

Mutual learning, mutual inspiration, and consensus building



HLP4 Highlights Ecosystem Protection and Restoration as Key to Sustainable Water Resource Utilization

The High-Level Panel 4 convened to discuss a pressing global issue: "Ecosystem Protection and Restoration". The meeting, co-chaired by Eric Tardieu, Permanent Technical Secretary of the International Network of Basin Organizations (INBO) and Secretary General of the International Water Resources Association, along with Xia Jun, an academician of the Chinese Academy of Sciences.



Water Challenges in a Changing World

The backdrop for this critical discussion is the rapid evolution of climate change and socioeconomic development, which has led to a noticeable imbalance in the distribution of water resources across time and space. The surge in water demand adds to the complexity of water ecological security. Managing water resources effectively, therefore, requires a dual approach: robust management methods and robust scientific support.

In his keynote speech titled "Strictly Manage Water Resources and Restore the Ecological Environment of Rivers and Lakes," **Derui Yang** highlighted China's decade-long progress in ensuring water supply security and maintaining a healthy ecological environment in its river and lake systems. Looking ahead, Yang stressed the importance of an overarching strategy encompassing disaster prevention, water resource conservation, ecological protection and restoration, and water environment management. Achieving high-quality development, common prosperity, and harmony between humanity and nature hinges on enhancing water supply quality, reliability, and ecological sustainability.

Ecosystem Integrity and Water Security

Andrea Erikson, in her keynote speech, "Creating a Virtuous Cycle in Ecosystem Investment: Common Challenges and Practical Solutions," emphasized the intricate connection between ecological integrity and water security. A healthy ecosystem is a cornerstone of a well-functioning water cycle system. Unfortunately, human economic and social development, coupled with climate change, has led to the depletion of freshwater wildlife and the deterioration of freshwater ecosystems. Erikson advocated for the protection and management of ecological assets like agriculture, forests, grasslands, wetlands, rivers, and urban green infrastructure, along with innovative rainwater management, as natural solutions to restore ecological balance.

Engineering Innovation for Coastal Ecosystems

Joseph Hun Wei Lee shared insights into protecting coastal ecosystem services through engineering innovation. He highlighted the pivotal role of coastal water quality in fisheries, food security, public health, and various competitive uses. Lee showcased examples of scientific management in marine fish farming, AI-based harmful algal blooms warning systems, the Hong Kong Kowloon Island Artificial Island Plan, and the "WATERMAN" beach water quality daily prediction system.



In addition, other distinguished participants, including Benedict Braga, honorary president of the World Water Council, Lv Yonglong, chair professor of Xiamen University and distinguished researcher of the Chinese Academy of Sciences, Safar Parvez, chief representative of the Asian Development Bank's representative office in China, and Wang Dianchang, director of Changjiang Ecological Environmental Engineering Research Center of China Three Gorges Corporation and chairman of Changjiang Ecological Environmental Protection Group, engaged in discussions with the keynote speakers.



Yonglong Lv addressed issues such as uneven spatial water use distribution, agricultural irrigation pollution, and the flow of nuclear wastewater in terrestrial and marine ecosystems. He also presented practical cases of land-sea interaction and integrated ecosystem management.

Dianchang Wang elaborated on the enterprise experience in protecting, restoring, and sustainably managing water resources in the Yangtze River Basin. His approach involved increasing engineering investment and technological innovation, promoting market-oriented water management aligned with government policies through the concept of "urban smart water management," and vigorously advocating natural-based solutions for the protection and restoration of the Yangtze River ecosystem.



A Picture of Future Global Water Management: Regular Sessions, Special Sessions, and Side Events.

On September 14th, 12 regular sessions, 17 special sessions and 1 side event were held to present research on issues related to water security challenges in key regions, water security assessment and risk management, monitoring and early warning of water-related disasters, groundwater and ecosystem, water quality improvement, utilization of multi-functional water projects, and integrated river basin management, as well as innovative technology and tools for water resources.

Theme 1: The Interplay of Water Resources-Population-Economy-Ecology in a Changing Environment

Dr. Dinesh Kumar Manhachery, from the Institute for Resource Analysis and Policy, presented his research titled “Assessing Global Water and Food Security Challenges: Rethinking on Methods” that analyzed the food security and water management challenges in various countries, proposing that the criteria for assessing the water management and food security challenges of a country have to factor in “cultivated land”.

The special session on “Water Security and Cities” was chaired by IWRA.

The “Water Security and Sustainable Development: UNESCO IHP IX” side event was hosted by the China IHP National Committee.



