolkata Wetlands

Speaker: Dhruva Das Gupta, Project Director, Society for Creative Opportunities and Participatory Ecosystems (SCOPE)

- Dhruva started off by paying respect to Dhruvajyoti Ghosh, who introduced her to the East Kolkata Wetlands and the community and ecosystems that are involved.
- World Meteorological Organization: State of the Global Water Resources 2022
 - There is quantitative and qualitative data supporting the fact that the disturbance and changing of global hydrological cycles as a result of climate change and human activities will devastate aquatic ecosystems and wetlands in particular.
 - The report highlights the lack of accessible verified hydrological data.
 - There is a need for data, observational data in particular, from Africa, Asia, and India and an urgent need for investments in monitoring and data sharing.
- Ramsar Global Wetland Outlook 2021
 - Paradigm shift is needed from wetlands being viewed as wastelands to being a solution to climate change as a mitigation factor.
 - Wetland actions need to increasingly be included in Nationally Determined Contributions (NDCs), as well as in national adaptation and disaster risk reduction plans.
- Wetlands provide various solutions to climate change such as water storage, a carbon sink, and an ecological hub for biodiversity.
- Wetlands are more than often seen as areas for development and “real-estate-in-waiting” and are at increased risk of destruction for said development.
- Sackett v. EPA case
 - Changed the way that the EPA looks at the distinction of “waters of the United States” (WOTUS) under the Clean Water Act (CWA).
 - This resulted in the scope of the CWA being significantly narrowed and for wetlands to only be federally protected from development if they have a continuous surface connection with a navigable waterway rather than a “significant nexus” like in the past.
 - The results were done without the consideration or consultation of science.
 - This decision had ramifications on wetland governance around the world.
- Environmental jurisprudence is of fundamental importance and is prevalent in India, and the Supreme Court of India has been reluctant to prioritize environmental stability as a matter of key concern, especially if pitted against infrastructure development.

- Reports have not shown the depth of knowledge about how ecosystems and the development of ecosystems affects both the environment and humans alike.
- Approximately 4.86% of the geographic area of India was designated as wetlands via the National Wetland Inventory and Assessment in 2021.
 - Have to have integrated management plans to guarantee wise use and if there are Ramsar Wetlands of International Importance they must have extensive documentation and data.
- State of West Bengal
 - In this area of India, approximately 12% of the state is designated wetlands and contains two Ramsar Wetlands: including the East Kolkata Wetlands.
 - Both of these Ramsar sites have dedicated management authorities but the East Kolkata Wetlands has a federal law solely for its governance.
 - This legal framework is especially important given its peri-urban nature and the pressures of urbanization that it faces.
- Has been found in India that wetlands contribute to lower costs of city living, which is shown in Kolkata near the East Kolkata Wetlands.
- The East Kolkata Wetlands act as a natural wastewater treatment plant through using integrated resource recovery to take up the nutrients absorbed up by the wetlands from the sewage.
 - The wetland also supports various agricultural and aquaculture activities.
- East Kolkata Wetlands management challenges
 - The wetlands do have an integrated management plan, but there is little holistic thought on wetland restoration.
 - The East Kolkata Wetlands Management Authority (EKWMA) does not engage with a broad network of scientists and are more involved in administration and legal issues.
 - They also have insufficient engagement with the community that needs to be empowered and incentivized to conserve.
 - The most significant challenge is the lack of baseline data and of the awareness that this data is necessary
 - Without good data, we cannot do good management work.
- The community needs good data to gain knowledge about the wetlands and their positive impacts along with being connected with the wetland by collecting data from different areas.
- SCOPE connects the community with various scientific institutions to engage them on activities such as sampling for sewage quality, monitoring carbon storage in fish ponds and community-driven data collection on fish health and biodiversity.
- The next needs are for capacity building, government assistance, ecosystem restoration, and assistance from the scientific community for management and restoration of these wetlands.

Session 3: On water literacy and data translation: Synthesizing scientific and local knowledges for community-based solutions

Moderator: Faith Sternlieb, PhD, Associate Director of Engagement, Center for Geospatial Solutions, Lincoln Institute of Land Policy

- It is critical that we speak in terms that are understandable and translatable; Faith posed this challenge for the audience.
- Faith is Associate Director for an initiative called the Internet of Water at the Lincoln Institute of Land Policy.
- Water data fragmentation is the difficulty that we have with looking for the water data we need, when we need it and relates specifically to where it is located geographically on Earth.
- The Center for Geospatial Solutions helps organizations on the frontlines of our most complex land, water, and social challenges leverage data and technology to accelerate impact.
 - They have four focus areas:
 - Environmental data modernization
 - Land and water management
 - Sustainable infrastructure development
 - Data-driven policymaking
- Our water future demands data-driven, real time, and accurate decision-making.
- Our current water data ecosystem is fragmented with producers, users and decision-makers lacking access to the information they need.
 - We all have different methods of collecting, compiling, analyzing, storing and sharing data.
 - Many people spend most of their time “wrangling” data before they even get to the analysis and decision-making stage.
- Internet of Water explores why we have so many data sources and how to bring them together and make them interoperable.
 - We should be able to find water data for an exact geographic location in the same way we can find weather data.
 - We currently cannot go to a particular data point on Earth and understand all of the information about its water, including but not limited to its quality, flow, source and temperature.
 - This requires a new, shared language between water data users.
- Geoconnex is a universal addressing system for our national hydrology landscape, enabling water data discoverability; think of an address for a water point that you can search up and get all of the information about that water.
- Geoconnex works by:
 - Helping water data producers describe data sets with common vocabulary.
 - Establishing persistent identifiers for every water feature across the U.S.
 - Unlocking the ability to organize, link, connect, and access data in one place.

