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EDITORIAL

Closing remarks to the featured collection: Water security—New technologies, strategies, policies, and institutions

The COVID-19 epidemic seems to have slowed things down and made time go faster. The 2019 Beijing *International Specialty Conference of Water Security—New Technologies, Strategies, Policies, and Institutions* has passed for 3 years (Xia et al., 2021), and a companion featured collection issue in JAWR is now near its closure. A total of 19 papers have been accepted covering seven themes: new technology (4 papers), water quality dynamics (2), urban water security (2), resources carrying capacity (3), integrated and trans-discipline study of water (2), transboundary water (2), and policy and institution (4).

Papers on new technology mainly focus on new methodology in model simulations and water resources allocation for both water quantity and water quality. Chen et al. (2021) proposed an interval two-stage classified allocation model to address the nonstationarity and uncertainty in optimal allocations of regional water resources. Jung et al. (2022) overcame the limitations of the Soil and Water Assessment Tool (SWAT) to model salinity in a watershed within the Rio Grande basin by coupling SWAT with eXtreme Gradient Boosting (XGBoost), a decision-tree-based ensemble machine learning algorithm and identified both temporal and spatial trends. Lou et al. (2022) put forward an information-based method, supplemented with a coupling strength index, to quantify soil moisture–precipitation feedback characteristics in a case study of Illinois. Rallings et al. (2022) provided a case of hydrologic classification using global datasets to inform water management planning in rapidly developing data-limited regions, such as the Yangtze River, China, based on the functional flow framework of managing rivers to deliver environmental water in the right place, adequate time, and appropriate amount.

Two papers covered water quality dynamics, algae growth under different exposure of erythromycin, and the fate and transport of pollutants in vegetation filter strips as well as its roles in the control of non-point source pollution. Ma et al. (2021) found the production of reactive oxygen species and antioxidants may account for the hormesis of growth and different sensitivity in *Chlorella vulgaris* and *Raphidocelis subcapitata* to the exposure of erythromycin. Yu et al. (2022) found by experiment that flow hydrodynamics condition has a significant impact on the fate and transport of colloid pollutant in vegetation filter strips, which is of critical importance in the control of nonpoint source pollution.

Two papers showcased urban water security from urban runoffs and inundation and low-impact development (LID). Wang et al. (2022) analyzed the impacts and sensitivity of impervious areas and connectivity on surface runoff under rainfall simulation experiments. Zhou et al. (2022) constructed a hydrological and hydrodynamic coupling model to better simulate urban inundation and analyze the mitigating effects of LID on urban inundation.

Three papers explained water resource carrying capacity (WRCC) with different spatial scales at the city, region, and national levels using different methods. Xiao et al. (2021) improved an ecological footprint model responding to data changes faster for evaluating regional carrying capacity and suggested to decision makers to pay attention to the protection of water resources area to enhance its regional carrying capacity in Wuhan City. Han et al. (2022) proposed a framework for the risk assessment of WRCC for North China based on the fragility of damage-affected bodies and the damage posed by disaster-inducing factors. Lv et al. (2021) investigated the risk factors influencing WRCC of China based on risk theory and resources carrying capacity theory and proposed a method for the risk assessment of the WRCC by combing the vulnerability and the hazard of WRCC system.

Integrated and transdisciplinary water study papers examined the status of food–energy–water (FEW) nexus research in water and virtual water. Susnik and Staddon (2022) examined and updated the current state of FEW nexus research, in particular modeling research, to reflect recent advances, corrected some misperceptions, and put the nexus enterprise into the context of larger epistemological issues. Zhou et al. (2022) analyzed the changes in virtual water flows embedded in trade for wheat, cotton, and livestock with outside regions (external) and Central Asia countries (internal) for the period 2000–2018.