▲ Dr. Dinesh Kumar MANHACHERY



▲ special session on “Water Security and Cities”



▲ “Water Security and Sustainable Development: UNESCO IHP IX” side event

Theme 2: Enhancing Water Use Efficiency and Promoting Public Water Services

Hohai University hosted a special session titled “Advanced Technology on Un-conventional Water Allocation and Utilization.” The session discussed achievements in the planning of un-conventional water resource allocation and utilization, advanced technologies for water recycling and seawater desalination, industrial wastewater reuse, and zero-emission.

special session on “Advanced Technology on Un-conventional Water Allocation and Utilization” ▶



Theme 3: Building a Resilient Disaster Prevention and Mitigation System

Dr. Wu Yanfeng from the Northeast Institute of Geography and Agroecology at the Chinese Academy of Sciences delivered a presentation on “Wetland mitigation functions on hydrological droughts: From drought characteristics to propagation of meteorological droughts to hydrological droughts.” He highlighted the drought-mitigation roles of wetlands and provided valuable insights for assisting basin management on drought risks in the context of climate change.

Dr. Wu Yanfeng ▶



Mr. Pablo Andrés Pineda Capacho, from Universidad de Guanajuato (the University of Guanajuato) in Mexico, presented “Assessing the Potential Impact of Climate Change on the Hydrodynamics of the Valle de León Aquifer (the Leon Valley Aquifer) in Mexico Using a Combination of Modeling Tools.” The simulation results show that climate change projections in the Valle de León aquifer will have a significant impact on groundwater levels and system hydrodynamics. Overall, the results indicate the need for adaptation of sustainable management measures for the aquifer to address the impacts of climate change and ensure its long-term use.

The Nanjing Hydraulic Research Institute organized a special session on “Improving Resilience of water Infrastructure projects for extreme events.” The session delved into achievements such as improving dam safety management in Finland, matrix management for operation of reservoir dams, and dam safety and risk management in Taiwan, China.



▲ Mr. Pablo Andrés Pineda Capacho



▲ special session on "Improving Resilience of water Infrastructure projects for extreme events."

Theme 4: Supporting Aquatic Ecosystem Health and Functions

Mr. Zhou Jiahong from the Zhejiang Hydraulic and Estuary Research Institute presented “Research on the Value Accounting and Realization path of Water Ecological Products—Take Anji County of Zhejiang Province as An Example”, which will deepen the study of water ecological product connotation and definition and outlined path of value realization.

Mrs. Li Jingjing from the Hubei Institute of Water Resources Survey and Design delivered a presentation on “Effect of pollution load reduction on water quality in typical lakes in the shallow hill water Network area”. In the relatively closed water bodies of rural lakes in the shallow hilly water network area, pollution intercept and control is key to controlling TP, and taking measures such as increasing lake hydrodynamic conditions in summer will be a more efficient approach to improve rural lake water quality.



▲ Mr. Zhou Jiahong



▲ Mrs. Li Jingjing

Theme 5: Establishing Sustainable Water Infrastructures

Dr. Yao Huaming from China Yangtze Power Company introduced the Three Gorges Decision Support Systems (TGDSS), discussing its functions, modeling methods, application and system integration technologies of TGDSS in detail, as well as its application in coping with the series floods in 2020 and the extreme drought in 2022.

Dr. Yao Huaming ►



Theme 6: Innovation for Water Governance and Management

Dr. Angela Lee, from the Center for Water Resources Technology and Policy, the University of Hong Kong, introduced the application of edge computing and deep learning to analyze domestic water use data and to sustain water-conscious behavior: A case study of Hong Kong.



▲ Dr. Angela Lee

Miss Qingyang Luo from Zhongshui North Survey, Design and Research Co., Ltd. presented a report titled "Characteristics and Division of Watershed Water Network Pattern", where she proposed a new river network classification method and applied it to some large watersheds.



▲ Miss Qingyang Luo

Ms. Li Heshu from Development Research Center of the Ministry of Water Resources shared the River and Lake Chief System and its practice in China. Taking Xiaonanxi River in Chongqing as a typical example, the presenter summarized the successful experiences, difficulties and problems in the process of promoting the system, and put forward corresponding suggestions for strengthening the system in the future.

Ms. Li Heshu ►



Poster Exhibition Showcases Diverse Water Science Research

278 high-quality posters submitted in response to the call for papers took center stage at the basement exhibition area. The exhibition, aligned with the congress theme and its six sub-themes, offered a comprehensive view of water science research and its connections to other fields.