- All of this coding is open to the public.
- To untap the full potential of water data, we need data that is:
 - Spatially indexed: Mapped back to real-world geographic locations
 - Accessible: No technical expertise or prior knowledge about where it is stored required
 - Organized: Structured, topically organized and interlinked
 - Discoverable: Easy to find information amplifies your efforts across the water data ecosystem
 - Usable: Standardized production enables automation through scriptable workflows

Panelist 1: Kim Nelson

- Kim Nelson started off by showing multiple pictures that address the diversity of water issues and the need for data to address them, including:
 - A picture of a major flash flooding incident in Bucks county in which two lives were lost
 - A map of Pennsylvania in the summer where most counties were under drought watch
 - A bridge collapse in Montana caused by snowmelt that increased river flow and erosion of bridge buttresses
- The climate crisis is a water crisis.
 - 90% of all climate change impacts are experienced through water.
- Climate change is significantly changing the water cycle, yet water has lagged behind carbon in attention and investment.
- Good decisions require good data- the need for reliable water data and analytics is urgent.
- There are two data worlds:
 - Too much data- at the federal level alone there are over 30 agencies that have water data.
 - Too little data- there are also large areas of the world with no data at all.
- Frequent challenges to gaining water insights:
 - Data is hidden, scattered, inconsistent, insufficient.
 - Data aggregation and normalization is time consuming and costly; the process would be much easier if we had data standards.
 - Analysis and forecasting are complex, resource intensive and often incompatible and unreliable.
 - Communities are at increasing water risk.
- Water intelligence is a unique combination of state-of-the-art technology, scientific analysis, and artificial intelligence capabilities that continuously:
 - Aggregate, synthesize, and transform expansive amounts of complex water data into easily understandable, increasingly precise analyses and forecasts via scores and visualizations that:

- Produce deep, clear insights that help decision makers better understand water resources and make fully informed decisions about how to manage and optimize those resources.
- Water resilience starts with water intelligence.
- True Elements is a water intelligence company. Water intelligence is about turning data into appropriate insights that you can use for your purpose.
- There are many different applications of water intelligence
 - A Governor or Mayor appointed a Chief Resilience Officer and wants to understand future impacts on infrastructure & operations from climate change.
 - A water utility may have potential source water protection/contamination issues.
 - A customer is under a consent decree from the US EPA for combined sewer overflows and is struggling to meet the decree.
 - Mayor is concerned about the frequency of severe weather and needs to better prepare and deploy emergency services to handle storm impacts.
- Entities across the world have carbon neutral goals, but what about their water positive goals?
- We can only address distressed watersheds around the world with really good data.
- The task force on nature-based financial disclosure recently released guidelines.
 - Now we are really starting to talk about climate change not just from a carbon perspective but really looking at what are the biodiversity issues related to nature-based solutions to solve some of the problems we are talking about, whether it is stormwater, flooding, or drought.
 - We really need to look at nature-based solutions and not just hard infrastructure.

Panelist 2: Jaime Andrés Cárdenas Sánchez, Ph.D. Student in Biology, Wake Forest University

- Jaime introduced the Young Lab at Wake Forest University, which is led by Kyana Young and addresses on water quality, water treatment efficacy and public health.
- He provided a background of the water cycle and how rain events feed water sources and water bodies through runoff.
 - This runoff can become the hotspot for nutrients and microorganisms that are affecting how treatment plants can provide drinkable water to communities.
 - This runoff often has high concentrations of nitrates and orthophosphates, which are dissolved in water and increased in concentration through eutrophication because water is getting warmer.
 - This increases the amount of algal blooms, which can be toxic and cause concerns for humans, animals, and plants.
- Water can be the means that addresses this issue from a number of disciplines.
 - This issue is at the intersection of engineering, science and technology studies and biology.

- There are intertwined disciplines between them all such as human centered design, bioethics and biotechnology.
- Water is right in the middle of it all and is a great example of how we can address these types of issues in a systematic way.
- Definition of sustainability: Meeting the needs of the present without compromising the ability of future generations to meet their own needs.
 - Sustainability has three typical variables: economic, social and environmental.
 - The Young lab works to apply the United Nations Sustainability Goals of 2 (Zero Hunger), 6 (Clean Water and Sanitation) and 13 (Climate Action) into their work.
- Agriculture is a major contributor to the high nutrient levels in our water.
- Sustainability is a “wicked problem”, a complex issue for which there can be no final solution, since any resolution generates further issues.
 - When we address sustainability, we need to think outside the box and not from one discipline alone- we need a systems change.
- We need to shift our thinking from an anthropocentric approach to a biocentric approach that looks at solutions that address human and ecological needs before economic needs.
- Can meltdown nonwoven fabrics be a viable stormwater runoff treatment?
 - Wake Forest University, in collaboration with NC State University, created different pore sizes of meltblown nonwoven fabrics and used them to insulate underground piping to see if they could filter water out of it.
 - They also wanted to see what the public health and microbiome impacts of the treatment’s implementation were.
 - They found significant removals of water contaminants such as total coliforms, nitrate, and orthophosphate.
 - This provides an alternative solution to more common and traditional water treatment technologies.
 - Next steps are to coat those nonwovens to approve their efficiency and make them more modular to address different contaminants depending on the context of where they are trying to treat the water.
 - Not every source of water is going to be the same or have the same requirements- these technologies need to be adaptable to address different community needs.
 - Read the full study [HERE](#).

Panelist 3: Scott Ensign, PhD, Assistant Director, Research Scientist, Stroud Water Research Center

- Stroud Water Research Center advances knowledge and stewardship of freshwater systems through global research, education, and watershed restoration.
- Established in 1967 originally to research freshwater systems but research has been extended to the tropics.