Two papers demonstrate the complexity of transboundary water issues, including success through cooperation and lessons learned from failures. Lee and Lee (2021) investigated shared benefits through the cooperation between North Korea and China over transboundary water management in the Yalu River Basin. Primary attention has been placed on joint hydropower development since the 1950s, which has brought in developmental benefits for North Korea and security benefits for China. Ziganshina and de Schutter (2022) reviewed the achievements and failures in pursuing evidence-driven and knowledge-based transboundary water cooperation in Central Asia and concluded that joint policy-oriented research going "beyond water" can support regional water security.

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Policy and institutional issues can affect water end uses (household), different water sectors, and large-scale water projects. Carney et al. (2021) framed and examined water banking's potential influences on water security from a hydro-social perspective through a case analysis of water banking policy in Utah. Liu and Jia (2021) presented the decision-making models of industrial water recycling and different decision logic of the participants about water reclamation and explained the gap between the relatively low utilization and the strong demand for water recycling. Peng and Li (2022) evaluated the effects of implementing the water pricing mechanism of China's South-to-North Water Diversion Project on its operation and put forward recommendations for future water pricing mechanism improvement. Wutich et al. (2021) presented an agenda for Household Water Insecurity research that addresses measurement, monitoring, and management with the goal of enhancing long-term sustainability and water security for all aligning with the sustainable development goals (SDGs). They set up three goals, namely (a) improving the measurement precision at the household and individual level to better inform the decision makers, (b) enhancing monitoring with new information and communication technology to identity maintenance and investment needs for water infrastructure in a timely and precise manner, and (c) managing complex water infrastructures in more inclusive and democratic ways (Wutich et al., 2021).

The scale of water problems spans from a household, community, city, region (states/provinces), and nation to a global/international level. Water security is one of the key elements of the FEW nexus. Although it failed to reflect all the themes of the special water security conference (Xia et al., 2021), let alone the large field of water security, this featured collection showed the wide range of subjects and research depth of water security, especially embodied the important significance of this topic in food security and national security.

1 | LOOK FORWARD

On World Water Day, March 22, 2011, the then Secretary of State Hillary Clinton requested the National Intelligence Council to develop a global water security report (Defense Intelligence Agency, 2012) which was announced a year later. This may be the first open emergence call from the leadership of top leaders of major countries on global water security issues. On June 2, 2022, Vice President Harris of the United States (U.S.) launched the White House Action Plan on Global Water Security, which covers the full spectrum of global water issues and advances U.S. leadership on water security (U.S. Department of State, 2022). It's a new landmark of the U.S. whole-of-government effort to achieve a water-secure world.

In China, President Xi Jinping has also been very concerned about water security, and put forward a new idea of water governance, “water conservation as a priority, space balanced, system governance and two-handed work” (Nie, 2014). Globally, he put forward the initiative of building a community of human life (Xinhua News Agency, 2017). All countries work together to meet challenges such as water security and achieve the goal of sustainable development for all mankind with no nation/country left behind.

The attention of decision makers and the injection of more resources will certainly be conducive to the solution of water security problems. However, the challenges remain enormous. For example, this year's large-scale and record temperatures and extreme droughts in West Europe, South Europe, North Africa, West Asia, Central Asia, China's Yangtze River Basin, the southwest of the U.S. and other places have had a great impact on water supply and food production. In addition, the impact of COVID-19 and the conflict between Russia and Ukraine have affected the world's food supply, especially the food security in low-income countries. These urgent issues require practitioners in the water industry, including researchers, educators, engineers, managers, and decision makers, to provide innovative solutions from all the aspects of promotion of novel ideas, technological progress, institutional reform, especially global cooperation under the vision of a community with a shared future for mankind. Although there are no silver bullets for solving such complex water security issues, recent advances in FEW or water–energy–food (WEF) nexus provided a better framework of addressing the complex development and security challenges, holding promise for guiding policy development and governance structures in a world facing escalated population growth, climate change, and inequality in terms of access to resources (Simpson & Jewitt, 2019). Further linkage between WEF framework and SDGs could help improve security of all the resources.