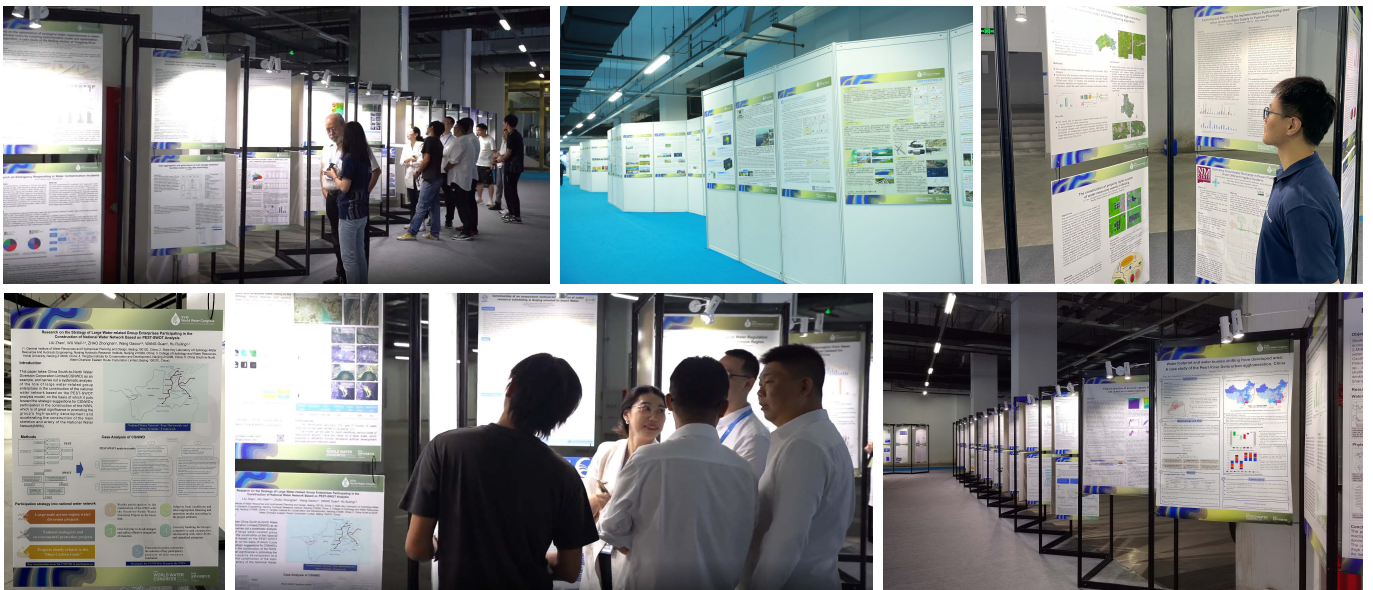
The displayed posters covered a wide range of topics. They explored the impact of climate change on snowmelt and water flow processes, the laws governing water and sediment evolution, and the dynamics of extreme precipitation. These studies provided insights into the intricate mechanisms at play in the world of water.

Beyond theoretical research, the exhibition featured practical applications of water science. For instance, it showcased the implementation of drip irrigation technology in Xinjiang and the use of digital twins in water temperature operation systems. These applications demonstrated the integration of technology into water resource management.

One particularly valuable aspect of the exhibition was its focus on water efficiency in both production and daily life. These studies offered practical guidance on optimizing water usage, which is crucial in our era of sustainable resource management.

Authors of the displayed papers were present at the conference, facilitating direct interactions with attendees. This setup encouraged discussions, idea exchanges, and on-site clarifications of questions and doubts.

The exhibition not only celebrated the significance of water science research but also highlighted its role in driving economic and social development. Water science isn't isolated; it intersects with various sectors, influencing progress on multiple fronts.





A Taste of High Level Interviews

Water: The Core of Sustainable Development - Insights from Prof. Jun Xia



XIA JUN

Academician of Chinese Academy of Sciences
Professor on hydrology Wuhan University

In a recent interview with renowned scientist Prof. Jun Xia, the critical role of water in achieving sustainable development goals was highlighted. Prof. Xia, an expert in hydrology and water resource management, emphasized the growing complexity of water issues in today's world due to climate change and land use alterations.

Water's Central Role

"Water is the core of all our development goals," Prof. Xia stated emphatically. He explained that climate change and land use changes have made water-related challenges more intricate. Climate change, for instance, not only increases the likelihood and intensity of extreme events like floods and droughts but also disrupts the distribution of water resources in time and space.

Moreover, rapid urbanization, agricultural expansion, and energy development are altering land use patterns, which, in turn, affect domestic and environmental water use. The sustainable utilization of water ecosystems and social water use is significantly impacted by these changes.

Water Security: A Global Priority

Discussing water security, Prof. Xia underlined that it has become a paramount concern within the global sustainable development goals. This multifaceted issue encompasses various aspects such as water scarcity, pollution, disasters, and ecosystem degradation. Understanding global water security, therefore, entails examining the nexus between water and the future of humanity, seeking innovative solutions for water security, and managing water resources scientifically in the face of ever-changing environments.

The Key Role of Scientists

Prof. Xia stressed the indispensable role of scientists in addressing water-related challenges in our changing environment. Scientists are expected to gain a comprehensive understanding of hydrological processes, promote scientific and technological innovation, and intelligently manage water resources. For example, hydrologists are employing advanced methods like isotope hydrology to identify the sources of water in the hydrological cycle. Scientists are also developing sophisticated hydrological models, such as the Yangtze River Simulator, pioneered by the Chinese Academy of Sciences. In addition, the utilization of big data and artificial intelligence has proven instrumental in solving complex water safety problems.

IWRA's 18th World Water Resources Congress

During the interview, Prof. Xia lauded the 18th World Water Resources Congress as a platform that showcased numerous advancements in water science and highlighted new achievements in water resource management and application. Looking ahead, he expressed confidence that scientists would continue to provide crucial technological support for sustainable water resource utilization and enhanced water security in our rapidly changing world.