- They have a research station in northwest Costa Rica.
- Research focuses on
 - Biodiversity
 - Pollution
 - Understanding the dynamics of freshwater systems
- Research is done through fieldwork, laboratory analyses and research experiments.
- Stroud began to extend their work to outreach in the 90s and have worked with nearly 10,000 students a year.
 - Also work on outreach, communications and education with adults and many organizations interested in freshwater.
- They also do watershed restoration of impaired rivers, streams and lakes.
- Their philosophy is that you first start in the watershed- you start solving problems in the watershed where they originate.
 - Restoration and stream health solve long term problems in rivers.
- Agriculture is a main source of pollution, so they work with farmers and landowners on agricultural practices such as soil health.
- They also train people to use innovative technology tools, whether they are web-based or physical tools.
- Delaware River Watershed Initiative
 - Collaborative effort to restore, protect, study and monitor the Delaware River watershed.
 - A portion of that is EnviroDIY, a project that involves community-based monitoring of their own streams and rivers.
 - Helps people answer their own questions about problems in their backyard.
 - Stroud helps organize the training and education of groups who are interested in taking part in monitoring water.

Session 4: Managed Aquifer Recharge – Resiliency applications.

Moderator: Vincent W. Uhl, PH, PG, Groundwater Resources Consultant, UHL & Associates, Inc.

- About half of New Jersey drinking water is from groundwater.
- There are many large stress groundwater aquifers in the United States, including in the Central Valley, Ogallala Aquifer, Lower Mississippi River Delta, and southern Arizona.
- Artificial recharge is the practice of increasing the amount of water that enters an aquifer through human-controlled means.
- Groundwater can be artificially recharged by:
 - Redirecting water across the land surface through canals, infiltration basins, or ponds
 - Injecting water directly into the subsurface through injection wells

- Reconnecting floodplains through stream erosion repairs
- Using nature-based solutions such as reforestation, land control through contour bunding, etc.
- Managed aquifer recharge (MAR) has been happening in the United States for decades and the main focus is in the Colorado River Basin and in California.
- Why the need for MAR?
 - Global groundwater depletion and scarcity
 - It is a method for disposal and reuse of treated wastewater
 - It can be used to help conservation of wetlands and stream erosion restoration
 - It can be used for stream corridor and baseflow restoration

Panelist 1: Faith Sternlieb, PhD, Associate Director of Engagement, Center for Geospatial Solutions, Lincoln Institute of Land Policy

- Pivots to talk about a case study on transboundary water management in a desert environment in the Southwest United States and parts of Mexico.
- Discussed the water stress in Arizona, and the Santa Cruz Watershed and River, which is worked on by the Sonoran Institute.
 - The Santa Cruz River is a living river.
 - The river used to be a 'wash', akin to an ephemeral river.
- The Santa Cruz River is a unique case study has its headwaters are in AZ, flows to Mexico, then flows back to AZ.
- In this project, high quality effluent, or treated wastewater, is used to re-water the watershed and restore flow to the river as well as recharge a nearby aquifer.
- Both Nogales, Mexico and Tucson, AZ contribute millions of gallons to the flow of the river.
- Mexico contributes the vast majority of the water, approximately 90%.
- This water is restored enough to where it can support a federally endangered species called the Gila topminnow.
- There is a great importance put on community engagement and input, especially in the West where there Native American tribes are involved.

Panelist 2: Ashish Daw, Senior Hydrogeologist, UHL & Associates, Inc.

- Ashish highlighted structural and nature-based solutions for aquifer recharge.
- There are some regions, like New Jersey, that derive about half their water from groundwater, underscoring the importance of structural and nature-based solutions for aquifer recharge.
- Land-based practices for aquifer recharge can include reforestation, land contouring and contour bunding, and erosion control through stream repair and modification.

- An example is an injection well, which can pump water out and in of aquifers. Injection wells and large recharge basins are more structural solutions, however, these can be very expensive.
 - Other structural examples are recharge ponds, small dams, etc.
- Small dams are another example of structural measures that can be used to recharge shallow aquifers ranging from 1-2 meters deep. Small dams can enhance local groundwater recharge and increase watershed protection, fisheries development, and livestock watering.
- Structural and industrial recharge comes with high costs of implementation and management.
- Burkina Faso project was introduced with regards to natural recharge via surface water reservoirs.
- There is also restoration of stream flow present in projects to reconnect streams to floodplains.

Panelist 3: Casey Clapsaddle, Senior Hydrologist, Princeton Hydro LLC

- Casey spoke on reconnecting the floodplain to improve groundwater recharge.
- One major problem with a channeled stream is called an incised channel. When a stream is connected to the floodplain, the pressure is alleviated and allows the water to spread out. When you channelize the stream, it causes scour and erosion.
- A major driving of stream channel change is land use change (LUC). There is a dramatic decrease in the amount of water that is able to be infiltrated in urban, impervious areas and systems.
- When an impervious surface replaces a pervious one, the volume and flow rate drastically increase whereas the event has a steeper rise and shorter recession. This added stress is under a short time period and systems cannot keep up and handle them.
- An incised channel occurs when a stream channel cuts down into the bed of a valley through degradation and can be caused but stormwater inputs, hydrology changes, or channel straightening.
- Channel incisions caused by various processes, both natural and not, reduce the ability of water to be connected to the watershed or floodplain.
- Casey discussed the problems that can occur with channel incision and floodplain disconnection, such as a highway development in Costa Rica that caused such a significant amount of runoff that the flow became disconnected, disturbing the floodplain.
- A channel incision reduces the amount of water that is available for the alluvium and changes the vegetation of the riparian community.
- There are many measures for restoring the channels, including filling in the channel, building the floodplain, and adding complexity to the floodplain allows for greater erosion reduction and less channel scour.
- Changes in land use can change recharge. For example, natural groundwater has over

50% infiltration, while there is minimal infiltration when you change land cover to 75% impervious surface.

- A video was shown that highlighted the straightening of a channel and rebuilding a floodplain.