We will conclude this feature issue with a quote from the Sustainable Water Partnership (2017): “Water security is essential to humankind as it supports public health, economic growth, environmental sustainability, political stability and disaster risk reduction” and “Water security is the adaptive capacity to safeguard the sustainable availability of, access to, and safe use of an adequate, reliable, and resilient quantity and quality of water for health, livelihoods, ecosystems, and productive economies.”

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REFERENCES

Carney, C.P., J. Endter-Wada, and L.W. Welsh. 2021. "The Accumulating Interest in Water Banks: Assessing Their Role in Mitigating Water Insecurities." *Journal of the American Water Resources Association* 57(4): 552–71. https://doi.org/10.1111/1752-1688.12940.

Chen, S., Q. Li, J. Xu, D. Wang, Y. Wang, and Z. Yuan. 2021. "An Interval Two-Stage Classified-Allocation Model for Regional Water Management under Nonstationary Condition." *Journal of the American Water Resources Association* 57(4): 610–27. https://doi.org/10.1111/1752-1688.12924.

Defense Intelligence Agency. 2012. "Global Water Security, an IC-Coordinated Paper." https://www.dni.gov/files/documents/Special%20Report_ICA%20Global%20Water%20Security.pdf.

Han, Y., S. Zhang, A. Lv, and H. Zeng. 2022. "Risk Assessment of the Water Resources Carrying Capacity: A Case Study in North China." *Journal of the American Water Resources Association*: 58(6): 1240–1254. https://doi.org/10.1111/1752-1688.12994.

Jung, C., S. Ahn, Z. Sheng, E.K. Ayana, R. Srinivasan, and D. Yeganantham. 2022. "Evaluate River Water Salinity in a Semi-Arid Agricultural Watershed by Coupling Ensemble Machine Learning Technique with SWAT Model." *Journal of the American Water Resources Association*: 58(6): 1175–1188. https://doi.org/10.1111/1752-1688.12958.

Lee, S., and Y. Lee. 2021. "Transboundary Water Management in the Yalu River Basin between North Korea and China: With a Focus on Hydropower Development." *Journal of the American Water Resources Association* 57(4): 572–84. https://doi.org/10.1111/1752-1688.12944.

Liu, Z., and S. Jia. 2021. "Decision Behavior of Different Participants in Industrial Water Recycling and the Sharing of Water Recycling Value." *Journal of the American Water Resources Association* 57(4): 602–09. https://doi.org/10.1111/1752-1688.12935.

Lou, W., P. Liu, L. Cheng, and Z. Li. 2022. "Identification of Soil Moisture–Precipitation Feedback Based on Temporal Information Partitioning Networks." *Journal of the American Water Resources Association*: 58(6): 1199–1215. https://doi.org/10.1111/1752-1688.12978.

Lv, A., Y. Han, W. Zhu, S. Zhang, and W. Zhao. 2021. "Risk Assessment of Water Resources Carrying Capacity in China." *Journal of the American Water Resources Association* 57(4): 539–51. https://doi.org/10.1111/1752-1688.12936.

Ma, Z., F. Yang, J. Ren, R. Fan, Q. Duan, J. Guo, and J. Guo. 2021. "Growth Inhibition and Oxidative Stress in Two Green Algal Species Exposed to Erythromycin." *Journal of the American Water Resources Association* 57(4): 628–37. https://doi.org/10.1111/1752-1688.12915.

Nie, Y. 2014. "Make Every Effort to Ensure Water Safety in the Capital (In Chinese)." http://theory.people.com.cn/n/2014/0922/c83850-25710233.html.

Peng, X., and N. Li. 2022. "Water Pricing Mechanism for China's South-to-North Water Diversion Project: Design, Evaluation, and Suggestions." *Journal of the American Water Resources Association*: 58(6): 1230–1239. https://doi.org/10.1111/1752-1688.12990.

Rallings, A.M., B. Clifton, V. Espinoza, Z. Hao, W. Chen, W. Duan, Q. Peng, P. Luo, and J.H. Viers. 2022. "Regional Hydrologic Classification for Sustainable Dam Operations in China: Exploratory Applications in the Yangtze River Basin." *Journal of the American Water Resources Association*: 58(6): 1216–1229. https://doi.org/10.1111/1752-1688.12966.