Session 5: On the need for “good and reliable” data to do water management well in the circulars of economy, seasons, and water: Case studies from off the grid WASH systems

Speaker: Dr. Clive Lipchin, Director, Center for Transboundary Water Management, Arava Institute

- Discussed opportunities and challenges for how to address water access and sanitation for communities that are not being adequately serviced by water infrastructure.
 - Specifically how to overcome the challenges that these communities face in respect to sanitation and wastewater management.
- Water is not just water- it is the foundation for health, ecosystem functioning, economic development, security, and other services.
- You could not have a circular economy with effectively available and managed water.
- There is a 31% gap in irrigation water needed to feed the projected 2050 population.
 - Most of the world’s water goes to food production and there are already challenges meeting the world’s requirements for food security.
- 2 billion people do not have adequate access to drinking water and 3.6 billion suffer from inadequate sanitation and health services.
- Unsafe sanitation is responsible for 775,000 deaths annually and 5% of deaths in low-income countries.
 - Lack of sanitation increases the risk factor of infectious diseases such as cholera and diarrhea and for malnutrition.
- Globally, over 70% of wastewater is not treated and is going directly or indirectly into the environment.
 - We will not reach SDG 6 by 2030 if we don’t start treating more wastewater.
- 1.3 billion people have limited access to water, sanitation and electricity.
 - Many of these people live in rural and semi-rural communities.
 - Until such communities have access to efficient water, energy and sanitation services, little progress can be made to develop their economies and improve their lives.
- In the Middle East, many communities have off grid WASH (water, sanitation and hygiene) services, including around 70% of the Palestinian population in the West Bank, approximately 30% of the Jordanian population, and about 50% of the Bedouin population in Negev, Israel.
 - One result of this is livestock that are being raised for human consumption grazing and drinking from polluted water sources. This is an area of great concern for human health.
- Public health impacts to untreated sewage

- There is a direct connection between exposure to sewage due to lack of infrastructure and peoples' morbidity.
- Diarrheal diseases constitute the leading cause of hospitalization in Bedouin infants.
- In Bedouin communities, there is often no connection to a sewer network, so people make use of unlined cesspits or untreated sewage is discharged directly near places where people are living.
- The Laguna system is a technology that can treat wastewater and make it safe for reuse for irrigation of crops.
 - It is compact, sludge-free, simple to install, modular and operated by solar panels.
 - It links sanitation and food security and is a circular economy example of what you can do when you find appropriate sanitation solutions for off-grid communities.
 - This project has resulted in increased olive oil yields and an additional \$5,360 a year in revenue for farmers.
- There are still many challenges, including the fact that treated effluent still has residual contaminants and there is growing concern and understanding of contaminants of emergent concern such as pharmaceuticals that are not being removed from wastewater and what the risk is of the uptake of these contaminants into humans.
- We have to be able to effectively monitor the water quality of this effluent.
 - Testing, analysis and data collection is even harder in off-grid communities.
 - Field based water quality sampling is a solution, but it is not always accurate and you need to have trained people to conduct them, which can be expensive and logistically confusing.
 - Another option that is growing in the water technology field is the use of remote monitoring water quality sensors.
 - Downside is that they don't measure everything one needs such as contaminants of emergent concern and these technologies are still very expensive.
 - There are opportunities to see how this technology will change over time and become more accurate and monitor a broader perspective of parameters.
- We cannot neglect the opportunities in wastewater management as part of a circular economy, especially in parts of the world where infrastructure networks and treatment facilities are not accessible.

Session 6: Keynote Address: The power of possibility: Building a clean water movement

Speaker: Marc Yaggi, Chief Executive Officer, Waterkeeper Alliance

- Waterkeeper Alliance is a global nonprofit that unites more than 300 locally-based clean water advocacy organizations.

- They focus citizen action on issues that affect our waterways from pollution to climate change. 320 Waterkeepers are located in 47 countries on 6 continents and together they patrol and protect nearly 3 million square miles of watersheds.
- These are nearly 1,200 people who are drawn from different languages, cultures, religions and legal and political frameworks but they are all united by the firmly held belief that everyone has a right to clean water.
- Waterkeeper Alliance helps to strengthen these local groups and their work to protect their community's right to clean water, amplify their collective voices around the world and work together to fortify, defend and enforce clean water policies.
- Marc brought the audience back to the fundamentals of why water is important and how we need to make personal connections to water so we can be stronger advocates, and how we have to understand the threats to our waterways and embrace change at the local level.
 - Water is our most important natural resource. We drink with it, we bathe with it, without it we can't grow crops, we don't have clothes. No matter what form it comes in, whether it's rain, sleet or snow, water is essential to our atmosphere and the air we breathe.
 - It is also great for recreation, rejuvenation and relaxation. Studies show that being around water makes us happier, healthier, reduces stress and brings us peace.
 - Water a lot more than SDG 6- it is the fabric of our existence and the fundamental underpinning of all of the Sustainable Development Goals.
- To become better advocates for water, we need to tap into our personal connections with it and get others to do the same.
- The roots of Waterkeeper Alliance can be traced back to the 1960s on the Hudson River in New York where a group of blue collar recreational and commercial fishermen banded together to take back a dying river and restore its health for the people of the Hudson Valley.
 - They saw Penn Central Railroad discharging millions of gallons of oil into the river, blackening the beaches and making the fish taste like diesel fuel and saw that industrial polluters were getting rich by making the fishermen poor.
 - They were not scientists or environmental lawyers, but they knew the river better than anyone else and knew something was wrong.
 - They ended up doing some research and found that the polluters were violating a law from the 1800s called the Rivers and Harbors Act that had not been enforced in more than 60 years. They realized they needed to use citizen action, science and law to restore the river.
 - Because of their work, the Hudson River is cleaner than it has been in 50 years. They saw the power of possibility and have inspired others to do the same. If we work together, we can fix the problems that we have caused.
- Threats to water:
 - United States Supreme Court: Sackett v. EPA decision
 - Sided with industrial polluters who were looking to gut more than 50 years of Clean Water Act protections for our waterways.

- Now, half of the wetlands in the U.S. are no longer protected under the Clean Water Act. Only wetlands that are virtually indistinguishable from a navigable waterway will be protected.
 - This decision defies science and legal precedents as well as the public's expectation of clean water.
 - Industrial polluters can now fill in and destroy wetlands with impunity in a lot of places because most states don't have clean water protection regulatory schemes of their own. Only about 10 are reasonably strong and about half the states don't have any laws.
 - Solutions: a federal legislative fix to amend the Clean Water Act and help states craft solid wetland protection laws.
- Perfluoroalkyl and polyfluoroalkyl substances, (PFAS)
 - A class of more than 12,000 manmade chemicals that were put into manufacturing in the 1930s because they repel oil, water and grease.
 - We all have PFAS in our homes- they are in waterproof jackets, nonstick pans, microwave popcorn bags and more.
 - The manufactured use and disposal of these products has now made it that these PFAS chemicals are in our waterways. They are also called forever chemicals because they don't break down in our bodies or environment.
 - They have been increasingly linked to different types of cancers, kidney and liver disease and reproductive and developmental harm.
 - Waterkeeper Alliance had a surface water survey of PFAS in our waterways and worked with 113 Waterkeepers in the U.S. to sample 114 waterways in 34 states and the District of Columbia.
 - 83% of rivers tested positive for at least one type of PFAS.
 - EPA is finalizing primary drinking water regulations for PFAS to get them out of our drinking water. We as ratepayers will have to pay to take this out of water, while there are no limits on the more than 30,000 suspected dischargers who are dumping these contaminants into our waterways.
 - Waterkeeper Alliance is looking to ensure that the drinking water standards are strong but also trying to make sure there are limits on these industrial polluters and making sure infrastructure funding is going to high priority communities that are suffering disproportionately from this contamination
- Existential crisis of climate change
 - Climate change is a water issue. Climate change is altering the chemistry of our oceans, the character of our coastlines and the timing and intensity of rain and snow, wreaking havoc on our planet.
 - Shared examples of Waterkeepers around the world dealing with water issues exacerbated by climate change such as droughts, flooding, sea level rise and ocean acidification.

- How do we inspire people to take action?
 - Change happens at the local level. In places around the world, decisions about land use, transportation and energy are made at the local level, and these changes can ripple out.
 - Highlighted some stories of change happening at the local level such as:
 - The battle against Formosa Plastics and nurdle pollution in San Antonio, Texas, which led to Clean Water Act enforcement action against Formosa. It also resulted in the largest CWA settlement in history, which required the polluter to pay \$50 million for environmentally beneficial projects in the affected communities and a zero discharge policy.
 - Susquehanna River and Chesapeake Bay Waterkeepers along with the Center for Biological Diversity brought a lawsuit against the Fish and Wildlife Service for their 2019 denial of endangered species protection for the Eastern Hellbender Salamander. This species is an important indicator organism for water quality because it needs cold, highly oxygenated water to survive and is threatened by dams, water diversions, oil and gas extraction and development. This created a required habitat protection plan that will protect those areas from development and pollution.
 - In 2005, a football club in Hann, Senegal wanted to restore the grandeur of Hann Bay and sought the assistance of the Waterkeeper Alliance. The community had no sanitation services and a history of pollution of untreated food and household waste, petrochemicals, and untreated waste from a meat rendering plant that destroyed a bay once used for fishing that was a livelihood for many. They were able to get a small grant to turn their office into an internet cafe, which made their office a hub of the community and an education center, gave them a voice to the outside world to share what was happening in their community and gave them a source of revenue. Eight years later, Hann Baykeepers convinced the Senegalese government and three European development institutions to commit \$68 billion to clean up Hann Bay. It is now a \$130 million cleanup project that involves 17 other villages and towns. There are now sanitation services in the community, and they are expanding and upgrading their sewage treatment plants. It is now going to be the largest clean water project in the history of Senegal and will positively impact more than half a million Senegalese citizens, all because a small football club saw the power of possibility.
 - All of these groups still need help through science, data and innovation such as faster and cheaper field testing tools and new data platforms.
 - More than half of the waterways in the United States are not monitored or assessed by the government, so citizens need to jump in and they need tools to do it.

- We are at an inflection point in history right now with the climate and water crisis. It requires all of us to be engaged to be change agents to bend that arc and create a world where clean water is a given and a reality for everyone.
 - We need to make sure that we are not leaving future generations with dead rivers, dying oceans and sterile fields. We owe it to current and future generations to leave a better world than what we inherited.
 - Marc left the audience with the goal of tapping into their own personal connections with water and influencing the people around them to do it as well.
 - Also shared the importance of voting and for voting for politicians who are not puppets for polluters as well as getting friends and community members to vote.

Session 7: Voices of Youth: The next generation of WaSH innovators and global sustainability leaders

Moderator: Angelia Fasnacht, PhD, MPH, PE, Visiting Fellow at Princeton University, Emeritus Board Member and Past President Global Water Alliance

- Attracting a new generation of workers in the water industry is critical, but water isn't an industry we often hear youth think about for future careers.
- The conference was convened on "Imagine a Day Without Water", and for many people this day is not just something in the future, but it is their current reality.
- We are privileged with our access to education and have opportunities to bring that education, tech, innovation, professionalism, and time into the water sector.

Panelist 1: Julia Stengel, PHBB Project Leader, Public Health Beyond Borders at Temple University

- Julia co-leads a club called Public Health Beyond Borders at Temple University, which engages students in health projects across global communities.
- With the support of the Global Water Alliance, the Philadelphia chapter of Rotary International, Julia's Public Health Beyond Borders team went to Enriquillo, Dominican Republic to install a water pump and provide water access to the neighborhood of Penalba.
- The Temple students led handwashing education programs for 70 students, which included hanging up CDC materials in Haitian Creole and Spanish about handwashing.
- The Temple students strived for entire community engagement, developing relationships with community members outside of the school too.
- Julia and her team led water testing efforts, testing for bacteria, water hardness, chlorine, calcium, pH levels, and carbonate. E.coli was present in the water.
- The team met with 20 different groups in the neighborhood to share the results.
- The team also created rural first aid kits with basic first aid supplies, ointments, and insect bite relief for communities.

- They're expanding their work to look at other aspects of health like bullying, gender equity, mental health, sex education, hygiene and friendship.
- In their survey development work, Julia emphasized that the Public Health Beyond Borders teams focus on asking the communities what they need and build projects based on those needs without forcing them to do specific projects the club wants to do.