Simpson, G.B., and G.P.W. Jewitt. 2019. "The Development of the Water-Energy-Food Nexus as a Framework for Achieving Resource Security: A Review." *Frontiers in Environmental Science* 7: 8. https://doi.org/10.3389/fenvs.2019.00008.

Susnik, J., and C. Staddon. 2022. "Evaluation of Water-Energy-Food (WEF) Nexus Research: Perspectives, Challenges, and Directions for Future Research." *Journal of the American Water Resources Association*: 58(6): 1189–1198. https://doi.org/10.1111/1752-1688.12977.

Sustainable Water Partnership. 2017. "Improving Water Security, Toolkit #1." https://www.globalwaters.org/resources/assets/swp/improving-water-security-swp-toolkit-1.

U.S. Department of State. 2022. "U.S. Action Plan on Global Water Security." https://www.state.gov/u-s-action-plan-on-global-water-security/.

Wang, Y., X. Zhang, Y. Liu, C. Liang, J. Xu, and G. Pan. 2022. "Impacts and Sensitivity Analysis of Imperviousness Area and Connectivity on Surface Runoff under a Plot-Scale Rainfall Simulation Experiments." *Journal of the American Water Resources Association* 58(6): 1279–1292. https://doi.org/10.1111/1752-1688.13066.

Wutich, A., W.E. Jepson, J. Stoler, P. Thomson, M. Kooy, A. Brewis, C. Staddon, and K. Meehan. 2021. "A Global Agenda for Household Water Security: Measurement, Monitoring, and Management." *Journal of the American Water Resources Association* 57(4): 530–38. https://doi.org/10.1111/1752-1688.12926.

Xia, J., M. Campana, S. Jia, and Z. Sheng. 2021. "Introduction to the Featured Collection: Water Security—New Technologies, Strategies, Policies, and Institutions." *Journal of the American Water Resources Association* 57(4): 527–29. https://doi.org/10.1111/1752-1688.12954.

Xiao, Y., Y. Ou, X. Qu, L. Zhang, X. Zhang, and X. Jun. 2021. "Determining the Regional Carrying Capacity of the Wuhan City Circle Based on the Improved Ecological Footprint Method." *Journal of the American Water Resources Association* 57(4): 585–601. https://doi.org/10.1111/1752-1688.12938.

Xinhua News Agency. 2017. "Xi Jinping Proposed That We Should Adhere to the Path of Peaceful Development and Promote the Construction of a Community with a Shared Future for Mankind." http://www.xinhuanet.com/politics/19cpcnc/2017-10/18/c_1121821003.htm.

Yu, C., X. Sun, Y. Sun, K. Yang, and Z. Yu. 2022. "Colloid-Pollutant Migration through Saturated Vegetative Filter Strips with Various Hydrodynamics Condition under Rainfall." *Journal of the American Water Resources Association*: 58(6): 1255–1263. https://doi.org/10.1111/1752-1688.13019.

Zhou, X., S. Han, H. Li, D. Ren, Z. Sheng, and Y. Yang. 2022. "Virtual Water Flows in Internal and External Agricultural Product Trade in Central Asia." *Journal of the American Water Resources Association*: 58(6): 1162–1174. https://doi.org/10.1111/1752-1688.12959.

Zhou, Y., D. She, Y. Wang, J. Xia, and Y. Zhang. 2022. "Evaluating the Impact of Low Impact Development Practices on the Urban Flooding over a Humid Region of China." *Journal of the American Water Resources Association*: 58(6): 1264–1278. https://doi.org/10.1111/1752-1688.13032.

Ziganshina, D.R., and J.L.G. de Schutter. 2022. "Paving the Way for Evidence-Driven Transboundary Water Cooperation in Central Asia." *Journal of the American Water Resources Association*: 58(6): 1149–1161. https://doi.org/10.1111/1752-1688.12957.