Panelist 2: Arielle Headen, Jaida Jordan, Maryam Rahman, JaNiece Watters and Musa Wilson
Imhotep Institute Charter High School STEM Ambassador Program

- Imhotep Institute Charter High School's STEM Ambassador Program promotes mission-driven research initiatives guided by their code of ethics, including tackling social justice issues for black and brown communities and solving and eradicating generational challenges.
- Students at Imhotep are taking STEM activities like coding and using 3D printers to address real world issues.
- Students printed 3D water filters and brought them to Jackson, Mississippi to help residents going through a water contaminant crisis. They left 3D printers there to make sure the project was sustainable and communities could work on solutions on their own.
- In Ghana, students are helping communities that rely on dirty duck ponds for water. They brought 3D printed water filters to clean the water, but they emphasized their efforts weren't just about quick solutions but lifelong changes. They partnered with local schools and brought 3D printers so local students could continue to innovate and sustain the project after the Imhotep students left. The students and teachers also stay connected as e-pals, using apps like WhatsApp to check in on the water filtration systems and share new ideas.
- Students emphasized why water quality is important to the African American community and that everyone should have access to clean water no matter where they live and what the color of their skin is.
- The students highlighted the importance of black students going into the community in Ghana and how much the community appreciated having people that looked like them supporting them. They also shared that it was a different perspective of Africa than they'd seen on TV and there was lots of joy despite not having "much".
- Imhotep's STEM program emphasizes the importance of coming up with solutions with facts and science to address global injustice, while exploring ways to pass that information and help communities that don't have a voice.
- The program itself is designed with sustainability at its core. Students in grades 9-12 can participate in the program so it can continue on after students graduate. The program also has a strong connection to alumni.
- The students were preparing to visit Sapelo Island off the coast of Georgia to use STEM to address concerns around lack of sanitation, coastal flooding, water contamination and air quality issues.

Session 8: "To make the Delaware a more mighty river:" A virtual (and historic) field trip.

Speaker: Jesse Smith, PhD, Director of Curatorial Affairs, Science History Institute

- Jesse Smith took participants on a tour of the Delaware River, guided by the discovery of photographs, advertising materials, posters, and informational films from the mid 1950's located in a storage closet in the Delaware River Basin Commission.
- Materials such as these can provide a unique insight into the planning and management perspectives of local stakeholders, governments, and residents.
- Jesse introduced materials produced by the Interstate Commission on the Delaware River Basin (INCDEL) using the advertising slogan that "Nowhere is there a finer place to work, live, and play, than Delaware Valley, USA."
 - The INCDOEL program had several major objectives, including stream pollution abatement, soil erosion prevention, forest conservation, water supply development, and drought and flood control.
- He emphasized the importance of retaining historic documents such as these to reflect on the choices we make as we make contemporary choices on the environment to better reflect on "our own positionality and understand the choices that we make and what is important to us."
- The history of science is important for knowing how science has been used, abused, ignored and intersects with our lives.

Session 9: Breakout Sessions

Breaking Barriers: Gender and Equity Perspectives on Sanitation and Hygiene Innovations.

Lead: Amisha Shahra, Independent Consultant, The Water Center at Penn and The World Bank

- Women and girls bear the brunt of the water and sanitation crisis.
- Women and girls not only face WASH-related infectious diseases, like diarrhea and acute respiratory infections, they face additional health risks because they are vulnerable to harassment, violence, and injury when they have to go outside the home to haul water or just to use the toilet.
- Achieving the Sustainable Development Goal target for universal access to safely managed drinking water, sanitation, and basic hygiene services by 2030 will require a six-fold increase in current rates of progress for safely managed drinking water, a five-fold increase for safely managed sanitation, and a three-fold increase for basic hygiene services.
- Further efforts are needed to ensure that progress on WASH contributes towards gender equality, including integrated gender considerations in WASH programmes and policies and disaggregated data collection and analysis, to inform targeted interventions that address the specific needs of women and girls and other vulnerable groups.
- Gender transformative WASH includes:

- A level of personal transformation and evaluating the unconscious decisions and biases around gender and other issues
- Visualizing what success looks like and how it can be measured
- Researching key gender issues that intersect with WASH in your area, such as
 - Health and nutrition (especially in relation to maternal and child health outcomes)
 - Sexual and gender-based violence
 - Unpaid/care work burden
 - Girl's education
 - Menstrual hygiene management
 - Women's economic opportunities
- Men and boys serving as allies and champions of change
- Facilitating processes and partnerships that lead to stronger women's participation and engagement
- Rights-based theory of change
- Work with 'gatekeepers' of social norms and decision makers such as local government leaders and traditional leaders
- Knowing the challenges and potential unplanned consequences
- Grappling with tensions and acknowledging that WASH programmes alone cannot solve existing social inequalities and structural problems, but that they can be implemented in a way that supports significant change in gender relations and norms.
- Some anecdotes from the group were shared, including:
 - Women in a village in Nigeria had to walk long distances to get their family's water needs. Water pumps were installed by an outside organization, which cut the time needed for this chore drastically. It seems like a great initiative on face value, but the women were actually upset because it was the only time they were able to leave the house and socialize with their friends, so they enjoyed the long walk.
 - Others noted hearing about similar stories in other countries
- Open defecation campaigns - There were several discussions of these in places like India and villages across the African continent. While the campaigns come from a public health and sanitation standpoint, they do not always properly address the social components.
 - Examples again where going out into a field to defecate was one of the few times women in certain cultures are able to leave their house and husbands.
 - One example included enforcement campaigns that encouraged residents in the village to catch other people breaking the rules. The person who openly defecated would be fined and the person that caught them would receive a portion of the fine.
- Also examples of measuring success - programs where they built a bunch of toilets and just sort of checked off a box, okay this area now no longer defecates, but actually in follow up, they'd see the toilets were untouched.
- Access to period products

- Project Baala in India
- Discussion about the “pink tax”, where female hygiene products (like period care) have additional fees associated. Several countries have removed this including the UK and India.

“It ain’t all about technology and data” – Social, cultural, and economic considerations in achieving SDG #6.

Lead: Christiaan Morssink, MPH, PhD, President, Global Water Alliance

- Christiaan started the conversation with a discussion of a comprehensive model on growth and stunting, which would be used to predict health outcomes for certain populations.
 - If a child is subject to between five to six episodes of diarrhea (induced by disease), they are more likely to see stunted growth and increased health impacts.
 - A global stunted growth model was produced with inputs from 40 different countries, survey participants ranging from 24 to 48 years old, and the growth rates of 28,000 children over 5 years.
 - This established a comprehensive baseline against which modifications in diet, cultural considerations, and other variables could be manipulated. It identified that in the Dominican Republic, 35% of children suffer from stunting.
 - While the data provided insight into the trend overall, it was not until discussing with mothers in the Dominican Republic that researchers learned that mothers would stop breastfeeding after a few weeks, rather than the full year recommended by international health guidance.
 - Instead of breastfeeding, parents would turn to water, which was more likely to be contaminated with pollutants, inducing bouts of diarrhea (and therefore stunting).
 - This narrative highlights the importance of connecting high quality data with culturally rooted decisions.
- Another example discussed was the Flint, Michigan water crisis, where decisions by system administrators to switch from Lake Michigan to the Flint River as a water source, without applying an anti-corrosive element, lead to massive leaching of lead into the system.
 - The water administrator’s decisions to solely focus on one data point– cost of switching the system – at the expense of other data points such as water quality and community trust.

Water sector innovation and resilience in developing countries.

Lead: Yinusa Saheed Olanrewaju, Curriculum Development Consultant, Global Water Alliance

- Water insecurity is the growing absence of water, specifically freshwater.
- Population growth, urbanization and climate change are exacerbating water insecurity.
- Land use is changing wetlands and causing encroachment into industrial areas.
- In a linear water economy, water is extracted, treated, used once, treated and discharged elsewhere.
- Challenges of the Linear Water Sector Economy
 - Water infrastructure design: optimization, water loss and aging infrastructure

- Policy framework: tariff setting, cost-recovery, energy generation
- Regulations: water quality monitoring
- Capacity Development: ICT, Citizen observatory
- There is an imbalance between people who think water is a human right and others think we should pay for it to ensure optimization.
- Water sector shocks and stresses
 - Changing water demand
 - Changing land use
 - Changing demography such as informal settlements
 - Extreme water events
 - COVID-19 pandemic: showed we cannot sustain our current water economy and provide water to consumers
- Resilience should be integrated into any water economy strategy (circular or non-circular) to prepare cities for climatic and non-climatic shocks and stressors to avoid the undesired impacts of a disruption or failure of water services.
- The circular water economy offers an opportunity to recognize and capture the full value of water (as a service, an input to processes, a source of energy and a carrier of nutrients and other materials).
- Water in Circular Economy and Resilience (WICER) Framework
 - Three main outcomes: 1) deliver resilient and inclusive services; 2) design out waste and pollution; and 3) preserve and regenerate natural systems.
 - Included diversification of water sources between desalination, recycled wastewater, reservoirs and groundwater.
- Yinusa highlighted a case study in Chennai, India in which the WICER Framework was implemented to implement desalination and design wastewater treatment plants to help the economy. The project was financed by Public Private Partnership led by the World Bank.
 - Background: Chennai experienced a 50% increase in population from 2001-2020 and faced other challenges such as lack of water supply, many informal settlements and water variability issues due to failing monsoons.
 - Legal frameworks and policy were important in implementing this- the National Urban Sanitation Policy of 2008 recommended the re-use of about 20% of every treated wastewater in every city in India.
 - They treated wastewater through secondary and tertiary treatment and were able to save money by reusing wastewater for industry and were able to restore water levels in their lake.
 - They also used biogas to generate electricity in their wastewater treatment plants with a comparative gain of 600 million rupees compared to the cost of using electricity from the city grid.
 - They were able to solve 90% of their water needs, with 70% put to industry and 20% to domestic water needs.

Virtual Breakout Session: Unleashing the collective agency of educational institutions in achieving SDGs through service learning, exchange programs and study abroad opportunities.

Lead: Godlove Fonjweng, PhD, Executive Director of International Programs, Prairie View A&M University

- Godlove shared his thoughts and experiences working with students on WASH projects.
 - He discussed Global Water Alliance's WASH Project in Cameroon, which was in partnership with University of Pennsylvania's Public Health program.
 - It was designed to help the people with their water problems such as not enough water and pipes bursting because of too much pressure.
 - The project focused on a needs assessment and community meetings to train locals and make sure the community could sustain the project.
 - GWA recruited 12 students across different departments at the University of Pennsylvania.
 - Another project was an interdisciplinary WASH project in Uganda with Wilkes University Pharmacy and Anthropology Programs.
 - They partnered with an organization on the ground that drilled wells and explored 3 main facets:
 - They had pharmacists conducting interviews with the community to explore how water was impacting health, anthropologists exploring the socioeconomic impact of women not having to spend as much time fetching water and geologists explaining groundwater, water tables and more. Students were able to explore WASH from all angles.
 - He discussed a study abroad program at Hartwick College that involved service learning in Masindi, Uganda
 - Students partnered with a water drilling company and raised funding to drill a new well after the community's previous well had dried up.
 - Students were not able to see the completion through but they were able to help fetch water for the drilling process and sit in on a community health lecture.
 - Finally, he shared a Prairie View A&M University Natural Resources and Environmental Conservation project in the Galapagos Islands during the summer of 2023
 - It was an interdisciplinary project with the Department of Natural Resources and Environmental Sustainability that involved soil testing to measure salinity and pH and education on agricultural practices, impact of El Niño on crops and the geology of the islands.
 - The next time they go, an ecologist will join to teach the students about the diversity issues the islands are facing. They also want to bring in a political scientist to explain the impacts of environmental policy in Ecuador on the islands.

- He ended by emphasizing the importance of leveraging the international missions of institutions of higher education to advance WASH goals and empower students to do WASH projects abroad.
 - Groups to target include international programs, student engagement offices, faculty research, student clubs with student government support and academic programs of varying disciplines such as health, education, sociology, agriculture, political science and more.

Session 10: “Bringing the message to Bali”: Invitational Address by Loïc Fauchon, President of the World Water Council

- Our planet is thirsty and hungry. It knows poverty, war, disease and endurance when education is lacking. All of this gives rise to blind and cruel obscurities.
- The world lives in fear of tomorrow, showing especially in our youth. The state of the Earth, and especially water, is fragile.
- We are working on credit, spending more than we earn
 - The same is true for how we use resources and especially water; we consume more water than is naturally available.
- We have to look at our strengths and capacity to innovate and our willingness to act.
- We have ignored water, but it is everywhere and always; water surrounds us and brings us together, it is a friend of mankind.
- Water is the future for us and the next generations if we know how to protect it from the dangers that threaten it.
 - Dangers come in the form of demography and climate change.
 - Tensions have been exacerbated by uncontrolled globalization coupled with the rise of living standards which require additional volumes of freshwater every year.
 - The overreaching of the climate and demographics are jeopardizing our ability to secure water resources.
- What can we do about this situation and what have we truly started to do?
 - We need to have more water resources at our disposal through a combination of reserves.
 - We need to call on underground reserves, making the invisible visible.
 - We need to transfer water over greater distances.
 - Increase our ability to desalinate seawater and brackish water.
 - More widespread reuse of wastewater.
 - Use aquatic reserves as protectors of biodiversity and Earth’s ecosystems.
- Protecting, conserving, treating and using will only be sufficient if each and every one of us can change our relationship with water.
 - Requires a collective effort based on solidarity and sustainable sobriety.

- A new economy of water resources lies ahead, making better use of digital developments and artificial intelligence.
- We are going to have to drastically reduce a large proportion of food losses and waste, which accounts for almost 1/3 of global food production.
- All of this requires courage and political will of which politicians at all levels must be made aware.
- The next World Water Forum will be held in Bali in May 2024.
 - Take part in its preparation, bring your expertise and share your solutions.
 - Water is a factor of peace, development, and prosperity for humans and nature.

CLOSING REMARKS

Debbie Heuckeroth, PE, ENV SP, President-Elect, Global Water Alliance

- Global Water Alliance will be attending the World Water Forum in Bali in May of 2024 and will be bringing a University of Pennsylvania Masters of Environmental Studies class.
- The World Water Forum inspired the formation of Global Water Alliance in 2006- the WWF is in GWA's DNA.
- GWA brings together people from all different sectors and levels.
- Good water management can help us achieve prosperity together, and for all- this is the theme of next year's World Water Forum.
- There are six sub-themes of the WWF, including:
 - Water for humans and nature
 - Water security
 - Disaster risk reduction and management
 - Governance, cooperation and hydro diplomacy
 - Water innovative finance
 - Knowledge and innovation
- The WWF will have a political process that provides the opportunity for discussion amongst and with elected officials at all levels (head of government, ministerial, parliamentarian, river basin authorities).
 - It is all about breaking down silos at all levels.
- There will also be a regional process that provides perspectives on water from all regions of the world, a youth process of people aged 18-35 and a fair and expo.
- Next steps
 - Consider your own role in advancing WaSH equity and resiliency (in and for community and nature).
 - Community engagement- does your community understand water issues? How can you make a difference in your own community and share those learnings across different opinions, interests, and disciplines?
 - If you have WaSH infrastructure, is it in harmony with nature?

- Preserving the natural environment is a preferable way to have clean water compared to treating it.
- Finally, join the Global Water Alliance!
 - Use your voice on World Toilet Day (November 19th)
 - Unsafe water and sanitary conditions lead to tons of deaths to children daily.
 - There are not enough toilets yet to be at a level for celebration, but we can still spread awareness about these issues.
 - Attend GWA's Annual Membership Meeting on November 30th at noon over Zoom.
- Debbie thanked conference co-host Science History Institute and sponsors: Bill & Melinda Gates Foundation, Kenvue, Pennoni, Aqua, True Element, North Philadelphia Madrugadores Rotary Club and the United Nations Association of Greater Philadelphia as well as all of the attendees

STUDENT POSTERS

The conference included presentations of student posters on WASH research, as seen below:

Charley Orner, University of Pennsylvania

The Water-Migration Nexus in Guatemala: Policy Recommendations and Sustainable Water Management and Climate Resilient Solutions to Quell Mass Migration to the US-Mexico Border

Katherine Michelle Villalta, Prairie View A&M University

Application of COMET-Farm to Estimate On-farm Carbon and Greenhouse Gas Emissions across Texas

Diana Tiburcio, Temple University Engineers Without Borders

Lessons Learned During the Nueva Jerusalén, Ecuador Assessment Trip

Anil Kumar, Dornsife School of Public Health, Drexel University

Accessibility to Water Sources and the Prevalence of Childhood Diarrhea: A Cross-Sectional Study in Karatu, Tanzania

Dingyu Xuan, University of Pennsylvania

Multi-source Flood Modeling of the Schuylkill River in Philadelphia

Demamu Tagele Haligamo, Arba Minch University, Ethiopia

A Comparison of Crushed Seeds of Moringa Stenopetala and Cadaba Farinosa for Turbid River Water Purification: An Alternative Sustainable Strategy for Low-Income Countries

Aurora Mills, Temple University

Applying Knowledge; Building Global Connections

Ivy Steinberg-McElroy, University of Pennsylvania

Developing a Guide for Water Literacy at the Household Level



For more information on the Global Water Alliance please visit our [website](#). Don't forget to follow us on [Twitter](#), [Facebook](#), [Instagram](#), and [LinkedIn](#)!